What is Just Transition?

Perception of Grassroots Stakeholders

JTRC
IIT KANPUR

A Field Report from the Coal Mines and Power Plants of Uttar Pradesh and West Bengal

Just Transition Research Centre
Department of Humanities and Social Sciences
Indian Institute of Technology Kanpur
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Foreword

Climate change is here, affecting people around the world. In the last one month, climate crisis has worsened with floods in Pakistan and China, and drought in California being the latest incidents. Already the world has warmed over 1 degree Celsius. Climate action requires phasing out fossil fuels particularly coal in a matter of decades in order to keep global warming well below 2-degree Celsius.

While many OECD countries have explicit policies to phase out coal along with ideas for implementing just transition, same is not true for large coal dependent economies such as India. In India, coal remains the mainstay of its energy system and millions of people and several states remain economically dependent on coal.

In such a scenario, any phase out of coal in the future needs deep considerations for just transition for coal workers and their communities. This is not easy, given the scale of coal dependency at a district level and complexity of local political dynamics. From a research point of view, both understanding the scale of coal dependency and local dynamics along with possible just transition solutions is underexplored. Stakeholder perception including that of under-represented stakeholders is a crucial first step towards creating effective just transition policies.

To that end, a stakeholder level perception study by IIT-Kanpur's Just Transition Research Centre is an important contribution. The study exposes key sectoral stakeholders' – workers, local community, trade unions, power plants and coal mines, men and women – perspective on just transition. For any just transition policy to succeed, policymakers would need to incorporate stakeholder perspectives from coal dependent states. This being the first study that incorporates stakeholders' perspective will set the tone for future studies on the topic. The results and methodology of this study are going to be very useful for future studies on the topic focusing on understanding ground level perspectives on just transition.

I congratulate the team IIT-Kanpur's Just Transition Research Centre's dedicated team for conducting months of field work to provide much need ground level evidence on just transition. Let this be a beginning of many such future studies to come.

Sandeep Pai
Senior Research Lead
Global Just Transition Network
Center for Strategic and International Studies

"As people's perceptions are influenced by their needs, the perception study on 'just transition' can be a powerful tool to unveil the communities' needs in the phase of transition."

- JTRC

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List of Abbreviations

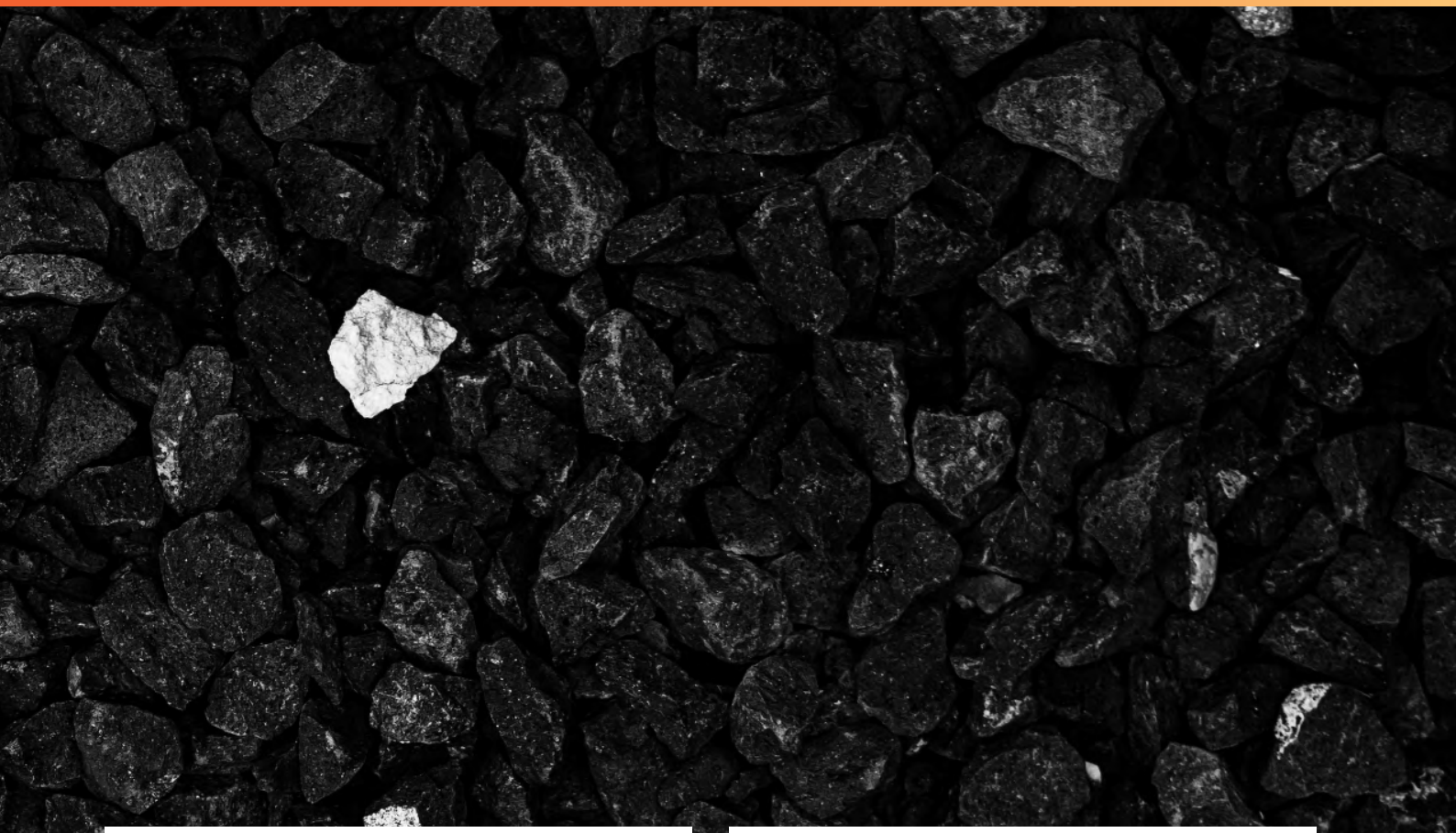
°C: Degree Celsius
°F: Degree Fahrenheit
AC: Air Conditioners
ANOVA: Analysis of Variance
BCCL: Bharat Coking Coal Limited
BT: Billion Tonnes
CAG: Comptroller and Auditor General
CDM: Clean Development Mechanism
CIL: Coal India Limited
COP: Conference of Parties
CSO: Civil Society Organisations
EAC: Expert Appraisal Committee
ECL: Eastern Coalfields Limited
EJ: Energy Justice
ESP: Electrostatic Precipitators
ET: Energy Transition
GDP: Gross Domestic Product
GHG: Greenhouse gas
GOI: Government of India
GW: Gigawatts
ILO: International Labour Organisation
INR: Indian Rupee
ISO: Independent System Operator
ITUC: International Trade Union Confederation
JET: Just Energy Transition
JTRC: Just Transition Research Centre
Km: Kilometre
LED: Light Emitting Diode
LG: Local Governance
mm: Millimetre
MS-Excel: Microsoft Excel
MT: Million Tonnes
MW: Megawatts
NCL: Northern Coalfields Limited
NDC: Nationally Determined Contributions
NFHS-IV: National Family Health Survey-IV
NTPC: National Thermal Power Corporation
SPSS: Statistical Package for the Social Sciences
SPV: Special Purpose Vehicle
sq km: Square kilometre
Thousand ha: Thousand hectares
UNECE: United Nations Economic Commission for Europe
UNFCCC: United Nations Framework Convention on Climate Change
UPRVUN: Uttar Pradesh Rajya Vidyut Utpadan Nigam
USD: United States Dollar
WBPDCL: West Bengal Power Development Corporation Limited

Executive Summary

Recent debates surrounding the climate change crisis have made the idea of 'just transition' even more prominent. As the world moves toward a future that is free of fossil fuels, an increasing number of supporters of environmental justice and climate change are realising the need to protect the communities and workers that belong to the fossil fuel industry. Over the years, industrial workers and communities have encountered a near constant set of challenges due to economic transitions, which often mean job loss, identity crisis or community disposition with little or no support. It is imperative to avoid the mistakes that occurred in the past, leaving the workers and community behind, instead strive for a society that works for all. To achieve the ambitious targets of net-zero emission by 2070, India, like many other countries, only has nationally determined contributions (NDCs) and is yet to devise a comprehensive policy roadmap to move away from coal to alternate energy sources at sub-national levels.

This report addresses the requirement of high-quality essential inputs for the policy makers. People who suffer for livelihood loss or will undergo the transition are often those whose voices and perceptions are not heard, yet they are those who live through the experience and can offer the most valuable input to the planning process. While introducing the problem, this report diagrammatically represents whether the transition is people-centric and how the post-transition coal neighbourhood will look like. Organically, the need of governance in localising energy transition is represented through an inverted pyramid.

As the first step, the report tries to focus on critical stakeholders' (worker, local community, men and women, trade unions of power plants and coal mines) perception of just transition in the due process. How grassroots stakeholders perceive the term 'just transition' is less known to the world largely because of the absence of a widely accepted scale to measure the transition. This report addresses the knowledge gap and identifies the major grassroots stakeholders in the just transition process in selected areas of two states in India. Insights on the thematic areas from the perspectives of workers and other



coal-dependent communities from the selected coal mines and power plants from the states of Uttar Pradesh and West Bengal are further represented.

The major findings of this report derive from the face to face interviews of almost 900 sample respondents associated with coal mines and power plants in two states. In addition a sizable number of qualitative interviews and case study also carried forward among the non-worker community members from across the two states that are conducted between December 2021 to March 2022. The report concludes that:

- The grassroot stakeholders' perception based on the trade union membership (member versus non-member), gender (women versus men), nature of dependence (mine and power plant workers versus other indirectly dependant people) and type of coal unit (coal mine versus power plant) varies on the three key dimensions of just transition, viz., coal downside, environment protection and community livelihood. Individual and collective perceptions of just transition have a wide range according to the type of dependence, gender, coal units and relationships with trade unions.

- Field observation elucidates the requirement of setting up power plant closure guidelines and strict adherence to existing closure guidelines for coal mines.

- Outsourced workers are found to be the most vulnerable workforce in the coal sector.

- Major take away from three stakeholder-level workshops under 'Just Transition dialogue with the local stakeholders' revealed that the coal workforce is already undergoing gradual reduction due to technical advancements. Energy transition would further harm the workers' livelihood.

The following sections allow readers to take a deep dive into the theme 'what is just transition? Perception of Grassroots Stakeholders that will portray a complete picture of what just transition entails, how coalitions can come together, and what possible pathways to a just future exist.

Chapter 1

Introduction

'While some jobs may be lost, low-emissions development can also open more opportunities to enhance skills and create more jobs…Integrated policy packages can improve the ability to integrate considerations of equity, gender, equality and justice.'

- Summary for Policy Makers, IPCC, 2022, p. 47

'When we take action to mitigate climate change by protecting nature, we're also supporting nature-reliant communities. By doing this, we are making the world a healthier and more just place.'

- World Economic Forum (Griscom, 2022)

In the early 18th century, the industrial revolution increased the need for energy with the advent of the steam engine and led to a steep incline in coal production (Wilde, 2019). Since then, the average surface temperature of the Earth has increased by 0.07 °C (0.13 °F) every 10 years (Ghosh, 2021). The fossil fuel-dependent (mainly coal) economic growth is damaging the environment and causing an unfavourable climate change. The global coal consumption amounts to over eight billion tons and it fulfils almost 40% of the world's electricity needs (International Energy Agency [IEA], 2020). Electricity generation from coal leads to 72% of the anthropogenic greenhouse gas emissions (GHG) worldwide (United Nations Environment Programme [UNEP], 2019).

India produced 716 million tons of coal in the financial year of 2020–21 and imported 215 million tons, which adds up to almost a billion tons of coal usage per year, making it the third-largest coal consumer in the world (IEA, 2021). Figure A 1 illustrates the coal mine fields and power plants in India at present. The coal-based power industry in India is responsible for around 2.4% of the world's greenhouse gas emissions, one-third of India's GHG emissions, and roughly 50% of the nation's fuel-related emissions (Centre for Science and Environment [CSE], 2022). On the other hand, India's coal sector creates millions of jobs, directly or indirectly linked to the entire coal value chain. Coal India Limited (CIL) directly employs approximately 270,000 as workers within its subsidiaries (see Figure A 2 for CIL subsidiaries); besides, there are several indirect jobs (e.g., people working in ash ponds, coal washers) and induced jobs (people who work in small local retail businesses, such as grocery stores or tea shops, in territories of coal mines and power plants) (Aggarwal, 2021).

This adds a threefold complexity to the Indian energy transition. First, shutting down the coal mines will result in loss of employment and impaired livelihood for the dependent communities (World Bank, 2019). Second, phasing out coal mining requires structural transformation that cuts across geographic sections, vertical levels of policy-politics, and sectoral boundaries (Gurtler et al., 2021). Third, the variety of the stakeholders and the complexity of procedures makes coal phase-out a multidimensional long-term task. In this context, it must be ensured that the process must be inclusionary in its approach and should do justice to all the stakeholders.

Therefore, to address these complexities, a clear and targeted policy roadmap envisioning the nature of interventions is required to support the transition efficiently. First, the challenge is to frame a policy that governs the techno-economic dimensions as well as the human and social aspects of the energy transition process. Second, to realise this, the acceptance

and legitimacy of the new changes **must come from the people** who are directly or indirectly dependent on the existing coal sector, as this workforce will be most acutely affected by the transition. Most importantly, to deliver justice to the communities under transition, robust stakeholder engagement, especially with the representative trade unions is required (World Energy Council, 2019).

However, interaction with other stakeholders, viz., state actors, business groups and civil society organisations are equally vital when localising the energy transition. Therefore, this report brings forth insights from a ground-level study of coal-dependant areas from two coal mine and power plant rich states of India, Uttar Pradesh and West Bengal, by engaging men and women, workers and non-worker local residents, trade union members and non-members, people from power plants and coal mines as the most predominant stakeholder groups of the concerned sector.

> "the acceptance and legitimacy of the new changes must come from the people who are directly or indirectly dependent on the existing coal sector, as this workforce will be most acutely affected by the transition."

1.1 Background and Context of Just Transition

The concept of "just transition" is not new. It emerged in the United States from the labour movement in the 1970s. North American trade unions then developed the idea to create a framework for discussions on the types of social and economic interventions required to safeguard workers' livelihoods during the transition from high-carbon to low-carbon and climate-resilient economies. (Mabey, 2018). In the due time, environmental justice organisations, the global trade union movement, international organisations and the commercial sector have adopted the idea of "just transition" as it has developed and expanded to various fields and domains. (UNRISD, 2018).

Nearly six years after, it was included as a single line in the Paris Agreement of 2015, 'just transition' advanced as a crucial component in ensuring a successful shift to a net-zero and resilient economy at the COP26 climate summit in 2021 (United Nations [UN], 2015). Other international organisations, most notably the International Labour Organization, which has created standards for a just transition, also offer thought and guidance on just transition beyond the United Nations Framework Convention on Climate Change (UNFCCC). Growing calls for a just transition are being made in response to the need to fairly and equally distribute the costs and rewards of ambitious climate action. (McCauley & Heffron, 2018). A schematic diagram of just transition developed by Just Transition Research Centre (JTRC) is presented. This is followed by a framework that elucidates why local governance is vital in energy transition and how it can engage the community.

1.1.1. What is Just Transition? A Simple Explanation

Figure 1 A: Energy Transition

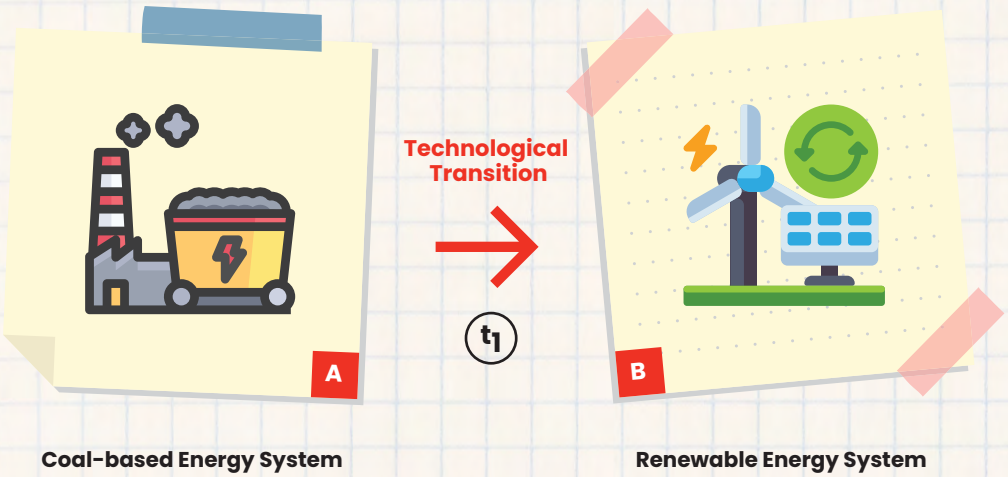
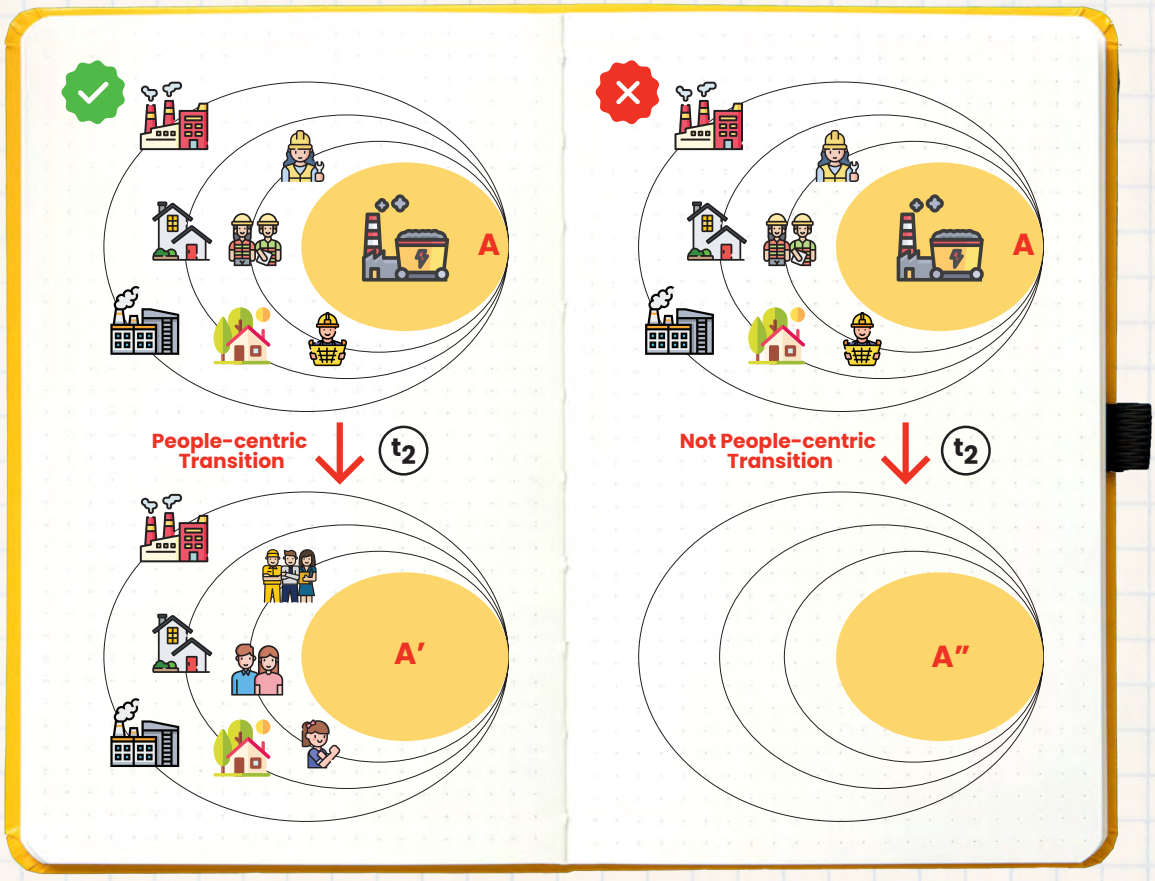


Figure 1 B: Just Energy Transition



Note: Developed and designed by the Just Transition Research Centre (JTRC)(2022).

Just energy transition can be explained by elaborating three words: 'just', 'energy', and 'transition'. We will begin with defining 'energy transition'. Historically energy has been at the centre, and will continue to play a pivotal role in the development of the world economy. The existing energy systems are pre dominantly sourced from fossil fuels. However, the fossil driven energy system is one of the biggest contributors to the global greenhouse gas (GHG) emissions and anthropogenic climate change.

To combat the impacts of climate change, global GHG emissions need to be declined. The alternative is to move towards renewables-based energy systems. Figure 1A represents the technological transition from fossil fuel or coal-based energy system (A) to the one based on renewable energy (B). This transformation might take t_1 amount of time. Being primarily based on technological change, it can be summarized as 'energy transition' or 'technological transition'. For example, three main technological innovations make up energy transition plans, those are energy savings on the demand side, increased production efficiency and the replacement of fossil fuels with low-carbon nuclear and other renewable energy sources (Kabeyi & Olanrewaju, 2022).

Thus, in addition to technological considerations, a just energy transition should take into account the three pillars of sustainable development: social, environmental and economic (Chatterjee et al., 2022) for ensuring sustainable livelihood of the coal-dependent community. Figure 1B explains two situations taking coal as an example. In the first situation, the sustainable social ecosystem remains intact even after the coal is taken out from it (A'). In the second situation, the entire coal-dependent ecosystem is disrupted after the coal is phased out (A''). The situation one in which the move is from A to A', reflects a 'just energy transition' while the situation two in which the move is from A to A'' depicts energy transition without justice. It depicts that one cannot ignore a people-centric approach of energy transition that is supposed to take place in t_2 time, because the impacts of transition directly and indirectly fall on the people who survive on coal. Energy transition is the process of making structural adjustments to the social subsystems that will increase its sustainability (Kabeyi, 2019).

> **"Social scientists have called for a paradigmatic shift from mere 'energy transition' to 'just energy transition'."**

Social scientists have called for a paradigmatic shift from mere 'energy transition' to 'just energy transition' (Goldthau & Sovacool, 2012). This requires addressing the key pillars of energy justice: recognition, distributive, procedural and restorative justice. These pillars can be reconceived in the context of energy. Recognition justice relates to the acknowledgement that the energy systems result in injustices which have to be remedied. For example, acknowledging the rights of contractual and informal labour force for just transition. Distributive justice stipulates that the ills and benefits of the energy systems should be equitably distributed among all the stakeholders. For example, the communities around the coal mines bear the inequitable burden of environmental pollution while the benefits in terms of profits or energy access is enjoyed by people far away. Procedural justice is related to the question of whether the decision-making around energy system is inclusive enough. For example, the extent to which the consultation process takes place with the tribal communities before their land is taken up for mining. Restorative justice deals with the compensatory mechanisms that are put in place to restore the socio-economic security of the people being affected by the energy system. For example, restoring the environment and providing fair compensation to the workers once the coal mines cease operation (Figure 2).

1 For more information, see: Shukla, R. and Swarnakar, P. (2022). Energy justice in post-Paris India: Unpacking consensus and conflict through storylines and discourse coalitions. Vol 91. https://doi.org/10.1016/j.erss.2022.102687

Figure 2: Key Pillars of Energy Justice

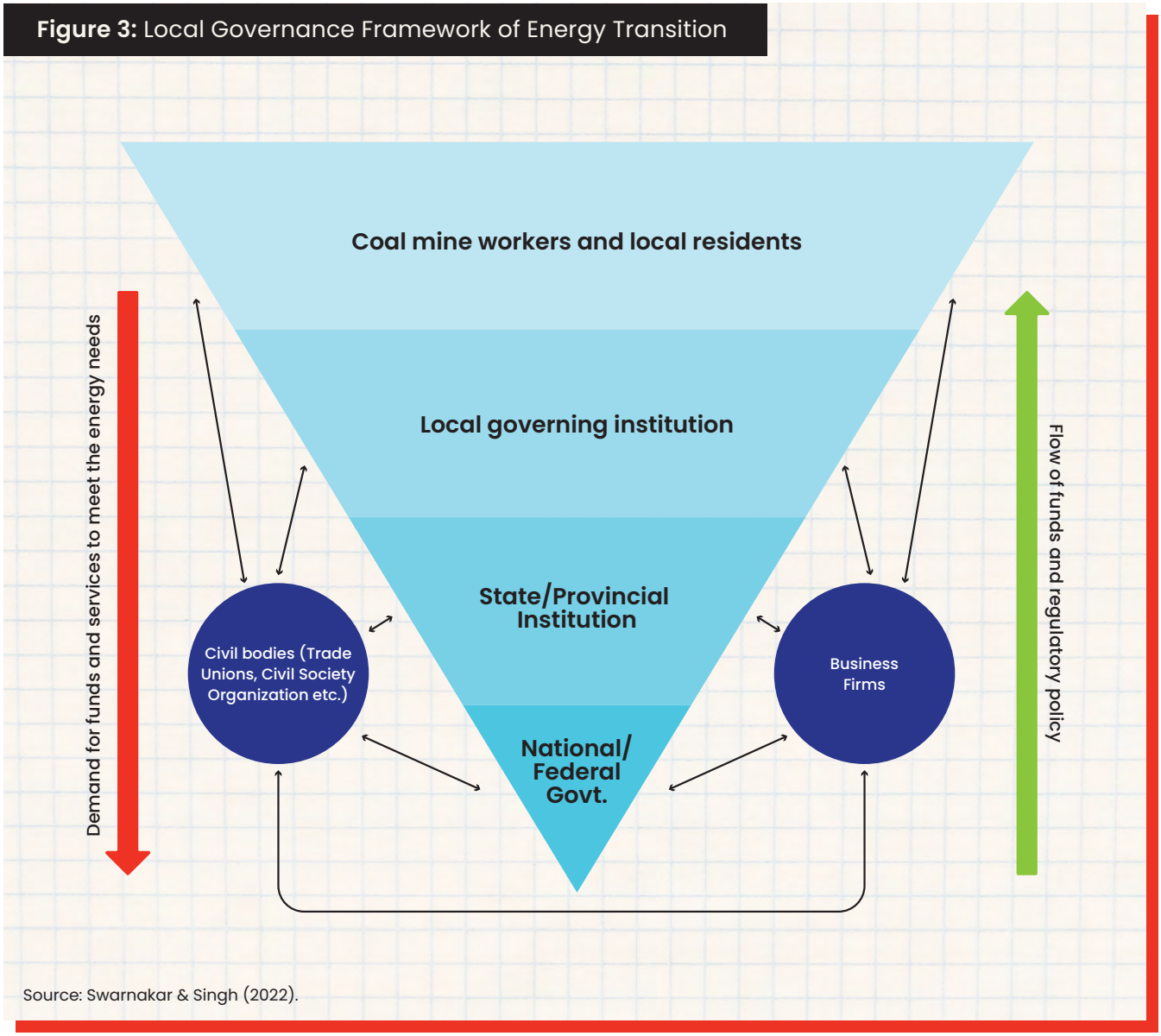
Source: Hess et al. (2022).

The realization of just transition lies in the kinds of jobs created and catered, payment structure, job security and externalities on the local economy in terms of secondary and tertiary opportunities (United Nations Framework Convention on Climate Change [UNFCCC], 2015). Equal access to education and targeted vocational training is vital to ensure the creation of quality 'green' jobs not just for the benefit for the already advantaged section but also for lower skilled workers. All these externalities demand for a local governance framework that can make the pathway of energy transition in India, a 'just' transition galaxy.

1.1.1.1. Localising Governance in Energy Transition

Ideas of justice in the governance of energy transition (ET), which originated in developed countries, are equally important for the developing world (Sovacool, 2012) and local governance (LG) (Loorbach et al., 2020; Hoppe et al., 2015). Strengthening LG systems by providing significant budgetary support is also key to successful transition, as it helps minimise conflict with business firms and facilitates stakeholders'[2] participation in multilevel governing mechanisms (Cheung et al., 2019). Addressing the requirement of a comprehensive framework for the local governance of energy transition, the report has used recently published JTRC framework to explore stakeholder perspective at the grassroot level (Figure 3) (Swarnakar & Singh, 2022).

Figure 3: Local Governance Framework of Energy Transition



Source: Swarnakar & Singh (2022).

2 As a company, society or organisation there are always individuals or groups of individuals who have a certain interest, or even influence, on the achievements of the operations. Freeman et al., (2010) defines these individuals and groups of individuals as stakeholders in the wide sense.

JTRC member with a worker at Bandel Thermal Power Station

Preventing job losses among coal workers by preparing them for the renewable energy transition is an urgent task at the grassroots level, as workers are at the bottom of the stakeholder pyramid. Western countries have adopted welfare plans and interventions to ensure income for affected coal workers. Earlier strategic documents (largely from the global north) underlined stakeholder engagement at the local level, as well as the need to strengthen relationships between local governing bodies, government and business entities (Agostino, 2013).

The thin arrows represent communication flow (ideally two-way). However, the nature of such communication may differ, in that it may be unidirectional, with orders and strict guidelines, or it may be two-way, allowing for feedback. The diagram may be used to fit the EJ concept at various stages. For example, distributive justice will take place largely at the national level, in terms of providing market access and equitably regulating top-down scientific renewable energy interventions, whereas recognition justice is largely applicable at the bottom of the pyramid in Figure 3. The inverted pyramid can be useful for a macro-level reality. On the other hand, micro-level nuances within the sub-levels as well as the stakeholders (shown by the boxes) are equally important when talking about the LG of ET. To assess the framework's applicability, the research team apply it to an Indian scenario to better grasp the reality of connections between stakeholders and the integration of the demand–supply process. As the authors are familiar with India and work closely with the stakeholders under discussions at local levels, discuss the framework in an Indian context; however, with modifications, it can be generalised to other places.

> **"Earlier strategic documents (largely from the global north) underlined stakeholder engagement at the local level, as well as the need to strengthen relationships between local governing bodies, government and business entities."**

At the bottom of the pyramid, engaging communities in policy formulation, implementation and monitoring is a crucial aspect of any policy intervention, as advocated by participatory development schools (Hickey & Mohan, 2005), whereas building participatory local self-governing institutions is vital to realise community-centric LG (Mansuri & Rao, 2013). With fossil-fuel-dependent communities at the bottom of the pyramid, just energy transition (JET) fits well with the focus of community-centric LG. Hence, participatory development practices such as participatory rural appraisal are critical for interventions with the local community. These participatory approaches can achieve a win-win situation with local people after the intervention (Biekart & Gasper, 2013). However, their inclusiveness is debated by participatory scholars in the case of local village meetings. Local socioeconomic diversity, especially gender representation, has been a serious concern for the scholars of participatory development schools (Dutoya & Sintomer, 2019). These concerns are even more important in the context of communities with various means of representation, for example, communities where workers are represented by trade unions and residents by LG representatives. At the local level, there are further categories of people who are represented by business unions and cooperatives that are likely to be hit by any non-planned closure.

Anecdotal cases indicate that centralising JET can weaken a community's sensitivity and response; thus, the decentralisation of decision-making to the local level is an essential step towards localising JET (Lawrence, 2020; Emelianoff & Wernert, 2019). Maintaining local democracy and successful decentralisation at the local level are key to participatory LG mechanism (Singh, 2018). This is particularly crucial for India, the largest democracy of the world, where nearly 68% of the population still lives in the rural area. Moreover, despite having a decades-old history of local government reforms, the country faces local democratic deficit and community demand for further decentralisation of power in village councils (Singh, 2021). Therefore, decentralisation and local governance are very relevant to EJ during mining closure and in areas where new installations are built. Community engagement at local level could be a way to ensure recognition and procedural EJ (Goddard & Farrelly, 2018). In addition, trade unions, being representative bodies of workers and thus representing a hybrid type of engagement of a social and political nature, also play the role of key political actors in the local areas.

Primarily, distributive justice is the subject of federal agencies and is practised around the globe through a top-down strategy. The other three pillars of EJ are crucial to the sub-national level; for instance, procedural and restorative are vital for local political institutions and recognition justice applies to the ethnically diverse coal-worker community. The dimensions (socio-spatial and technical) and principles of EJ should be kept in mind when engaging and regulating (through LG) stakeholders in the transition process. Recently, GOI's Ministry of Coal announced the establishment of a 'just transition' division and the World Bank expressed their interest in providing USD 1 million fund (Jai, 2022) (Figure B 1).

1.2 > Identifying the Research gap

There are many small-scale efforts to capture the dimensions of energy transitions and to find out possible pathways to make the justice-enabled transition pathways. The existing literatures on just transition are designed either as a case study or on some specific region. Studying perception of just transition is in its budding stage. Together, all these make it difficult to measure long-term and systemic impacts of energy transition on employment, company responses, trade union involvement, government initiatives and the economies and social fabric of vulnerable communities.

Surveying the workers of Kakri Coal Mine

1.3 Objectives of the Study

The discussion above highlights the need for identifying the potential actors at the grassroots level who will influence or get influenced by the transition away from coal. More importantly, it underlines the urgency of delving deeper into the various meanings that each of these actors attach to the process of transition and justice within it.

With this backdrop the primary objectives guiding this research are:

- To identify various grassroots stakeholders of the coal sector;
- To analyse the perception of just transition among these stakeholders based on three elements: dialogue and workshops with the stakeholders, researchers' observation, and perception scale

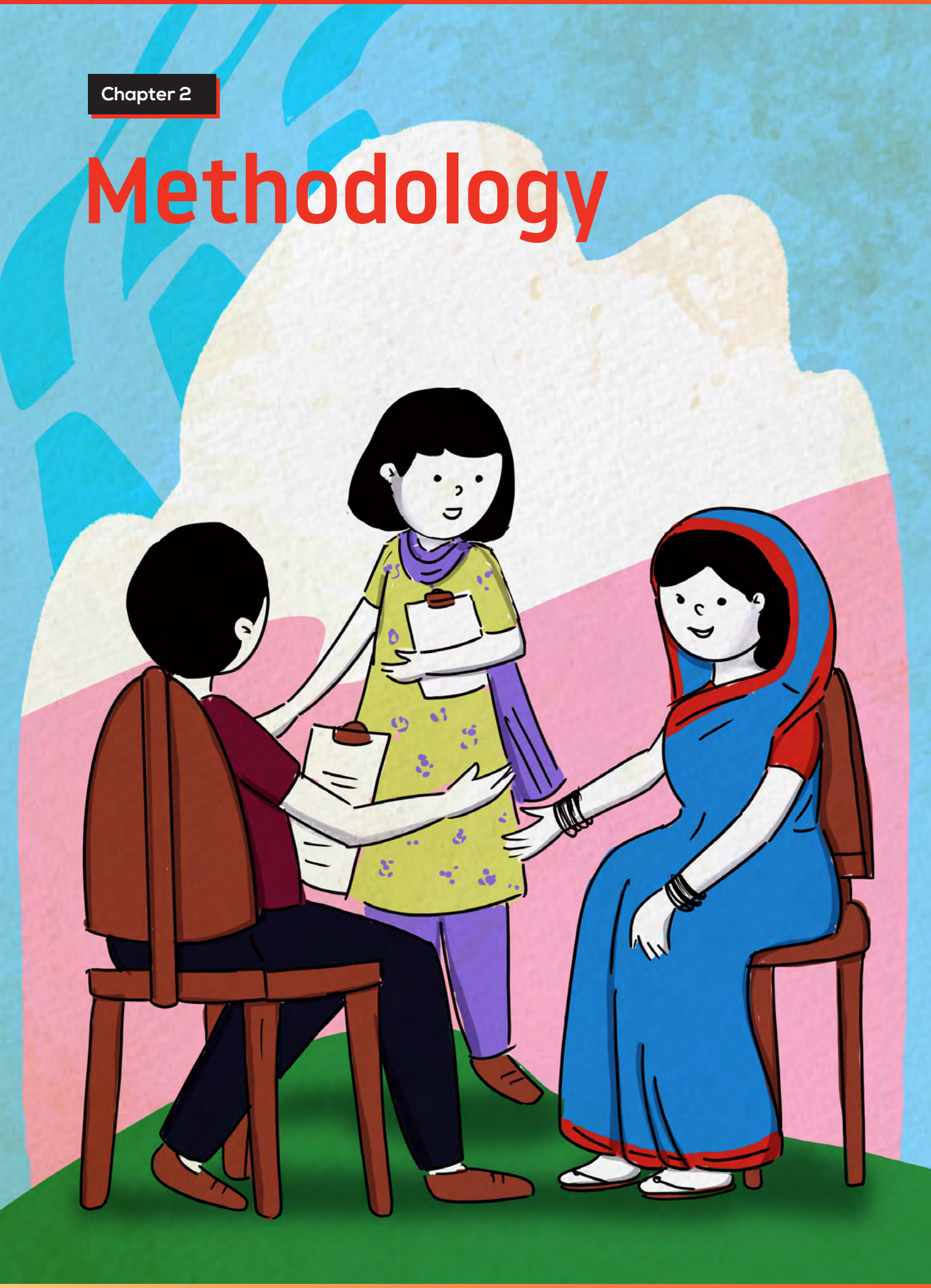
1.4 Novelty of the Study

Novelty of the present report comes in the following ways—

- This report recognizes the community level, i.e., grass-root stakeholder communities that vary demographically, socio-economically and geographically.
- JTRC team has conducted studies both in the coal mines and power plants.
- In the summary for policy makers part, the report accommodates dimensions of perception of just transition along with the respondents' expectations from government, company and trade unions.

Chapter 2

Methodology



A mix-method research design has been used by employing a range of quantitative and qualitative data collection techniques.

2.1 Study Locale Selection

To enable empirical exploration, the present study considers both coal mines and power plants. Uttar Pradesh and West Bengal are selected as the two sample states (see Table A 1 and A 2 in Appendix A for profile of the states). Both occupy a place within the top 10 coal producing states in India (SkyscraperCity Forum, 2022): Uttar Pradesh had the highest thermal power production of 25222.14 mega-watts (MW) in the northern part of India in 2021, while West Bengal led in eastern India, with a production of 14277 MW in 2021 (CEA-GOI, 2021). The districts of Kanpur and Sonbhadra from Uttar Pradesh are chosen as sample districts. Kanpur is home to the Panki Thermal Power Station that is closed; thus, it critically helped researchers study the dynamics of societal factors in a closed power plant. The Sonbhadra district houses a share of the Singrauli coalfield, which provides coal to Singrauli, Vindyachal, Rihand, Obra, Anpara, Resusagar and Pipri thermal power plants located at Singrauli and Obra (Government of Uttar Pradesh, n.d.). Singrauli is thus considered the energy capital of India; locally, it is known as **Urjanchal**. It is quickly becoming India's power hub, particularly for electrical power and coal (Romana et al., 2020). The coalfields in Singrauli are interested in the production of renewable energy to become a net zero company.

West Bengal has the fourth largest coal reserve (Ministry of Coal, 2018) in India as well as the India's first coal mine at Raniganj (one of the survey areas of the present study). In West Bengal, the Bandel Thermal Power Station had two of its units shut down in 2018 (Central Electricity Authority [CEA-GOI], 2018). Santaldih Thermal Power Station also subsequently experienced the closure of its units and now runs only on one unit (Swapdial, n.d.). In addition, Eastern Coalfield Limited, a division of CIL, runs 107 government coal mines in West Bengal, apart from the state's several other privately operated coal mines. Further, for more than two centuries, the Asansol-Raniganj belt (Raniganj coalfields) of West Bengal has seen extensive coal mining activities and remains the most vital source of livelihood for the surrounding localities (Sarkar, 2022). Thus, the selected states, districts, coal mines and power plants signify a strong relevance for the present study on just transition. The present report aims to focus on both coal mines and power plants, to study whether the meaning of just transition within the units is same or different, and if it differs, upon which point(s), as coal mines and power plants have several similarities as well as differences in their structures and functions.

2.1.1. Details on Sample Thermal Power Plants and Coal Mines From Uttar Pradesh

Uttar Pradesh, a northern state of India, is home to several power plants such as Panki (Figure 5), Obra (Figure 6), Anpara, Parichha, Harduarganj, and Tanda power plants and Singrauli super power plant (all sample power plants and coal mines of Uttar Pradesh are shown Figure 4) (NITI Aayog/Indian Space Research Organization, 2022). Most of the power generated in Uttar Pradesh depends on coal (25222.14 MW of thermal power produced in 2021 (CEA-GOI, 2021); however, the limited availability and high prices of coal have led to the perilous power situation in the state. In 2021, eight power plants in Uttar Pradesh had stopped functioning due to coal shortage. In 2020, Business Standard reported that Uttar Pradesh needs to shut the thermal power plants generating 2500 MW power (Figure B 3). In 2021, Zee Media Bureau reported that eight coal-fired power plants had shut down in the state due to lack of fuel, then another six closed making the total number of temporarily closed power plants to 14 (Figure B 2) (Zee Media Bureau, 2021).

Figure 4: Coal Mines and Thermal Power Plants in Uttar Pradesh

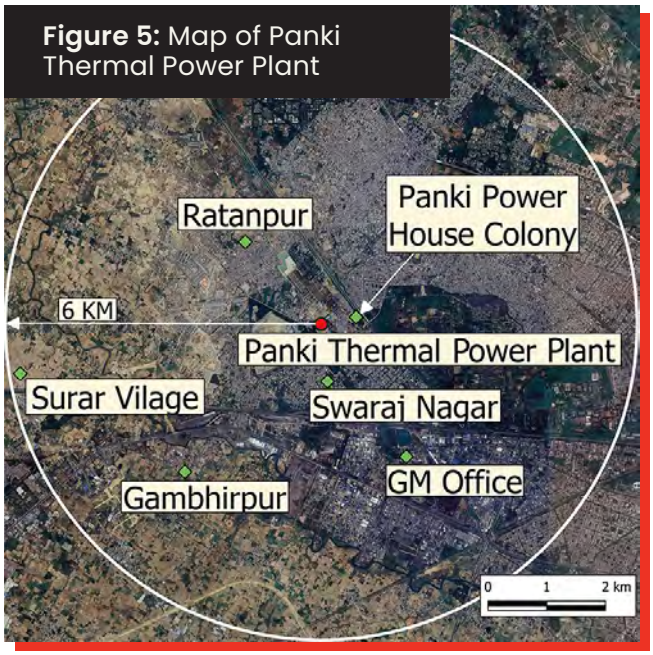
Source: NITI Aayog/Indian Space Research Organization (2022).

Panki Thermal Power Station

2.1.1.1. Panki Thermal Power Station

Panki Thermal Power Station is a retired 210-MW coal-fired power station situated in Uttar Pradesh, India (Figure 5). The power station is owned and operated by Uttar Pradesh Rajya Vidyut Utpadan Nigam (UPRVUN). It was commissioned in 1976 and 1977 and is comprised of two 105 MW units. Coal was supplied to this power station by Bharat Coking Coal Limited (BCCL) and Eastern Coalfields Limited (ECL) (Global Energy Monitor, n.d. a). In the 2007 Corporate Plan, UPRVUN intended to commission three additional 100 MW units at the Panki Thermal Power Station, two in 2010 and one in 2011 (Global Energy Monitor, n.d. a). In 2014, UPRVUN received a term of reference for a 660 MW unit (Ministry of Environment, Forest and Climate Change [MoEF-GOI], 2014), even though the plant was reported as one of the significant sources of air and water pollution in Kanpur city. Stating these reasons, the Expert Appraisal Committee (EAC) of the Union Environment Ministry refused environmental clearance for the Panki power plant and directed the state-run UPRVUN to "explore alternate electricity generation options (gas-based or solar) in the proposed location" (Kaur, 2018). Still, the power station expansion received environmental clearance in 2017 (MoEF-GOI, 2017) with the assurance of new technologies and that the ash issue would be resolved (The Economic Times, 2016). The remaining two units of the Panki power plant were shut down in 2018, after 50 years of service (the other two units had stopped way back in 1998) (CEA-GOI, 2018; Times of India, 2018) (Figure B 4). Commissioning for expansion, which was due for 2021 (CEA-GOI, 2020) was later pushed to 2022 (CEA-GOI, 2021) and then 2023 (CEA-GOI, 2021).

Figure 5: Map of Panki Thermal Power Plant



Source: Made with QGIS version 3.22

2.1.1.2. Obra Thermal Power Station

Obra Thermal Power Station is a 1094-megawatt (MW) coal-fired power station in Uttar Pradesh, India (Figure 6). The Uttar Pradesh Rajya Vidyut Utpadan Nigam (UPRVUN) owns and operates this power station. In 2007, UPRVUNL got a term of reference for a 2 x 500 megawatts (MW) expansion (units 14–15) of this power station (MoEF-GOI, 2007). In 2011, the Ministry of Coal listed UPRVUN and proposed a 1600 MW expansion of the Obra Thermal Power Station (Ministry of Coal, 2011). However, the EAC (Thermal) of the Ministry of Environment, Forest and Climate Change (MoEF-GOI) noted that 'the proposal does not involve approval/ clearance under Wildlife (Protection) Act, 1971 which may be factually incorrect as a notified sanctuary is located in close vicinity.' The committee also reported, 'it was observed that the green belt development in and around the thermal power station seem dismal and the project proponent seem to have not given any serious attention in developing the same'. Then, the project proponent was instructed to create an exhaustive action plan for the development of the green belt with a time limit and an appropriate monitoring system. (MoEF-GOI, 2012). Again in 2017, construction, for those units began for whom commissioning was planned for 2022–2023 (Swapdial, n.d.). Presently, there are five units (units 9–13) in Obra Thermal Power Station that are operational (see Table A 4 for operational details) (Swapdial, n.d.). Hindustan, a regional newspaper, on 29th May 2022, reported the closure of two units in Obra, each of 100 MW. At the same time, the power plant proposed to replace this closed unit with a new unit of 800 MW in the near future (Figure B 5).

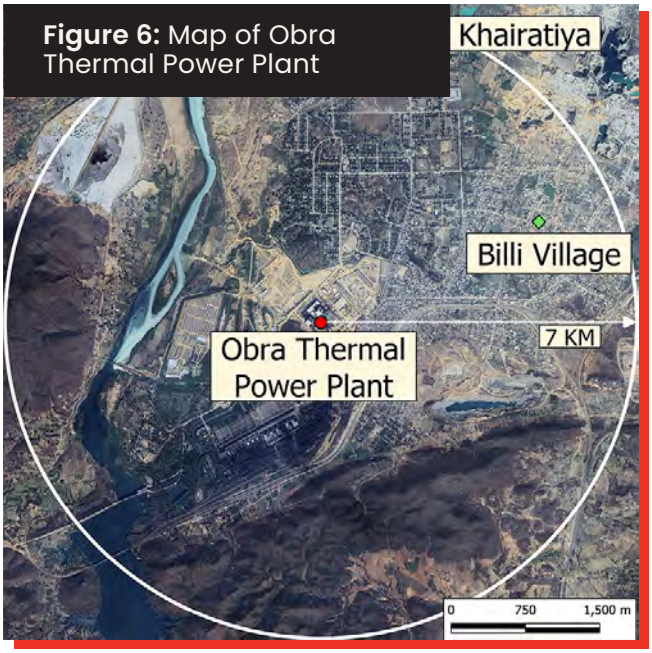


Figure 6: Map of Obra Thermal Power Plant

Source: Made with QGIS version 3.22

2.1.1.3. Singrauli Coalfields

Northern Coalfields Limited (NCL) was established in November 1985 as a CIL subsidiary. The NCL headquarter is located at Singrauli. The Moher sub-basin (312 sq km) and Singrauli main basin make up the two basins that embrace approximately 2202 sq km of the Singrauli coalfields (1890 sq km). The Singrauli district of Madhya Pradesh has the majority of the Moher sub-basin, and a group of five mines from the basin is in Sonbhadra district of Uttar Pradesh (Figure 7). The coal supplies from Singrauli coalfields have made it possible to produce about 10515 MW of electricity from the power plants of National Thermal Power Corporation (NTPC), UPRVUNL and the Renupower division of M/s. Hindalco Industries. The area is now referred to as India's 'power capital.' Currently, these power plants have an overall capacity of 13295 MW, and the NCL is fully prepared to satisfy the rising demand for coal for this purpose (PSU Connect, 2022a). Recently, Singrauli coalfield achieved the production of 122.43 million tonnes (MT) against the target of 119 MT set for the year 2021–22 and a dispatch of 125.66 MT of coal, a record 17 MT more than the previous financial year (PSU Connect, 2022a). During a visit to the Singrauli coalfields, Union Minister Prahlad Joshi emphasised on 'excavation activities to dispatch more coal to thermal power plants' (ANI, 2021) (Figure B 6).

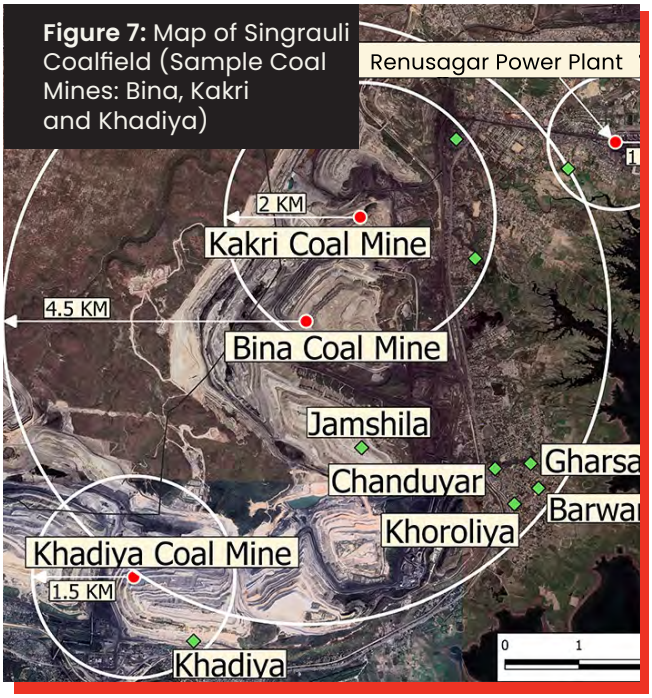


Figure 7: Map of Singrauli Coalfield (Sample Coal Mines: Bina, Kakri and Khadiya)

Source: Made with QGIS version 3.22

> **NCL Singrauli is coming up with sustainable programmes such asempowering local youth through a new CSR initiative, sustainable mining with 'Environment First', and a plantation campaign under 'Project Ankur'.**

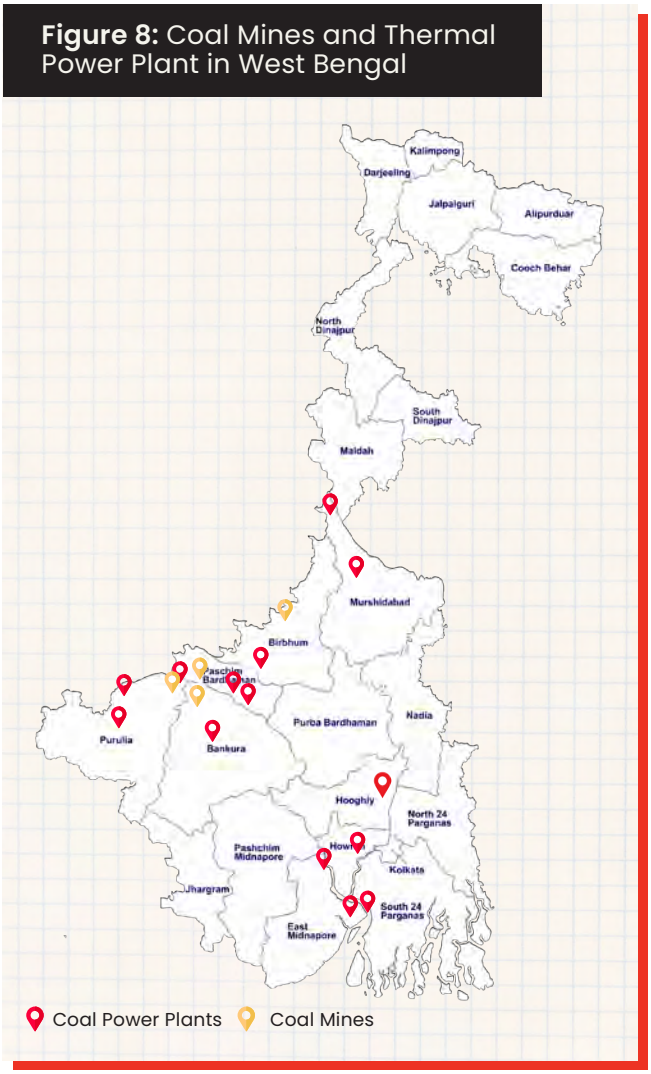
For the present study, two coal mines from the Singrauli coalfields have been chosen, i.e., Bina and Kakri. The Bina coal mine is an opencast mine, producing 7.5 million-tonnes-per-annum of non-coking coal (MoEF-GOI, 2014). Kakri is also an opencast mine and produces 7.5 million tonnes of coal per annum (NCL, n.d.).

Still, the locals of Wadhian and Muher villages in Singrauli, Madhya Pradesh, have been facing issues related to access to electricity (Aggarwal, 2018). The roads approaching the secondary schools are highly polluted, dangerous to travel and obstruct access to school. From an environmental point of view, the Singrauli region has experienced major ash dyke breaches in the past. Fly ash caused severe damages to the nearby agricultural fields and deaths of few people (South Asia Network on Dams, Rivers and People [SANDRP], 2019). As fly ash generation is a major issue in the Singrauli region with the lowest fly-ash utilisation rate (CEA-GOI, 2021). Thus, after prolonged perusal by government, the NCL Singrauli authority agreed to provide its closed 'Gorbi coal mine' for environmental concern in 2019 to formalise effort for disposal and management of fly ashes (Naveen, 2019). Regarding livelihood security, unemployment and displacement-related problems are found to be prevalent in the respective coalfield. Yet, a ray of hope is that NCL Singrauli is coming up with sustainable programmes such as empowering local youth through a new CSR initiative, sustainable mining with 'Environment First', and a plantation campaign under 'Project Ankur'. The company has responded positively to sustainable transition and is swiftly moving towards producing renewable energy to become a net zero company under the aegis of its sustainable development cell (PSU Connect, 2022a; PSU Connect, 2022b). With its robust energy strategy, the company is highly focused on generating 270 MW of solar power for internal consumption by the year 2025–26 (PSU Connect, 2022c). Details on the sustainable programmes that are run by NCL Singrauli are in Appendix A.

2.1.2. Details on Sample Power Plants and Coal Mines From West Bengal

In terms of mineral production, West Bengal ranks third in India, contributing around one-fifth of the country's total production. Coal accounts for 99% of the extracted minerals of the state from the major coal fields at Raniganj, Barjora, etc (Figure 8). The state's total coal reserves/resources were estimated to be 31.43 billion tonnes (BT) in 2015, and its major coalfields are located in Asansol-Raniganj and Durgapur in Bardhaman district, north western Purulia and Bankura districts and Deocha-Pachami-Dewanganj-Harisingha area in Birbhum district. Between 2015 and 2016, West Bengal achieved a coal production of 5.33 MT (Government of West Bengal, 2022). Raniganj coalfields has been taken as sample for the present report. The present study also selected two power plants, viz., Bandel Thermal Power Station and Santaldih Thermal Power Station as sample that are situated in West Bengal.

Figure 8: Coal Mines and Thermal Power Plant in West Bengal

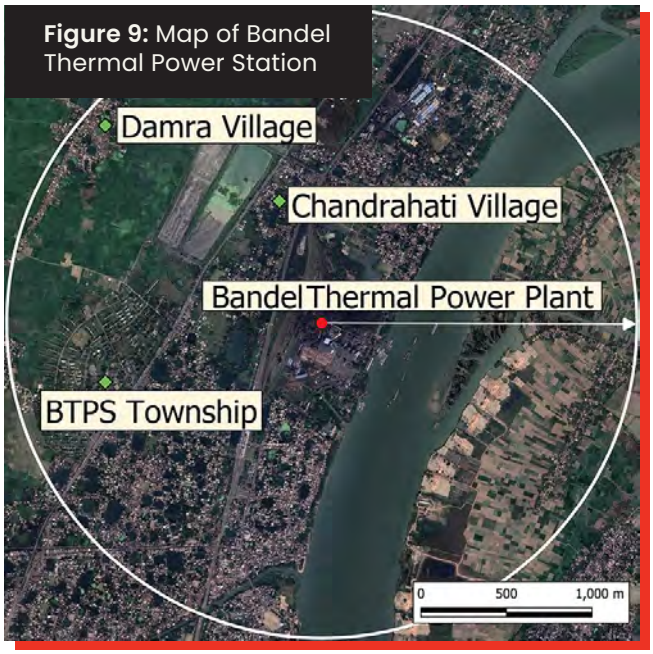


Source: NITI Aayog/Indian Space Research Organization (2022).

2.1.2.1. Bandel Thermal Power Station

Bandel Thermal Power Station located in the Hooghly district (Figure 9) had 5 units with a total installed capacity of 450 MW (4 x 60 and 1 x 210 MW). The power plant is operated by West Bengal Power Development Corporation Limited (WBPDCL). CIL provides the power station with the necessary coal. Of its total coal requirement, the power plant obtains 90% from domestic mines, and the remaining 10% is imported. Coal is transported to the plant through Indian Railways.

Figure 9: Map of Bandel Thermal Power Station



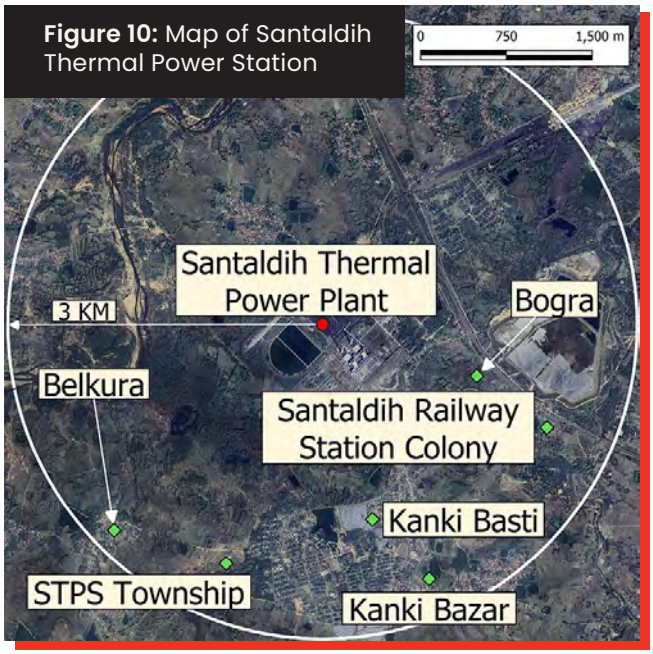
Source: Made with QGIS version 3.22

At the time of its commissioning in 1983, the plant's Unit-5 was the first of its kind in eastern India and the fifth in India (Competition Commission of India, 2013). Unit-3 and Unit-4 (60 MW each) were retired in 2018 (CEA-GOI, 2018). The electricity generated from Bandel Thermal Power Station is distributed to the residents of West Bengal (except Kolkata). Unit-5 of this power station (215 MW) is selected for the World Bank-funded Coal Fired Generation Rehabilitation Project for demonstrating energy efficiency rehabilitation & modernisation (West Bengal Power Development Corporation Limited [WBPDCL], n.d.). The Bandel Thermal Power Station made the headline for polluting everything and making people within 10-km radius severely ill because of its ash ponds (Business Line, 2021) (Figure B 7).

2.1.2.2. Santaldih Thermal Power Station

The Santaldih Thermal Power Station in the Purulia district of West Bengal (Figure 10) is a 500-megawatt (MW) coal plant operated by WBPDCL. A new Unit 6 (250 MW) became operable in 2011 (Global Energy Monitor, n.d. b). It was rated as the most efficient thermal power station in India in April-August 2021 (Figure B 8) (Times of India, 2021).

Figure 10: Map of Santaldih Thermal Power Station



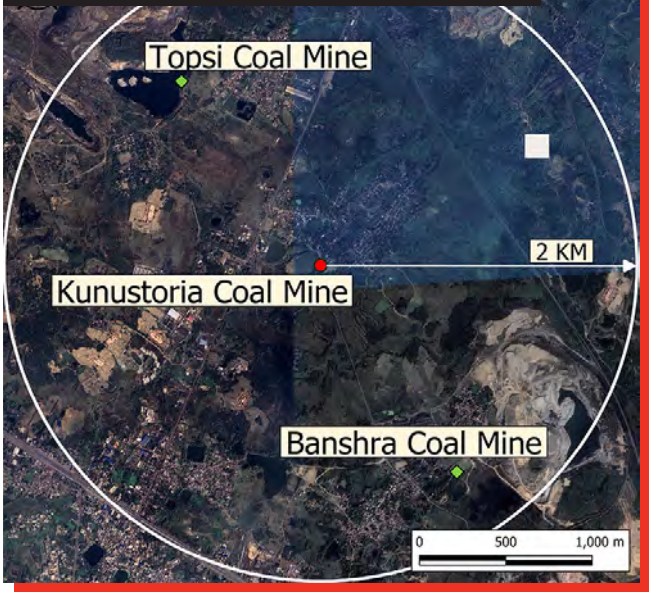
Source: Made with QGIS version 3.22

> "'No rehab in sight, thousands live in areas made vulnerable by mining in Bengal's Raniganj coalfields' as the residents were trapped due to livelihood reasons and cannot leave even in the worst cases."

2.1.2.3. Raniganj Coalfields

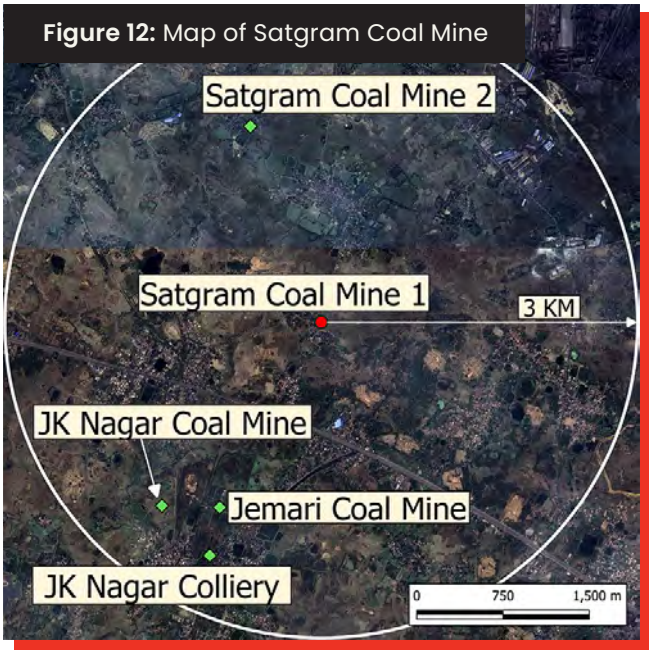
The first coal was extracted from the Raniganj coalfields in 1774, making it the oldest coal mine in India today. The privately held coal mines in Raniganj were all nationalised in 1973 and placed under ECL's supervision in 1975. ECL is in charge of all the 98 mines, 77 of which are underground while 21 open-cast. About 73,000 people work in the Raniganj coalfield. The proven total coal reserve in these coalfields is about 16.9 billion tonnes. (Eastern Coalfields Limited, 2022).

Figure 11: Map of Kunustoria Coal Mine



Source: Made with QGIS version 3.22

Figure 12: Map of Satgram Coal Mine



Source: Made with QGIS version 3.22

For the present study, field visits were conducted to only two coal mines, Satgram and Kunustoria. These two mines are located mainly in the Asansol subdivision of Paschim Bardhaman district (Figure 11 and Figure 12, respectively). Land subsidence due to illegal mining is found to be quite common in these coal mines. Satgram has 14 points of subsidence while Kunustoria has 11. Here, illegal mining leads to roof falling, water flood and poisonous gas leaks, causing the death of many labourers (India Environmental Portal, 2010). Unemployment, poverty, illiteracy and lack of consciousness are said to be the most critical factors behind illegal mining in this area. News Click (2022) recently reported, 'No rehab in sight, thousands live in areas made vulnerable by mining in Bengal's Raniganj coalfields' as the residents were trapped due to livelihood reasons and cannot leave even in the worst cases (Figure B 9).

While most of the reports on Raniganj coalfields say that land subsidence in the coalfield region has been covered sporadically, but there is little information on the overall status of the current mining activity. Sixty-five mines are reported as operational in this coalfield. The Legal Initiative for Forest and Environment (LIFE) found that most projects by the government-owned ECL have not submitted their 'mine closure plans', which are mandated while granting environmental clearance. This implies that no serious plans are in place to ensure environmental restoration in an already degraded landscape. No recent mine closure status reports were found for the 35 ECL mines that were shut down between April 1946 and July 2009 (including six mines that were shut down before nationalisation). (Comptroller and Auditor General [CAG], 2019).

Human development in the mining area also does not look good. The overall rate of labour force participation, specifically the rate of female labour force participation, is extremely low in the mining areas. However, in the "composite livelihood index", the mining area outperformed the non-mining areas of the old Bardhaman district. Further, the decadal change in workforce composition (see Table A 3 for workforce composition in the study coal units) depicts the growing pressure of population growth, as well as increased migrants from the adjacent state of Jharkhand (Department of Planning, Statistics and Programme monitoring-Government of West Bengal, 2011).

Details of operation in Raniganj coalfields (Global Energy Monitor, n.d. c):

- **Sponsor:** ECL
- **Parent company:** CIL
- **Location:** Various districts in West Bengal and Jharkhand States, India
- **Status:** Existing
- **Capacity:** 33.9 MT per annum
- **Proven reserves:** 16,940 MT
- **Coal type:** Non-coking
- **Mining method:** 77 underground and 21 open-cast mines

2.2 Pilot Study

Before taking up actual fieldwork, a pilot study has been conducted to understand the geographical area, grassroots stakeholders, key institutions interacting with coal companies, local community and unions. A first-hand experience of the socio-economic background of coal workers (of both power plants and coal mines) and non-worker local residents of the concerned power plants and coal mines, and their perceptions on just transition pertaining to its implication on the environment, livelihood and health, along with other important socio-economic aspects helped in the construction of reformative working tools in an iterative manner. The pilot study was conducted at the Panki Thermal Power Station in Uttar Pradesh and the Bandel Thermal Power Station in West Bengal. First, the team conducted five-to-seven interviews to check the questions for flow, comprehensibility and vernacular language translation (Hindi in Uttar Pradesh and Bengali in West Bengal). Then, the wordings of the questions are corrected and the formatting of the interview schedule is done. We re-tested the revised form of questions with an increased number of samples from the local community and affected workers. Through iterative testing and validation after 15–18 interviews, the interview schedule has been finalized. The sample respondents of the pilot study were excluded from the main interview.

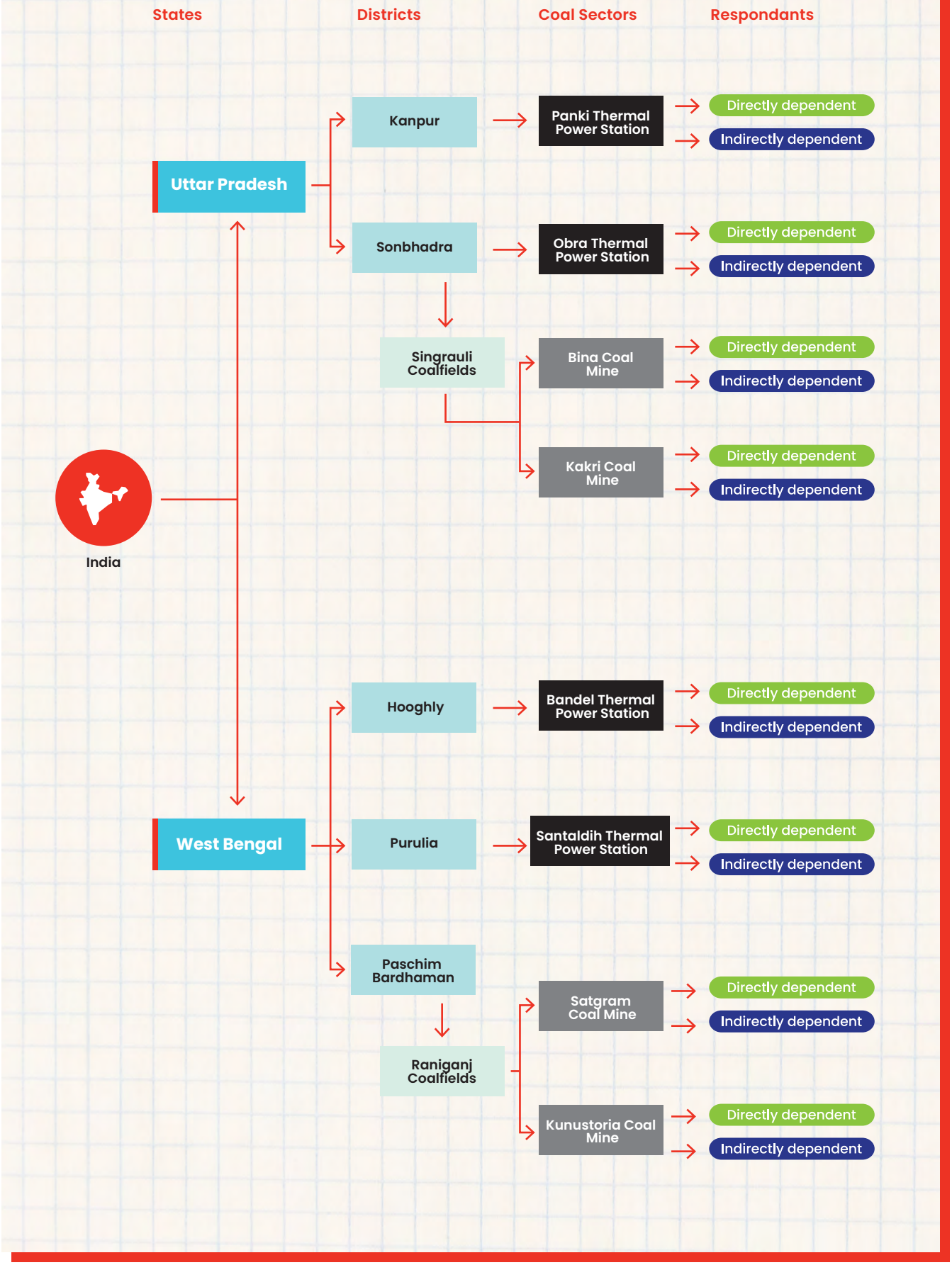
2.3 Sampling Design

In the current study, purposive sampling technique has been used for the selection of states, districts, power plants/coal mines, and towns/villages because the areas were ideal for the study of just transition. For the selection of respondents, the team used the snowball sampling technique to interview affected workers (job loss due to closure) and residents, whereas the incidental sampling technique was used to select respondents from local markets close to the sample mines and power plants. Respondents were asked for contact numbers of workers who are affected or working in the company that has gone through a partial or full closure of the power plant or coal mines.

Figure 13 represents the entire sampling design and units under study. A district-wise representation of the sample based on dependency on coal sector has been depicted in Table 1.

Chanduar Village, Bina Coal Mine

Figure 13: Sampling Design



Note: Developed and designed by JTRC (2022).

"Job insecurity and job loss are quite prevalent in coal mines and power plants. After a coal unit closure, workers look for urgent relief from the government, which includes support through alternative employment, enough compensation, payment of all statutory dues and issuance of service certificates. If these demands are not met, the workers are eventually forced to take up other work at lower wages."

Table 1 District-wise Representation of Sample Based on Dependency on Coal Sector

Type of respondents	Uttar Pradesh		West Bengal			Total
	Sonbhadra	Kanpur	Hooghly	Paschim Bardhaman	Purulia	
Directly dependent	133	52	45	125	53	408
Indirectly dependent[3]	144	73	80	125	62	484
Total	**277**	**125**	**125**	**250**	**125**	**902**

This report gives separate attention to both coal mines and thermal power plants, as they are directly linked with coal. The district-wise distribution of samples based on coal-induced unit type is given in the Table 2.

Table 2 District-wise Representation of Sample Based on Coal-Induced Units

Type of respondents	Uttar Pradesh		West Bengal		
	Sonbhadra	Kanpur	Hooghly	Paschim Bardhaman	Purulia
Power Plant	100	100	125	0	125
Coal Mine	175	0	0	250	0
Total	**275**	**100**	**125**	**250**	**125**

> "During the survey, researchers witnessed that women representation is meagre in power plants, and that majority of the workforce consists of men."

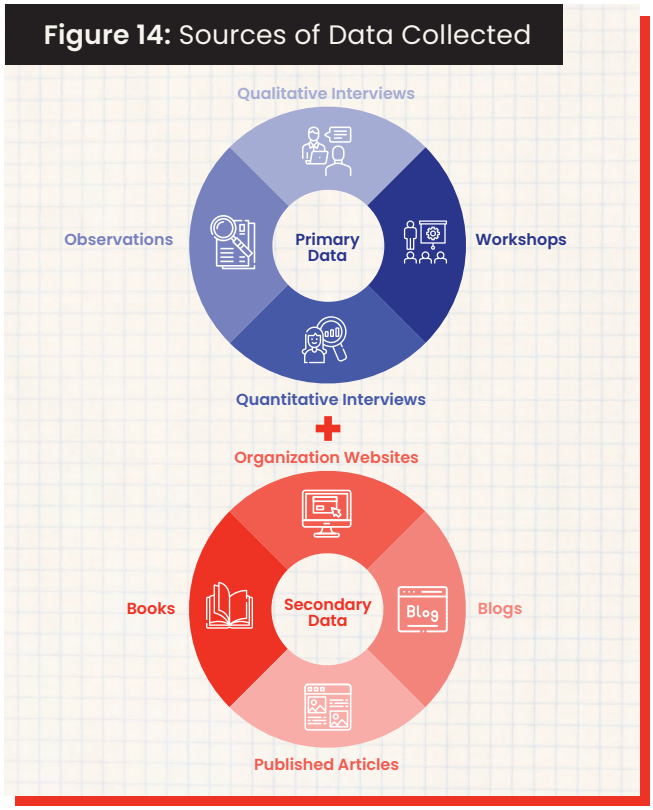
3 Directly dependents are the workers of the coal mines and power plants and indirectly dependents are those who do not work in the coal sector but indirectly depend on the coal sector for their livelihood, for example, local shop keepers, coal pensioners, local school teachers, and so on.

2.4 Data Collection

The present study conducted by JTRC collected both primary and secondary data for the report (Figure 14). Primary data are collected from 902 respondents between December 2021 to March 2022. The structured interview schedule used for quantitative data collection consisted of both open and closed questions. This resulted in data collection from 902[4] interviews from coal mine and power plant-dependent communities (workers and non-workers combined).

For collection of qualitative data, face- to-face interviews and three workshops were conducted. Researchers' observation from the field has also been used as a data collection tool for the study. Moreover, information from different sources like ILO, UNEP or World Bank, books, published news and journal articles and relevant blogs were used for extracting secondary data. The key sections followed for each of the tool are on i) perception of just transition, ii) work force problems and socioeconomic composition, iii) role of trade union and iv) gender based response and v) power plant and coal mine. At the end of the interviews, respondents were encouraged to mention as many indicators, reasons and practices as possible to express their preferences for practices, situations, perceptions and attitudes toward the just transition.

Figure 14: Sources of Data Collected



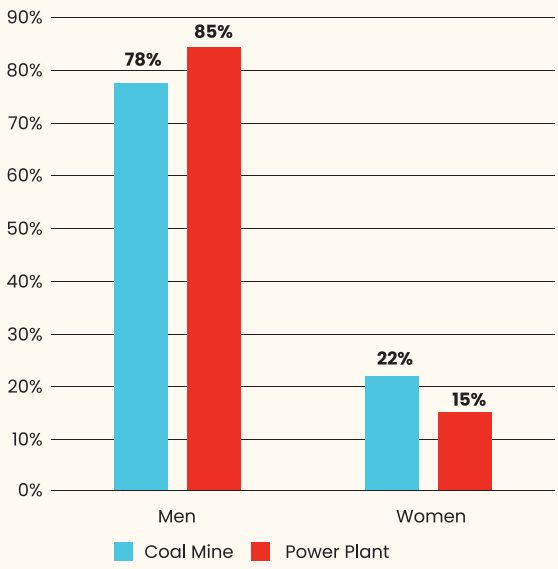
Source: JTRC (2022)

2.5 Data Analysis

SPSS has been used for data entry and analysis. By and large, we used descriptive analysis (percentage, frequency), association (chi-square) and variance (ANOVA) for scale verification. MS-Excel has also been used for a customised visualisation of the data.

2.6 Descriptive Statistics

Figure 15: Gendered Distribution of Respondents Depending upon the Type of Unit (In coal mine, n= 493; power plant, n=409)

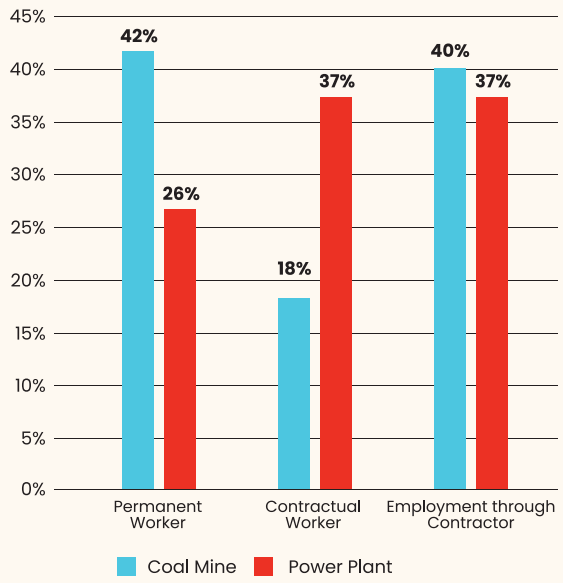


Source: JTRC (2022)

The survey responses revealed that in both coal sectors, i.e., power plant and coal mine, men occupy a greater part (Figure 15) of the total number of respondents: 78% of the total respondents from coal mine and 85% in case of power plant. Further, coal mines have higher women participation (22%) compared to power plants (15%). During the survey, researchers witnessed that women representation is meagre in power plants, and that majority of the workforce consists of men. In general, the number of women workers is lower in both coal mines and power plants, compared to men, and it is quite common in the Indian coal sector (Guimbeau et al., 2020).

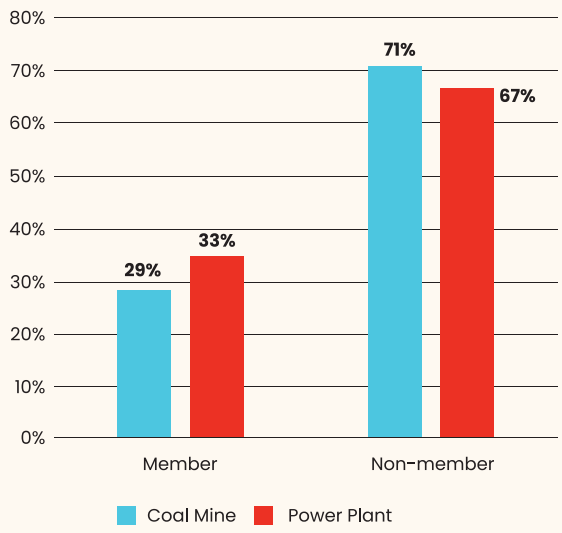
4 The questions were not relevant to all the respondents or the respondents did not want to respond to them.

Figure 16: Nature of Employment in Both the Units: Power Plant and Coal Mine: Power Plant and Coal Mine (In Coal Mine, n= 261; Power Plant, n=150)



Source: JTRC (2022)

Figure 17: Percentage Membership of Trade Union in Coal Mine and Power Plant (In Coal Mine, n= 493; Power Plant, n=409)



Source: JTRC (2022)

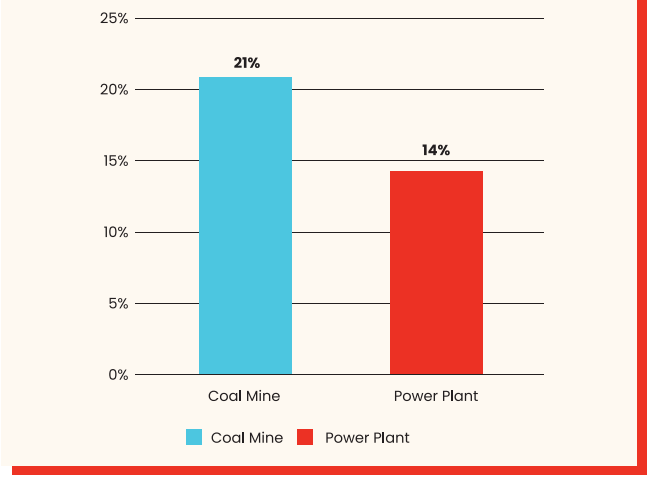
Within the sample power plants, majority of the respondents are contractual workers (Figure 16). They are either employed through contractors (outsourced workers) or contractual workers in the company (37%). Only 26% employees are permanent. In coal mines, most of the respondents, 42% are permanent workers, while 40% of the respondents are employed through contractor and only 18% are contractual. Findings by iFOREST (2022) are in line with the findings of the study conducted by JTRC: majority of the workers in coal mines are formal workers (either permanent or outsourced). Those who are informal workers (contractual and outsourced labourers) mainly do miscellaneous labour works, viz., moving equipment, loading and unloading, or civil works.

> "Five central trade called Hind Khadan Mazdoor Federation (HMS), Bharatiya Mazdoor Sangh (BMS), All India Trade Union Congress (AITUC), Centre of Indian Trade Unions (CITU) and Indian National Trade Union Congress (INTUC) dominate the Indian coal sector trade unions."

One third of the respondents are trade union members. Among the respondents from sample coal mines 29% are trade union members and 33% are members in case of sample power plants (Figure 17). As per the latest data, there are 16,154 trade unions in India that entail a combined membership of 9.18 million members (data gathered from 15 states) (Labour Bureau, 2012). The union named Indian National Mineworkers' Federation represented 40% of the workers for Coal India in 2017 (Rakshit, 2017). Five central trade unions called Hind Khadan Mazdoor Federation (HMS), Bharatiya Mazdoor Sangh (BMS), All India Trade Union Congress (AITUC), Centre of Indian Trade Unions (CITU) and Indian National Trade Union Congress (INTUC) dominate the Indian coal sector trade unions. These unions are part of all the vital decision-making at the central, state and firm levels in the Indian coal sector (Aggarwal, 2020).

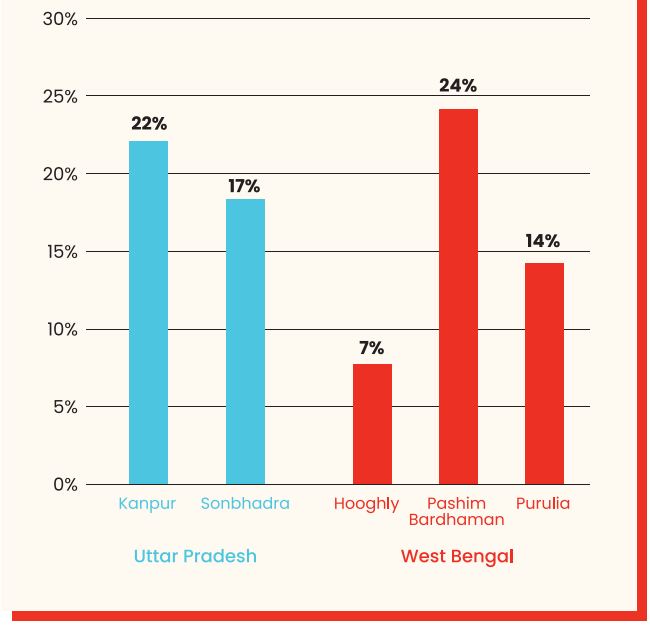
This section describes the rate of in-migration within the sample coal units. During survey, the JTRC survey team has asked questions like 'is this your native place?', out of the 902 respondents, the team found 161 respondents answered 'no'. In coal mines 21% of the total respondents are migrant; they came from another state, district or village. In power plants, the rate of migration is only 14% among the respondents (Figure 18).

Figure 18: Percentage of Migration Among Respondents of Coal Mine and Power Plant(In Coal Mine, n= 493; Power Plant, n=409)



Source: JTRC (2022)

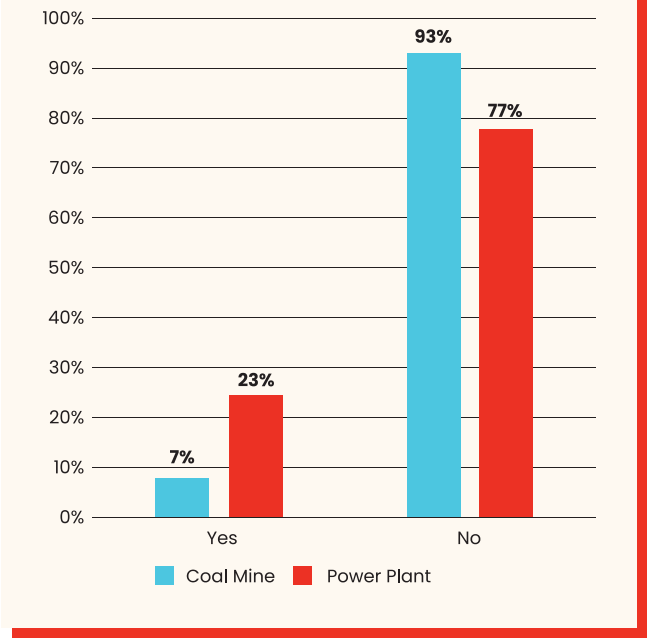
Figure 19: Percentage of Migrant Workers in the Coal Sector of Sample District (n= 161)



Source: JTRC (2022)

Further, migrant workers[5] are found in the power plants and coal mines of all the sample districts. The percentage of migrant workers is highest (24%) in Paschim Bardhaman district of West Bengal, followed by Kanpur (22%), Sonbhadra (17%), Purulia (14%) and Hooghly (7%) (Figure 19). Migration is quite prevalent in the coal sector of India. Coal mine workers held about 13–15% of the total migrant population from 1970s to 1990s in India; this figure fell to 9% in 2001. The collieries and the mining towns in the Raniganj coalfield region initially witnessed intra-state migration of workers. Later, the trend of migration changed and it began from the neighbouring states, namely Jharkhand, Bihar and Uttar Pradesh (Das, 2020).

Figure 20: Respondents Faced the Closure (In Coal Mine, n= 493; Power Plant, n=409)

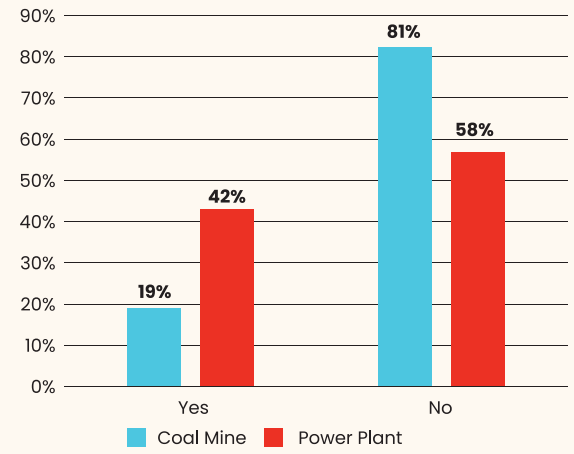


Source: JTRC (2022)

The union coal ministry of India had reported that it is in the process of finalising a "robust mine closure framework with thrust on three major aspects of institutional governance, people & communities and environmental reclamation & land repurposing on the principles of just transition" (Aggarwal, 2021). In the present study, it has been found that incidence of closure is more in the select power plants, 23% of respondents from power plants faced unit closure. In coal mines, the team found that the closure experience is smidgen: only 7% of the total respondents faced mine closure (Figure 20).

5 A migrant worker is a person who relocates for employment, either within or outside of their nation of origin. The majority of migrant workers do not want to permanently settle in the nation or region where they work. There are two forms of migration: in-migration and out-migration.

Figure 21: People Heard of Job Loss due to Closure (In Coal Mine, n= 493; Power Plant, n=409)

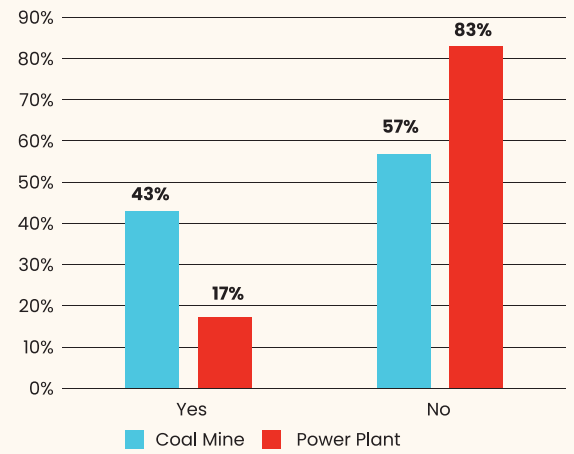


Source: JTRC (2022)

Thus, naturally, respondents from power plants heard more about job loss (42% of total respondents from power plant) than those from coal mines (Figure 21). Within the sample power plants, Panki power plant of Uttar Pradesh is already facing closure and notice has been put for unit closure in Bandel thermal power station from West Bengal.


Inside Obra Power Plant

Figure 22: Workers who Received Benefit after Closure (In Coal Mine, n= 35; Power plant, n=92)



Source: JTRC (2022)

'Did you get any benefits after the closure of the coal mine/power plant?' -team JTRC has asked the 127 respondents who faced unit closure. For this, 83% respondents replied that they haven't received benefit after power plant closure; this percentage is 57% in case of closed coal mines (Figure 22). The rate of receiving benefit is higher in case of coal mines (43%). In India, about 42% of mining households are highly vulnerable due to the unsecure nature of their job (Siddiqui & Lahiri-Dutt, 2015). Job insecurity and job loss are quite prevalent in coal mines and power plants. After a coal unit closure, workers look for urgent relief from the government, which includes support through alternative employment, enough compensation, payment of all statutory dues and issuance of service certificates. If these demands are not met, the workers are eventually forced to take up other work at lower wages. Moreover, most of the times, there is no transition plan in place for the contractual workers who are the most vulnerable in the transition period (Juneja, 2021). People above 55 years can have severance benefits such as early retirement. Formal and younger workers can be shifted to other types of operations or the newly opened mines. Re-skilling and reemployment must also be considered as significant rehabilitation benefit options for the workers who are to face unit closure (Gupta, 2021).

> **Most of the times, there is no transition plan in place for the contractual workers who are the most vulnerable in the transition period.**

Photo Credit: Ravi Singh (www.unsplash.com)

Table 3 Socio-economic Status of the Respondents

State	District	Statistical parameters	Age of the respondent	Educational Status	Household size	Monthly family income
Uttar Pradesh	Kanpur	n	125	125	104	93
		Mean	42	8	6	13774
		Minimum	18	0	1	2000
		Maximum	80	17	16	60000
		Standard Deviation	15	5	2	13031
	Sonbhadra	n	277	277	264	221
		Mean	40	7	6	16921
		Minimum	19	0	1	1500
		Maximum	73	19	20	200000
		Standard Deviation	12	5	2	18035
	Total	n	402	402	368	314
		Mean	40	7	6	15989
		Minimum	18	0	1	1500
		Maximum	80	19	20	200000
		Standard Deviation	13	5	2	16751
West Bengal	Hooghly	n	125	125	124	125
		Mean	49	5.45	4.69	11101
		Minimum	25	0	1	1800
		Maximum	72	17	18	50000
		Standard Deviation	12	5	3	11296
	Paschim Bardhaman	n	250	250	250	250
		Mean	42	6	7	33988
		Minimum	20	0	2	1500
		Maximum	70	15	19	600000
		Standard Deviation	10	4	3	55538
	Purulia	n	125	125	124	125
		Mean	41	7	5	14045
		Minimum	18	0	1	1500
		Maximum	72	18	12	80000
		Standard Deviation	13	5	2	13906
	Total	n	500	500	498	500
		Mean	43	6	6	23280
		Minimum	18	0	1	1500
		Maximum	72	18	19	600000
		Standard Deviation	12	5	3	41652
Pooled	Total	n	902	902	866	814
		Mean	42	7	6	20468
		Minimum	18	0	1	1500
		Maximum	80	19	20	600000
		Standard Deviation	13	5	3	34430

Source: JTRC (2022)

According to the existing Indian education system, education levels can be categorised in the following way: 0–5 year(s): below primary level, 5–10 years: primary to high school, 10–15 years: high school to graduate and >15 years: above graduate. On an average, respondents are educated up to 6th standard (that is, in the range of primary to high school), which is a little better than the national average of five years (Pratap, 2013). Minimum education level found non-literate and maximum level is above graduation. The respondents from Sonbhadra district of Uttar Pradesh have the highest educational status among all other districts, whereas the lowest is found among the respondents from Bandel thermal power station (Hooghly, West Bengal). During survey, researchers found that the respondents from power plants have at least some vocational trainings. Further, in case of total observation, a big variation was observed in the respondents' monthly family income with a standard deviation of 34430: the minimum is as low as 1500 INR per month while maximum is as high as 600000 INR per month. The mean family income is as low as 20468 INR per month. Household size of the respondents also varies on a large scale, from a single person family to as big as a household of 20 members. As the survey was intended for people who are dependent on coal for their livelihood, the team interviewed adults, i.e., individuals who were 18 years and above. The minimum age of the respondents is 18, whereas the upper age limit is 80 years. The study sample mostly constituted of middle-aged people, i.e., people aged in range of 40 years (Table 3).

> **"On an average, respondents are educated up to 6th standard (that is, in the range of primary to high school), which is a little better than the national average of five years."**

Chapter 3

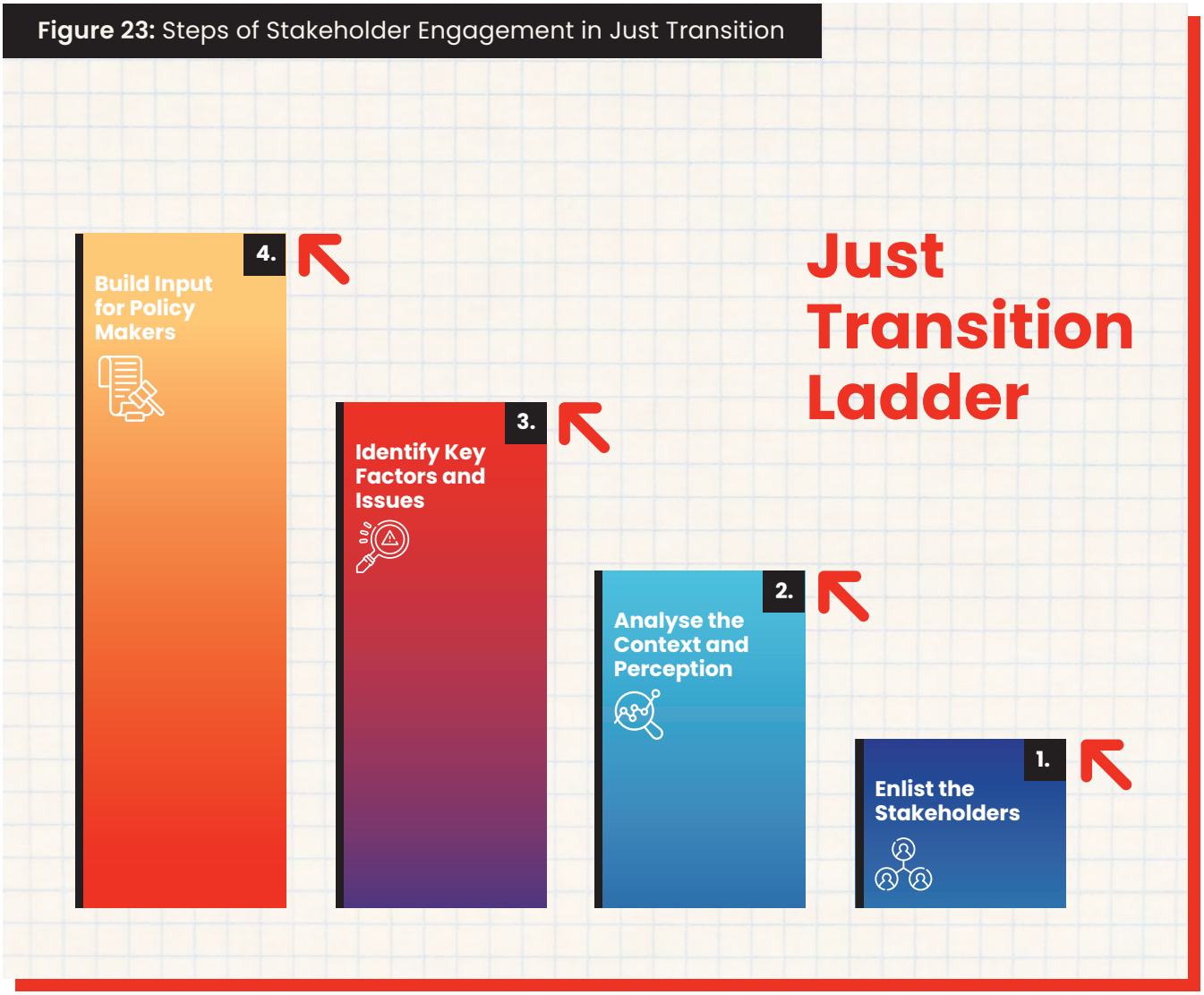
Stakeholders' Perspectives on Just Transition

The notion of 'just transition' stems from the belief that a transition to a cleaner, more sustainable energy system must be ensured in a way that is fair and equitable to all the stakeholders: workers, consumers, local communities and society at large. The term stakeholder includes all the "actors who have an interest in the issue under consideration, who are affected by the issue, or who – because of their position – have or could have an active or passive influence on the decision-making and the implementation processes" (Varvasovszky, 2000, p. 341).

When it comes to coal phase down, each focus area can implement a set of plans, policies, and actions that can together mitigate the impact of coal mine or power plant closure on affected sectors and communities. In addition, active stakeholder engagement at each phase of transition and within each focus area is crucial. Most importantly, local stakeholders, including the underrepresented section(s), must be meaningfully engaged throughout the transition process to ensure inclusive outcomes and buy-ins (Center for Strategic and International Studies [CSIS], 2021).

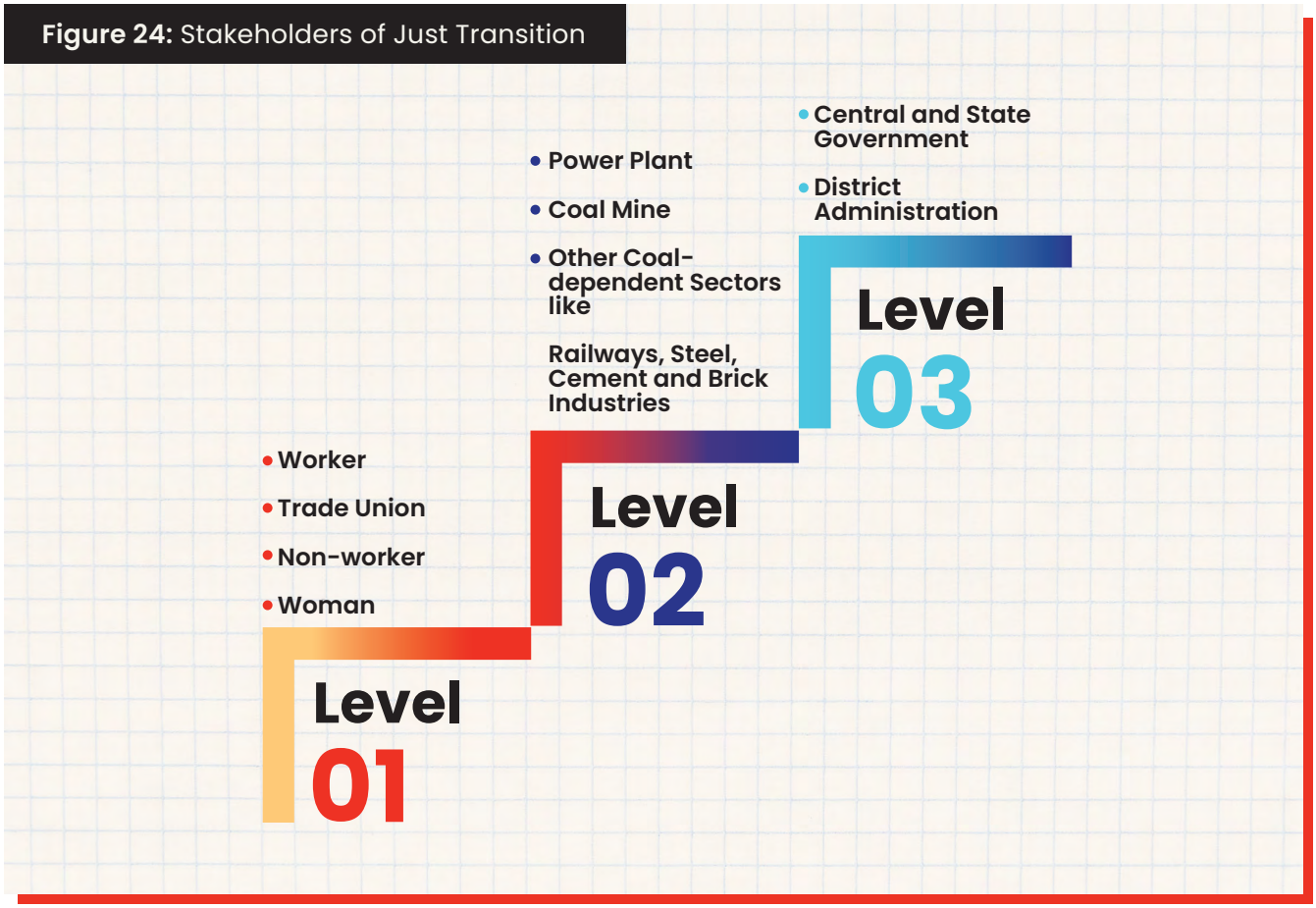
This report identifies some of the most important stakeholders who are vital for implementing just transition policy framework (Figure 24). It discusses the ways through which the stakeholders can be involved meaningfully so as to climb the 'just transition ladder' which has the following steps (Figure 23):

Figure 23: Steps of Stakeholder Engagement in Just Transition



Source: Developed and designed by JTRC (2022).

Figure 24: Stakeholders of Just Transition



Source: Developed and designed by JTRC (2022).

What is Perception?

The original meaning of the word 'perception' can be traced back to Latin where it means 'the action of taking possession, apprehension with the mind or senses' (Schwartz, 2004). According to more recent conceptions, perception is the process of becoming aware or conscious of an entity or entities; in other words, it is the state of being aware, conscious or understanding something (Oxford English Dictionary, n.d.). Perception is traced back to its original Latin meaning 'the action of taking possession, apprehension with the mind or senses' (Schwartz, 2004). In the context of coal mines, a worker knows that his/her life will change if any transition from the coal-based energy sources to other sources occurs. The perception of 'just transition' for a power plant worker will differ from that of a coal mine workers or the coal community in general. Individuals may pay selective attention to different aspects or details of a 'just transition' while ignoring others. These individual differences depend on gender, age, education, income strata or on the type of the working sector. In this regard, a question arises: why is it important to study perceptions before going deeper into the discussions of just transition? The answers lies in the following:

- Understanding how people currently perceive their surroundings will help in accurately predicting how they would behave under the new set of circumstances. Studying inter-personal disparities in perceptions is crucial since different people may have different perspectives of the same set of circumstances.

- Since individual views are influenced by needs, one can deduce the needs of different people from their perceptions.

- If one wishes to get along with others to include them in any process, it is imperative to understand their viewpoints or temporarily put oneself in their shoes. By doing so, one will be able to understand them better, empathise with them, and assist them in numerous ways.

In the context of energy transition, the aforementioned points highlight the importance of gaining insights into the perceptions of the people on 'just transition'. This will assist in understanding what would 'justice' mean for those who might be encountering the unjust outcomes of the transition.

3.1 Significance of Stakeholders' Perception in Just Transition Research

- 'Just transition' is an academic concept, with which people at the grassroot level have no to little acquaintance. Nonetheless, before proceeding, we must know whether the stakeholder community at the grassroots is aware of the transition that is happening in their power plant or coal mines.
- As people's perceptions are influenced by their needs, the perception study on 'just transition' can be a powerful tool to unveil the communities' needs in the phase of transition.
- Unheard or unheeded voices from coal mines/ power plants can bring new perspectives to both problems and solutions.
- Individual perceptions of 'just transition' can reveal new resources for successful community organization and action.

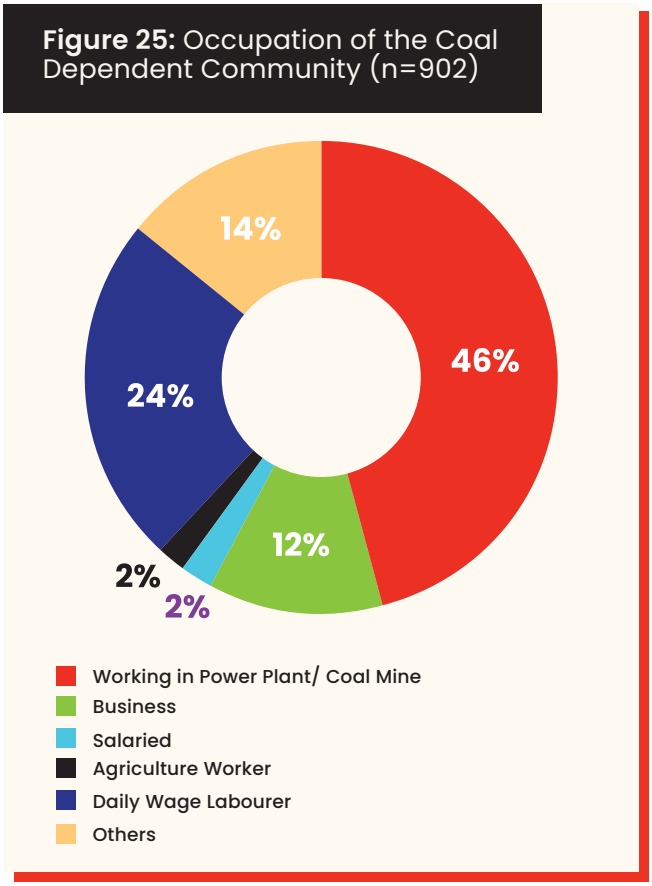
3.2 Background of the Stakeholders: Origins and Core Concepts

3.2.1. Coal-Dependent Communities (Worker and Non-worker) as the Stakeholder

In the context of phasing down coal, concerns over the fate of the workers in the coal sector and the communities that depend on it are crucial. The fundamental goal of a just transition is to ensure a sustainable and decent livelihood through proper planning. Simultaneous initiatives must be there to alleviate poverty in such areas and to create flourishing as well as resilient communities (ITUC, 2017). Furthermore, the notion of a just transition upholds the belief that a clean environment and a healthy economy can and must coexist (Just Transition Alliance, 2018). In countries of the global North, formal workforce of the coal industry and accompanying socio-economic conditions have largely shaped just transition experience (Bhushan et al., 2020). However, the condition is notably different in India as most of the key economic sectors such as coal also depend on an informal economy.

The coal industry directly or indirectly employs about 4 million Indians. If one merely looks at Coal India, there are 84 mining complexes in eight Indian states that employ close to 300,000 people (Ramchandran & Pai, 2021). Another 500,000 Indians besides the active workforce depend on the coal industry for their pensions. Thus, of these occupations, 80% are related to the coal mining industry, which is spread throughout 51 districts, while the remaining 20% are related to coal-fired power plants (Aggarwal, 2022).

Figure 25: Occupation of the Coal Dependent Community (n=902)



Source: JTRC (2022)

The present study grouped the total respondents as directly dependent (worker) and indirectly dependent (non-worker). Directly dependents are the people who work in the coal sector, i.e., in coal mines or coal-fired power plants. Among the respondents, 46% work in power plant or coal mine. The people under the indirect dependent category are mostly daily wage labourers (Figure 25). Only 2% are agriculture workers and another 2% are salaried employees from companies other than those related to coal sector. A good portion of the respondents fall under others category (14%) and come under non-worker (indirectly dependent) category. This category includes businessmen, housewives, students, shopkeepers, carpenters, sweepers and unemployed job seekers.

Within the worker, i.e., directly dependent section there are different category of jobs such as:

Direct/formal jobs defined by contracts:
Formal workers are directly recruited through some employment process of the company and have their name registered in the company. Rehabilitation is easy or possible for the formal workers. They mostly have some kind of "union" affiliations and therefore, better representation. This category includes:

- On-roll employees
- Outsourced manpower
- Work/activity outsourced

Indirect/informal jobs:
Don't have employment contracts, workers' benefits, and social security. Rehabilitation is difficult for the informal workers. Mostly they have no union affiliations and it is challenging to identify if they change jobs or move anywhere else. They are:

- Directly dependent on coal supply chain (Transport from point of sale to point of consumption)
- Linked to the coal economy (coal transport, pilferages etc)

Contractual jobs:
These workers come through contractors. It is convenient for the company to employ these types of workers because they don't have to accept the liability (in the form of social security). They may have some kind of social security due to labour laws. They are:

- Directly dependent on coal supply chain (Transport from point of sale to point of consumption)

Indirectly dependent section comes under:

Induced jobs:
People engaged in small or petty businesses around the mining area and provide the consumer goods and services. Those people have their income directly linked to the purchasing power of the plant workers. Mine closures may have significant spill over impacts on those induced workers.

- Everything beyond point of consumptions

Table 4 **Economic and social impacts of coal mine/power plant closure on different job types**

Type of job	Intensity in terms of-				
	Entitlement	Rehabilitation	Social Security	Union affiliation	Closure impact
Formal/Direct	★★★	★★★	★★★	★★★	★★
Informal/Indirect	★	★	★	★	★★★★
Contractual	★★	★	★★	★★	★★★
Coal economy induced	★	★	★	★	★★★

★★★ High Intensity

★★ Medium Intensity

★ Low Intensity

Source: Computed from various field level interactions and secondary data sources.

Table 4 clearly depicts replace with the formal employees of coal units, are entitled to many jobs benefits, enjoy greater social security and have stronger trade union affiliation; they are more likely to get rehabilitation after coal unit closure. Coal mine and power plant closure is going to have moderate impact on this group of employees. Closure impact will be highest on the informal employees as well as coal induced indirectly dependent community, as they are reeling under no or lesser entitlements from the coal units. This translates to lesser or no rehabilitation opportunities, lower social security and no trade union affiliation and representation. Contractual employees are those who have some sort of entitlements and social security from their contractors; they have medium level of union affiliation. However, they also have low chance of rehabilitation due to no direct entitlements from the coal company.

3.2.2. Women: Critical Stakeholders of Just Transition

SNAPSHOT

A

JTRC member is interacting with the women coal workers

Gender is mainly the pattern of socially constructed roles, behaviours, expressions and identities of men and women. It demonstrates how people perceive themselves and each other, the way they act and interact, and the access to and control over the power and resources in society. On the other hand, sex defines a set of biological attributes in humans and animals that is categorized as female or male, and it is related to chromosomes, gene expression, hormone levels and functions, and reproductive/sexual anatomy, among other physical and physiological characteristics. As such, the definitions of sex and gender are changing as science advances, and it is still difficult to clearly distinguish between the social and the biological aspects. Sex and gender frequently interact, are linked, and may even be inseparable (Canadian Institute of Health Research, n.d.; Joshi, 2021). Gender studies provide a common knowledge of gender identity and relationships, enabling people in various social ecologies to resolve gender-related conflicts. It reveals the similarities and differences between men and women (Canadian Institute of Health Research, n.d.).

Transitions to a low-carbon future are profoundly social and gendered in addition to being technically and economically complex. Energy transitions frequently have an implicit and undiscovered gender component (Anfinsen & Heidenreich, 2017; Scoones et al., 2015). Gender-specific challenges in a just transition emanates from socio-cultural biases that restrict women's expression, ability to come onboard with new opportunities, and freedom. In addition, women in the workforce face various instances of structural discrimination as they are paid lower wages and deprived of basic workplace necessities. To realise the sustainable development goals and the Paris Agreement, gender equality in the workplace must be achieved. This can be done in several ways as the world moves towards a low-carbon and sustainable economy (Dhir, 2017). At first, the causes of gender bias must be acknowledged, identified and assessed as the stepping stone towards mainstreaming gender in a just transition process. Second, raw information, data and research here act as the pre-requisites for devising plans to address the inherent challenges associated with women inclusion in the transition pathway.

Third, the government agencies such as the labour department, social welfare department, women and child development department and other nodal agencies must collaborate and generate comprehensive data and research on the impact of the rapid energy transitions on women's employment as well as the transformational role women can play in clean energy projects. Fourth, skilling and, where it is necessary, re-skilling of women is extremely crucial. Fifth, coal companies can influence equal inclusion of men and women in rehabilitation programs by undertaking gender-related opportunities and risks assessment that can highlight the socio-economic and environmental factors. Fifth, it is essential to study and identify how men and women, perceive the just transition which will help to elucidate the gender-based latent needs throughout the energy transition pathway.

Ultimately, these strategies will yield beneficial results if accompanied with corresponding behavioural and socio-cultural shifts related to shattering the cultural norms that hinder women from participating in social, political and economic discourses that are shaping up around clean energy transition. While this is a long-term and slow process, such shifts are essential to realise the dream of a 'just' energy transition and an inclusive society (Roy, 2022).

3.2.3 Trade Union: Significance as a Stakeholder in Just Transition

Trade unions are an important part of modern industrial society and can be defined as an organisation that is formed by workers to protect their interests and improve their working conditions. It is a continuous association of workers to maintain and address their issues so that their working condition can improve and be consistent with the wages they get (Ghosh et al., 2009). In industrial societies, the right to form unions and bargain collectively protects workers from exploitative employers and miserable work conditions. Protection of basic worker and human rights in developing nations, thus, necessitates unionisation so that the working population can reap the benefits of economic growth (Ghosh & Geetika, 2007). According to Bhowmik (2012), unions have emerged as an important factor in production and distribution systems worldwide. Yet, it is also important to note that unions are not homogenous associations in the sense that each union is different from another in terms of their approaches and they are governed by different political ideologies. Despite all the differences in political ideologies and approaches, trade unions share a common purpose, which is to protect the interests and rights of the workers.

Meeting with Trade Union members and labourers at Union Office

Brief History of the Trade Union in India

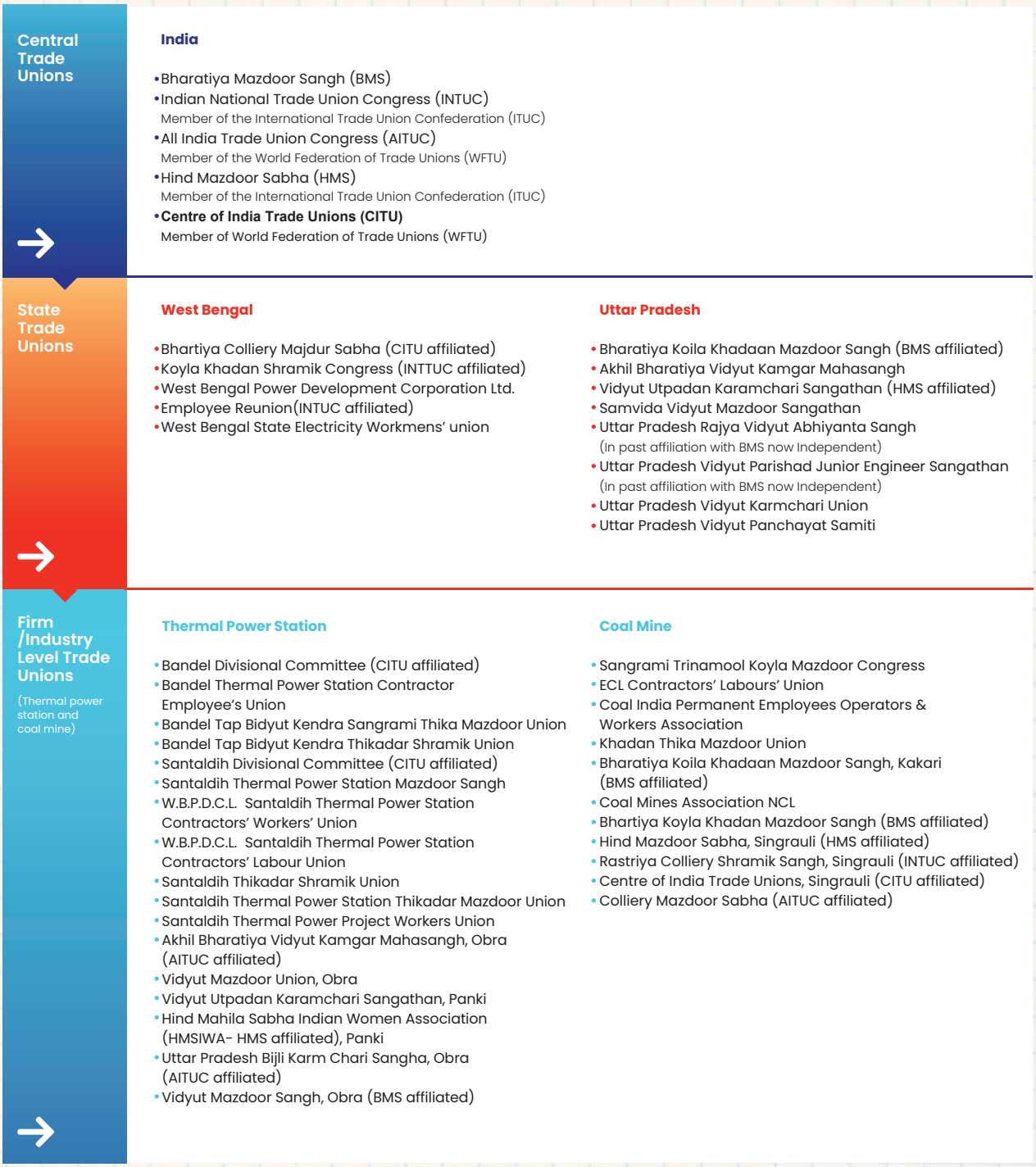
The Indian Trade Unions have a strong legacy of collective bargaining and protecting the rights and interests of workers. Trade unionism in India dates back to the first Indian workers' association called The Bombay Mill-Hands Association that was founded by N. M Lokhande in 1890. His work for the improvement of the working conditions in the textile mills made him a part of Factories Commission, on the recommendations of which the Factories Act of 1881 was passed. Many labour historians believe that organised labour movement started with the emergence of the Madras Labour Union in 1918, founded by B. P. Wadia. A few months later in the same year, Mahatma Gandhi founded the Textile Labour Association in Ahmedabad. In the following years, nationalist leaders such as Lokmanya Tilak, Lajpat Rai and others wanted the working class to involve in the struggle for freedom, while, at the same time, leaders such as V.V Giri and N.M Joshi were keen to establish a trade union federation that would represent the interests of the working class at international forum such as the International Labour Organisation. These two streams of thought were merged to establish the All India Trade Union Congress (AITUC) in 1920. This organisation remained as the largest representative of the working class and covered all shades of diverse political ideologies till independence.

With the passing of Trade Union Act 1926, workers got the right to form unions to address their issues and collectively bargain with the authority and employers for protecting their rights and safeguarding their interests. The trade union movement has gone through several stages, which has led to the multiplicity of several unions divided along the lines of political ideologies and their affiliation to national or regional political parties (Bhowmik, 2012). In 1929, the AITUC was split into two over the differences of opinions among the leaders, which resulted in the formation of the Indian Federation of Trade Unions (IFTU). However, the two organisations merged again in 1939. Later, in May 1947, the Congress formed another union that was in contestation with the communists-led AITUC and named it the Indian National Trade Union Congress (INTUC). As Congress was the ruling party following independence, the formation of INTUC marked the historical step of the state controlling the labour movement. AITUC's split in 1947 made way for further divisions of labour unions along narrow political ideologies. As a result, every political party that emerged on the national or regional scene had to form a trade union. Consequently, such splits made the working-class movement fragmented. In the following years, Praja Socialist Party (PSP) formed a non-communist and non-congress trade union called Hind Mazdoor Panchayat (HMP), which became Hind Mazdoor Sabha (HMS) in 1948. Further, in 1955, Bharatiya Jan Sangh initiated its own trade union named as Bharatiya Mazdoor Sangh (BMS).

The Chinese aggression of 1962 resulted in the split of the communist party, which eventually led to the formation of Communist Party of India (Marxist) (CPI (M)) in 1964. In 1970, the CPI (M) decided to form another trade union body known as Centre of Indian Trade Unions (CITU), which took a large section of unions from the AITUC, especially the ones in West Bengal and Kerala. The working class was divided along the lines of political parties at the national level, regional parties such as the Shiv Sena in Maharashtra and the Dravida Munetra Kazhagham and All India Anna Dravida Munetra Kazhagham in Tamil Nadu formed their own trade unions in the 60s and 70s.

Trade unions in India and their overall organisation are basically to be analysed in the context of the democratic political structure the country has adopted. Their main function can be described as the pursuit of the social, economic and political interests of workers. Trade unions act as a representative or spokesperson of its member workers in matters regarding their wages, working conditions and general welfare. They also provide a channel of communication between the workers, employers, and the state (Sheth, 1958). Figure 26 represents an organogram of the trade unions that commonly prevail in India. Additionally, the chart shows the names of trade unions that are relevant to the present study and that there exists a huge network of workers' unions at the sub-national level.

Figure 26: Trade Union Organogram from the Present Study



Source: Developed and designed by JTRC (2022).

The trade unions played a pioneering role in framing the concept of just transition during the 1970s in the USA. Since then it has become a major agenda for the global environmental negotiations in the contemporary times (Stevis & Felli, 2015). The International Trade Union Confederation (ITUC) defines just transition as per the guidelines of the International Labour organisations (ILO): just transition…secures the future and livelihoods of workers and their communities in the transition to a low-carbon economy. It is based on social dialogue between workers and their unions, employers and government, and stakeholder engagement with communities and civil society. A plan for just transition provides and guarantees better and decent jobs, social protection, more training opportunities and greater job security

for all workers affected by global warming and climate change policies". The Paris Agreement of 2015 (COP 21), UNFCCC recognizes the significance of just transition in its prologue.

Trade unions have a strong history of engaging with the welfare of workers in the coal mining sector in India. Because they are the voice of the workers who bear the direct impacts of the energy transition process, trade unions play a significant role in protecting the rights of the workers whose livelihoods are in question. They are undoubtedly one of the most important stakeholders in the process of transition.

3.2.3.1 Trade Unions and India's Energy Transition

As mentioned above, in India, trade unions are highly concentrated in sectors such as coal mines and thermal power plants. They have a history of resistance against the exploitative policies of the employers, and they have been working to protect the interests of the mine workers. As India transitions from a fossil fuel-based economy to a renewable energy-based economy, at this moment, it is of paramount importance to consider the large section of the population that will bear the major social and economic ramifications of this transition. Trade unions can play a critical role in demanding 'green jobs' for the coal workers. They can raise the concerns of the workers by being part of the major decision-making process along with other stakeholders. The coal mining districts of India (see Table A 6 for detail) are already socio-economically backward, and the loss of livelihoods due to the energy transition will make the formal and informal mine workers and their dependents more vulnerable. To address these issues, trade unions can work collectively with the state, pursue the rights of the workers and join hands with other stakeholders in re-skilling the mine workers in various trades and sectors. This can also help in providing economic support and livelihoods to the workers and labourers in the renewable energy sectors.

Trade unions represent an effective medium of carrying forward the voices of the workers who will be affected by the externalities of the energy transition process and ensure that they are presented as key actors in the process (IndustriAll, 2019).

3.3 Empirical Study on Stakeholders' Perception of Just Transition

3.3.1. Exploring Stakeholders' Perceptions of Just Transition from face-to-face interviews

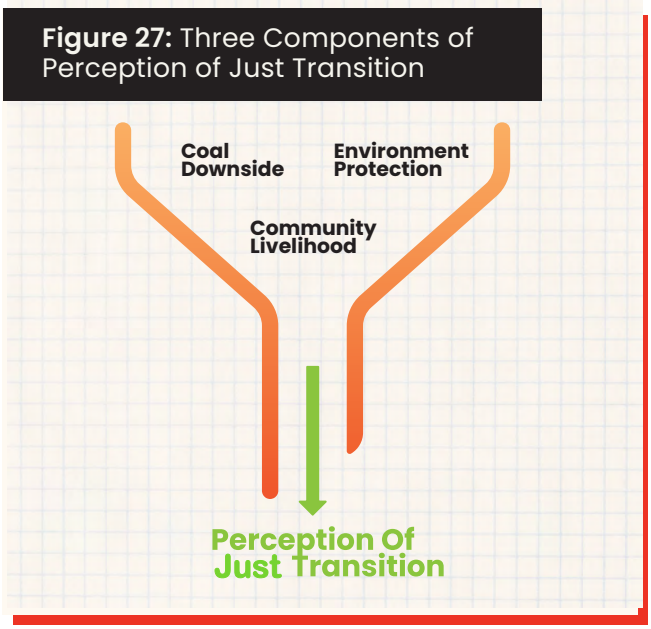
As described in the objective the study aimed to develop a scale to measure perception of just transition at stakeholder level (see Appendix C for the detailed method of the scale construction). This scale has the following three dimensions coal downside, environment protection and community livelihood (Figure 27).

The dimension of coal downside captures individuals' perception on the negative consequences of coal. The dimension consists of three main elements: environmental degradation and pollution; health problems related to coal mines/thermal power plants; and, willingness to find alternatives for coal.

The dimension regarding environment protection relates to peoples' perception on environment vs livelihood with main focus on environment. It captures two elements: prioritizing environment over jobs in coal sector and emphases on jobs in the alternative energy sector.

The community livelihood dimension is concerned with peoples' perception on environment vs jobs with main focus on livelihood. It has two main elements: mine closure due to pollution and prioritizing livelihood over environment.

Figure 27: Three Components of Perception of Just Transition



Source: Developed and designed by JTRC (2022).

Table 5 One-Way ANOVA Showing the Variation in Perception of Just Transition among the Stakeholders

Factors of Perception of Just Transition	Type of unit	Nature of dependency on the coal sector	Gender	Trade union membership
	f-value[6]	f-value	f-value	f-value
Coal Downside	32.46***	0.64	7.06***	0.18
Environment Protection	18.84***	0.76	0.60	9.47***
Community Livelihood	0.07	11.36***	2.99	12.28***

***significant @ p-value[7] =0.000

Source: JTRC (2022)

3.3.1.1. Do People from Thermal Power Plants and Coal Mines Perceive Just Transition Differently

To assess whether there is any difference in 'perception of just transition' between respondents from coal mines and power plants, the type of coal unit (i.e., coal mine and power plant) was taken as the independent variable. The bars in Figure 28 show the direction and quantum of perception of the three identified factors from the scale, i.e., coal downside, environment protection and community livelihood. Two groups of respondents from coal mines and power plants distributed around their normalized perception score (mean[8]=0, standard deviation[9]=1). People from power plant were found to be more and positively inclined toward environment protection and people from coal mine are more and negatively inclined to coal downside. The respondents also perceive that government can replace coal power plants with solar and other energy plants in order to protect environment. However, livelihood issues must be prioritized along with the special concern for the environment.

Figure 28: One-Way Interaction Between Perception of Just Transition and Type of Coal Unit

Source: JTRC (2022)

6 The f-value can be used to determine whether the test is statistically significant. The F value is used in analysis of variance (ANOVA). It is calculated by dividing two mean squares.
7 In statistical science, the p-value is the probability of obtaining a result at least as extreme as the one that was actually observed in the experiment, given that the null hypothesis is true.
8 Mean is the average of a set of values
9 Standard deviation (or σ) is a measure of how dispersed the data is in relation to the mean..

For further confirmation, a one-way ANOVA was performed to compare the effect of type of coal unit on perception of just transition. The ANOVA also revealed a statistically significant difference in the mean perception scores of coal downside between respondents from coal mines and power plants ($f = 32.46$, $p = 0.00$). The respondents have also demonstrated significantly different perceptions on the point of environment protection ($f = 18.84$, $p = 0.00$) (Table 5). In other words, people from power plants, perceived that coal has significant adverse consequences for environment and health while people from coal mining did not perceive the presence of adversities related to coal. Hence, the type of coal unit (i.e., coal mine and power plant) plays a role in shaping the coal phase down and environment-related perception of just transition.

Most of the respondents from thermal power plants are found to be aware about environmental pollution and can better perceive the need for environment protection (Sahay, 2018). He also found people's high perception on company's commitments to minimise air and water pollution, as well as the effort to reduce stack emissions. The perception of coal downside is different between the two coal sectors because the situations are different, and the resulting effects also vary from sector to sector. The coal sectors in India differ widely in terms of the scale of operations, the extent and nature of dependence, and particularly the scale of workers (formal and informal), income opportunities and indirect dependence (International Forum for Environment, Sustainability & Technology [iFOREST], 2022). Indian coal mine sector plays a vital role to generate employment opportunities and improved livelihoods but also creates extreme environmental degradation (Mishra & Das, 2020). Environmental distortion directly and indirectly altered the precipitation rate, degraded the cultivatable soil and water quality and exacerbated human health problems in Raniganj coalfields of West Bengal (Guha, 2014). Despite such nuisances, Shi and He (2012) found that respondents think that pollution is mainly caused by coal processing and coal mining is not the main reason of the pollution in the coal mine area. Education level and low environmental awareness of the respondents can be attributed to this revelation (Shi & He, 2012). According to Hine et al. (2007) those working in the coal mining industry would naturally perceive its advantages as high and its hazards as low because of the affect heuristic.[10] However, coal mining is also becoming 'sensitive to the need of environmental protection and pursues sustainable mining practices persistently' (Singh, 2021). Coal India Limited (CIL) is dedicated to promoting sustainable development through integrated project planning and design, pollution prevention or mitigation, natural resource conservation, ecology and biodiversity restoration, waste recycling and proper disposal, addressing climate change, and inclusive growth. It also strives to raise awareness among its stakeholders about the need for ongoing environmental performance improvements based on best practises (Coal India Limited, 2018).

The present study corroborates the findings of Vögele et al. (2022), who observed improved environmental protection in the process of phasing out coal-based power plants, including water management, biodiversity conservation and reduced release of pollutants. In this regard, the development of less carbon-intensive and resilient urban centres, the promotion of waste-to-energy projects, and enhancing carbon sinks through the growth of forest and tree cover are among the environmental protection policies and programmes that thermal power plants in India are putting into practise (The Economic Times, 2016). The Indian Ministry of Power (n. d.) highlighted their most recent strategies for environmental protection through the implementation of special purpose vehicles (SPVs) for reforestation, a fly ash utilisation action plan, initiatives to improve the environmental performance of coal-based power plants, clean development mechanisms (CDMs), and implementation of international standard for environmental management systems (ISO 14001) in a more organised manner.

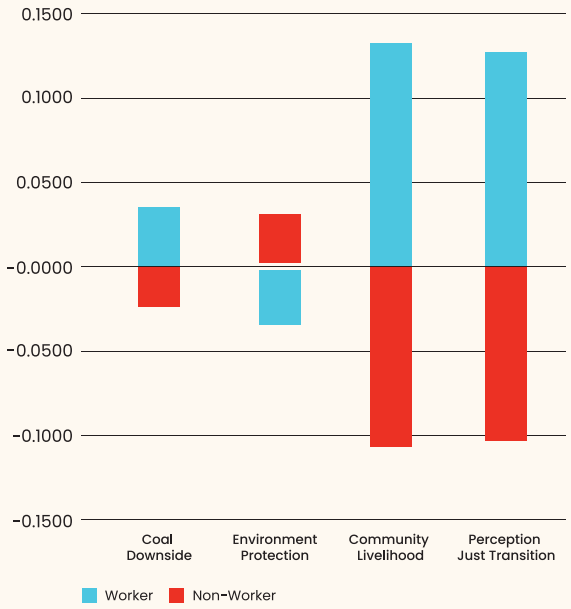
Sustainable Development Cell (SDC) of Ministry of Coal- GOI (2022) has identified several thrust areas to work on in a planned and systematic manner:

- Land amelioration and afforestation
- Air quality, emission and noise management
- Mine water management
- Gainful Use of Overburden
- Sustainable Mine Tourism
- Planning, Monitoring and Auditing
- Policy, Research, Education, and Dissemination

10 Affect heuristic describes how one often rely on emotions, rather than concrete information, when making decisions.

3.3.1.2. Does Dependency on the Coal Sector Shape Perception of Just Transition?

Figure 29: One-way Interaction Between Perception of Just Transition and Nature of Dependency on the Coal Sector



Source: JTRC (2022).

Figure 29 depicts the distribution of the independent variable nature of dependency on coal sector (worker and non-worker) with respect to mean perception of energy transition. Workers (i.e., directly dependent community) found to be more and positively inclined towards community livelihood. Overall perception of just transition is also higher and is in positive direction within the worker community, non-workers found to be in negative direction.

The same result was observed when a one-way ANOVA was performed to compare the effect of dependence on coal sector, i.e., direct dependence (workers) and indirect dependence (non-workers) upon perception of just transition (viz., coal downside, environment protection and community livelihood). The **ANOVA revealed a statistically significant difference in the mean perception score of community livelihood between workers and non-workers of the coal sector** ($f = 11.36$, $p = 0.00$) (Table 5).

Research in developed countries demonstrates that disrupting the coal economy promoters

Interaction with a coal worker at Ratanpur Gaon

regional imbalances. Accordingly, changes in the economy of Indian coal states due to energy transition will affect the lives of many millions (Dubash et al., 2019). In the United States, the shutdown of coal mines has created vast unemployment and stressed local communities. The workers were promised that they would be transferred to green jobs that were often less secure and provided lesser salaries; however, these promises, have been rarely upheld. Though the closure of a coal mine or plant largely impacts the entire community that is indirectly dependent on this industry, including families, teachers, small business owners, healthcare facilities, and so on (Environmental Defense Fund, 2020), the perception of just transition among the non-worker community is still lacking. Respondent workers perceived transition in terms of livelihood and stated that coal mine/power plants should remain operational, even it has some negative repercussions on the environment. Actually, "there is a need to maintain employment in regions where coal production is concentrated. However, this can be a large barrier against a transition away from coal, unless it is addressed specifically through targeted national support for regions affected. Policies that are adapted at the regional and local levels with the aim to create 'just transition hotspots' are of vital importance for a human-centred transition away from coal," said Cristina Martinez, ILO Senior Specialist on Environment and Decent Work (ILO, 2022).

How can coal-dependent communities adapt to the energy transition?

Certainly, the environment and public health will benefit from coal being used less frequently as a primary fuel source (Martenies, 2019; Hendryx & Zullig, 2009) Although the coal industry has long offered employment opportunities, tax income, and a sense of regional pride, these jobs will eventually disappear from the sector (Bell & York, 2010; Lewin, 2017). As such, negative economic and social repercussions will radiate in the regions depending on the coal industry as a result of its rapid decline and impending collapse. The same is reflected in the story of Mr. Loknath Pandey[11], a 64-year-old resident of Barwani village, serving in the Kakri coal mine as a contractual worker for the past 40 years (Figure 30). When he was asked about 'just transition', he replied, 'In coal mining, many people are involved in unskilled work, including trolley man who dumps the coal or work in coal transportation. If coal mines are replaced with solar or any other renewable energy plant, those people will lose their jobs.'

Similarly, workers from Panki thermal power station also expressed their grief because of the plant's closure in 2016. The plant was closed due to the ensuing fly ash that was highly polluting the local environment. Later, a new unit with electrostatic precipitators (ESP) technology was established to reduce fly ash emission; however, it has around 200–250 people out of their jobs. Some of them migrated to Obra or other places. Few of the people who stayed back are still fighting for their compensation. Among them, 60-year-old Naveen Singh was a contractual labour for 20 to 25 years, and he said: *No one informed us about the plant closure beforehand. Like every day we came for work and the guard refused to give us entry pass. Suddenly, we came to know about the closure. After that we protested against the closure but nothing happened till now.*

After this closure, people who used to earn around 200–300 INR per day became unemployed overnight, and they were neither rehabilitated nor given any compensation. In many cases, the workers have still not received their wages

Figure 30: A Contractual Worker at the Kakri Coal Mine

for the last two months they worked. Now, the workers and trade union are fighting together for their rights, and few of the workers have filed cases to receive the pending payment and compensation; however, justice is yet to be served.

Another group of people depend indirectly on the coal sector, including Ajay who has a small tea shop near Obra thermal power station (Figure 31). Before closure of unit A of the power station, he used to provide cable connection in the sector-10 colony. However, after closure of that unit, the colony was mostly vacated, and he had to resort to opening a tea shop. On this matter, he said: *I used to have a decent income of around 30000 per month by providing cable services in the colony. The business went down once the colony got vacated. I have then started a tea shop, but income has become very uncertain as well as lowers than the previous days.*

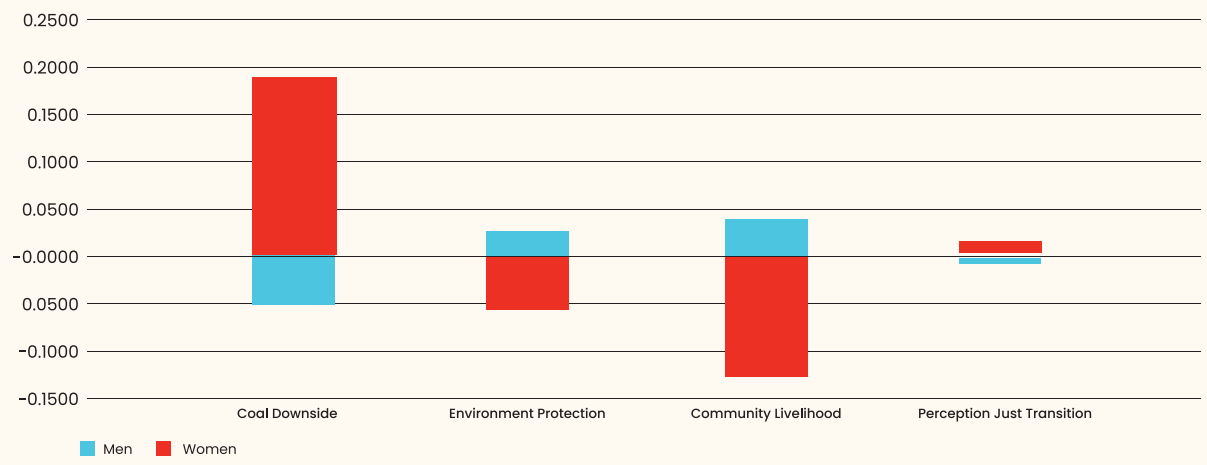
Ultimately, a 'just' transition is necessary to soften the inevitable impact on the dependent communities because of rapid socio-technical shifts away from coal-based energies.

Figure 31: Interaction with a Tea-Shop Owner Who Experienced the Effect of Unit Closure in Thermal Power Station

11 Respondents names are changed everywhere in the text.

3.3.1.3. Women and Just Transition: Is There Any Perceptual Connection?

Figure 32: One-Way Interaction Between Perception of Just Transition and Gender



Source: JTRC (2022).

There is a paucity of research that has examined whether differences in people's perception are influenced by both social background and cognitive skills (Bai et al., 2015). Given the complexity of group perception, this study investigated whether there is any difference between men and women regarding perception of just transition.

For the empirical revelation, the gender of the respondents was taken as the independent factor and the perception of just transition as the dependent one. Figure 32 shows the direction and quantum of around coal downside, environment protection and community livelihood (mean=0, standard deviation=1). The bars above and below the mean value (0 mark) denote that **the gendered difference of perception of just transition is highest on coal downside with women having more and positive inclination towards coal downside.** Furthermore, women found to have more and position inclination towards coal downside. In other words, women perceived the negative consequences of coal on health and environment more than men. The overall perception of just transition is also higher among the women respondents. However, the conclusion cannot be made from this diagram alone.

For the empirical revelation, the gender of the respondents was taken as the independent factor and the perception of just transition as the dependent one. A one-way ANOVA was performed to compare the gendered perception of just transition. The ANOVA revealed a statistically significant difference in the mean perception scores of coal downside between men and women of the sample coal units (f = 7.06, p =0.00) (Table 5).

The coal industry in general and coal transition in particular are gender-relevant processes (Braunger & Walk, 2022). However, in coal mines, men comprise a majority of the workforce (98.4%). The Mines Act of India 1952 prohibited the employment of women in underground mines and allowed them to work only in above-ground mines. Later, the law was amended to allow women to work in underground mines only during daytime and in 'technical, supervisory and managerial' positions solely. However, it has been found that most of the women who are engaged in the coal industry are part of the informal workforce. Moreover, women lack safety nets and good working conditions, and their wages are often much lower on average than that of men (Joshi, 2021). Women pointed out few of the negative externalities of coal such as pollutions caused from coal mines/power plants and its effect on health. In Sonbhadra, diseases such as fluorosis, silicosis, cancer, tuberculosis, lung disorders and miscarriages among women are found to be common in the surrounding areas of power plants. Moreover, heavy pollution from nearby thermal power plants, orchards are not bearing any fruits, fly ash polluted entire locality (Anwar, 2022).

JTRC Member Interviewing a Worker at Renusagar Power Plant

The water in Sonbhadra is a disastrous accumulation of fluoride, mercury, silica, cadmium, iron, nickel and aluminium. Fly ash (containing fluoride, arsenic and phosphorous) emanating from Sonbhadra's nine coal-based thermal power plants has contaminated water, air and soil to an extremely dangerous extent in 269 villages. These villages are spread over four development blocks (Chopan, Babhani, Duddhi and Myorpur) of the state's second largest district by area after Lakhimpur Kheri. While women perceived that coal has environmental and health adversities, their perception for environmental protection was found to be lesser than men. This finding underlines the ironical trade-offs that women do to save their livelihood, no matter how harmful it may be to their health and environment. Gender inequalities like access to and control over resources, access to education and information and equal rights and access to decision-making processes found to define what women and men can do and cannot do in a particular context of environmental protection (Joe, 2022).

Changes must accompany the shift; however, they won't take place in a vacuum, and they will certainly have a distinct impact on different social groups, such as men and women. The impact on women and their involvement in the transition are mostly ignored in the debate around the phase-down of coal use and the regulations that accompany it, which place the emphasis on the majority of men employees in the industry (Walk & Braunger, 2022). Hence, these existing gender imbalances and inequalities will continue even as India shifts to a low-carbon economy unless the country makes special provisions for skilling women to have access to good quality green jobs as it is very likely that new low-carbon jobs will come up in different locations than the conventional ones and might not be easily accessible to women. Addressing gender discrimination in the energy transition process requires than just changing energy sources and boosting the proportion of women working in the energy sector (Mang-Benza, 2021). According to history, during coal transitions, women were affected differently and became politically active in different ways than men.
Some experts believe that just transition will offer an opportunity for women in the coal sector. Just transition can provide a space to discuss gender equity within the ambience of imminent transition to low-carbon energy source, rather than re-examining the process at a later stage (Joshi, 2021). Women's presence in the workforce can be mainstreamed, and this can help guarantee that women's viewpoints are adequately articulated if gender perspectives are completely incorporated, gender-sensitive policies are adopted, and skill development plans are tailored. (International Renewable Energy Agency, 2019).

Why Geeta and Rama Devi from Uttar Pradesh do not want the coal mine closure?

The transition to a decarbonised energy sector is the call of the hour for maintaining global warming below 2°C (OECD/IEA/NEA/ITF, 2015). Countries must gradually phase out or reduce their usage of coal if they are to succeed. Even though the changeover will have many advantages, a significant structural change will be necessary. Naturally, this shift will have a direct impact on the coal-related industries, the people who work in them, and the dependent communities and areas (United Nations Economic Commission for Europe, 2022). However, the change may also negatively affect women in the community. Therefore, as part of this transformation, environmental protection and the welfare of all stakeholders engaged, including women, must be taken into account equally (Aragon et al., 2018). Poorly planned mine closures are likely to have a considerable impact on women's employment, even if it may not be obvious at first. Negative effects of a poorly managed transition for women include personal and safety difficulties, restricted access to health care and other social amenities and deprivation due to inadequate inclusion in the employment and wage structure, community transformations, and re-skilling programmes (Foot, 2022). The current study conducted by JTRC-IIT Kanpur also witnessed that women respondents from Surar village, Uttar Pradesh, who are facing coal mine closure, demonstrated willingness to work with re-training. In this regard, 39-year-old Geeta Devi, a resident of Swarajnagar village, described her situation. She is indirectly dependent on the Panki power plant as her husband was an employee in the plant. He was the single earning member of their family but lost his job due to the unit closure. Post closure, Geeta needs to earn money and contribute to her family's income; however, she expressed her concerns:

We have handcrafting skills such as weaving, stitching and cooking, but we need some training to improvise these skills for earnings. The government can provide us with skill development training so that we can also contribute to the income of our family.

The team met a woman worker of the Kakri coal mine who described a similar ordeal. 37-year-old Rama Devi from a nearby village called Kohorolia (Figure 33), a mother of three children, carries a sad story of losing her husband seven years back. Since then, she has been trying to get some informal work at a nearby coal mine to provide for her household. She is currently working under a contractor. As the team was in search of answers related to closure, she was asked, 'Do you want coal mine closure in the near future?' In response, she said 'No!' Justifying her stance, she continued, 'For those who are like me, the coal mine is the only source of getting some work. If it is closed down, we will die of hunger.'

The story above highlights that, the workforce and the local community must be prepared for the transition (World Bank Group, 2018). Such readiness can be achieved only through resilience building and organizing noble efforts to broaden the skillset of the social groups who will exposed to any negative consequences of the upcoming transition. To secure stakeholders buy-in, it is critical to strengthen their position in the future job market (United Nations Economic Commission for Europe, 2022). This can be accomplished through open communication and inclusiveness in decision-making to ensure that the transition is just and does not leave anyone behind.

Figure 33: JTRC Member Interacting with Women Workers From Kakri Coal Mine, Uttar Pradesh

Why do women in a village of West Bengal want thermal power plant closure?

If two situations are two sides of the same coin, they are very closely related, although they seem different (Cambridge Dictionary, n.d.). In the context of the transition away from coal, the majority of the workforce and local communities related to coal mines and power plants do not want closure. However, a focus group discussion with 12–15 women (45–50 years old)—seven of which are widowed—from Kanki Basti, a village near Santaldih thermal power station (Purulia, West Bengal), revealed a different story (Figure 34). The group was highly vocal when the JTRC survey team started discussing the nearby thermal power station. One of them named Katsura Mahato took an initiative to gather others and provoked them to share anecdotes about their miserable life. They expressed their dissatisfaction towards thermal power plant authority and thermal power stations. They said that power plant authorities are very reluctant about the appointing the local people in the plant – even as contractual workers— and only a few got appointed through contractors. Instead, the authorities independently appoints workers and recruit employees from outside the area. Moreover, despite the commitment to provide free electricity and pure drinking water within an 8-km radius of the power plant, the concerned community didn't get the promised access despite their residence within one kilometre.

Even those who gave their land were also deprived from this committed assurance of the thermal power authorities. In 2015, the women confronted the political party in their area and the relevant trade union so that their sons—many of which had passed industrial training (ITI)—could be employed in the power plant and raised the slogan 'chakri dite hobe, dite hobe' (you have to provide jobs). However, nothing changed after numerous protests, agitations and changes in the political parties. Furthermore, the thermal power plant resulted in the infertility of their agricultural lands through fly ash making them lose their ultimate source of livelihood. They expressed their anger toward the thermal power plant and their desire for its closure. From their perspective, it will be only after the plant's closure that this deprived local community can focus on agriculture and sustain their livelihood to some extent.

Figure 34: JTRC Team Member During Focus Group Discussion at Kankibasti, Purulia, West Bengal

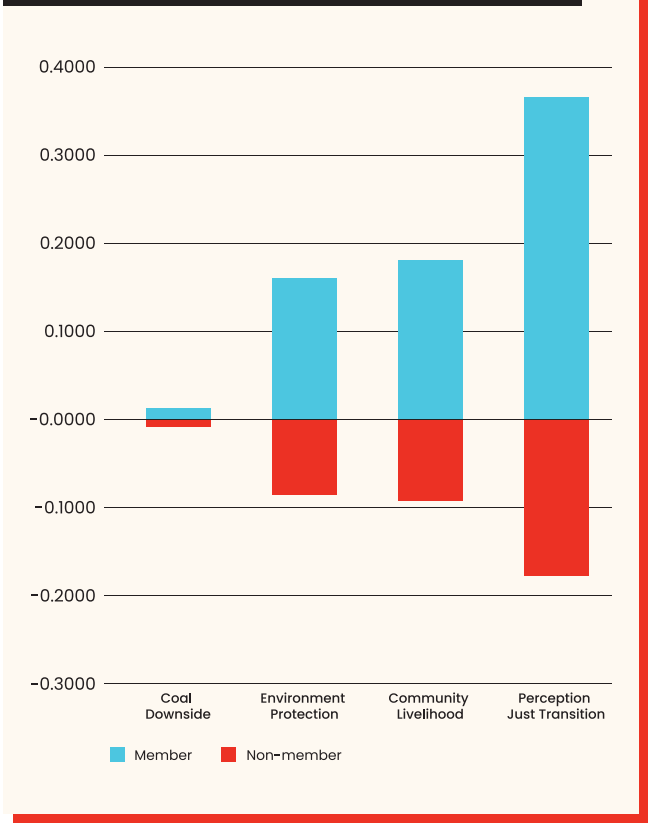
3.3.1.4. Trade Union and Just Transition

Trade unions in the coal sector have a strong history of securing rights for the workers. Thus, in the context of making the transition just, the unions hold a special place as mediators between the top and grassroots actors. Given their central role, membership in a trade union can mean a big difference in representation and being heard and can be a significant indicator of just transition perception. In this section, the report will portray the empirical relation between the perception of just transition among the members and non-members of trade unions following which a few qualitative cases will illustrate our findings.

3.3.1.4.1. Does Trade Union Memberships Have Any Relation to Perception of Just Transition?

For the empirical analysis, trade union membership was taken as the independent variable and the perception of just transition as the dependent variable.

Figure 35: One-way Interaction Between Perception of Just Transition and Trade Union Membership



Source: JTRC (2022).

Figure 35 depicts the vertical bars that shows the mean distribution of standardized normal data (mean= 0, SD=1) around the three identified factors of the perception scale. The bars above and below the mean value (0 mark) suggests the inclination of groups around the standardized score of individual perception. Figure 35 represents the two groups—trade union members and non-members—dispersed based on their normalised perception scores and inclinations toward coal downside, community livelihood, and environment protection. Members proved to be more predisposed to the two community livelihood and environment protection while the perception of coal downside was found to be similar among members and non-members of trade unions. In other words, those who have membership in the trade unions are more likely to perceive that environmental protection should go hand in hand with securing livelihood for the communities. A stronger and positive overall perception for just transition was also observed among trade union members as compared to non-members.

For strengthening the analysis, one way ANOVA was performed taking trade union membership as the independent variable and the perception of just transition as the dependent variable.

ANOVA revealed a statistically significant difference in the mean perception score of environment protection between members and non-members of trade union ($f = 9.47$, $p = 0.00$). Furthermore, members and non-members of trade unions also have significantly different perceptions on the point of community livelihood ($f = 12.28$, $p = 0.00$) (Table 5). Thus, the status of trade union membership matters in shaping the livelihood and environment-related dimensions of perception of just transition within the coal mines and power plants investigated in this study.

Perception often depends on peer groups. Peers often decide what is desirable or unpleasant, which provides insight into how to understand the world around us (Sailor Academy, 2012). Similarly when it comes to community livelihood, trade union members sometimes find solace under the roof of their concerned union (Hackel et al., 2014). However, non-members think on an individual level. Being the representatives of the labourers in the fossil fuel sectors, trade unions are concerned about the possible impacts of transition on the workforce. Hence, they look at the transition as a comprehensive plan proposed by workers'

representatives in consultation with the employers and environmentalists to guarantee economic security for the impacted workers and the planning for the rehabilitation and reemployment of the affected communities (Abraham, 2017). From the workers' point of view, the transition would change the labour market in ways that pose risks of job loss but create new opportunities for new jobs. Keeping these in mind, the role of trade unions is critical as they not only represent the workers but also form potential stakeholders in the policy process (European Trade Union Confederation, 2018). Therefore, this makes the trade unions promote the concept of 'just transition' at various international forums (United Nations Framework Convention on Climate Change, 2015; Galgóczi, 2020).

Furthermore, members and non-members were found to differ on the question of environment protection. The primary reason put up in favour of this claim relates to individual political orientation that is closely linked with environmental concern (McCright et al., 2016). There are many different classifications that previous empirical research has suggested for union responses to the environment; however, it is generally agreed that trade unions are beginning to recognise the significance of environmental issues (e.g. Räthzel & Uzzell, 2011, Snell & Fairbrother, 2011). Union movements worldwide are working hard to raise awareness regarding the need to protect the environment and treat climate change as a matter of trade union policies. If we look at the history of how labour has interacted with the environment, it is the trade unions that make the transition from being primarily concerned with worker health and safety and the pollution of industrial settings to being more broadly concerned with climate change and a just transition to decent green jobs. Additionally, comprehensive union policies that combine the defence of workers' rights with environmental conservation have repercussions for trade union policies in a number of ways. On one hand, they accept the idea that unions must reinvent themselves for social movements with the goal of transforming society as well as the lives of their members (Uzzell & Räthzel, 2012). However, when a union is asked to choose between supporting environmentally damaging productions, which can create immediate job opportunities, or opposing such a production for the sake of green jobs in an uncertain future, the hard reality is that most will opt for the first option (Räthzel & Uzzell, 2011). Neither leaders' nor individual members' attitudes should be conflated directly with union strategy and policy; despite of complex interconnections between these levels of analysis (Offe, 1985)

3.3.1.4.2. What do the trade union leaders think about 'just transition'?

Trade unions from the power plants and coal mines in the study area have expressed their views on the transition. They have also shared their views about the status of livelihood during the closure of a unit of the power plant. The following are some of the distinctive narratives and views:

Views of Trade Union Leader(s) From Panki Power Plant. Ms. Abha Chaturvedi heads the Bharatiya Mazdoor Sangaha in Kanpur, Uttar Pradesh (Figure 36). She has been associated with the organization for more than 30 years, and she holds the position of vice president of Vidyut Utpadan Karmachari Sangthan. Overall, she encourages the government's endeavour to protect the environment and agrees that we should seek alternatives for coal; at the same time, she is concerned about the impact of the transition on the workers. In this regard, Ms. Chaturvedi does not hold a favourable attitude towards the sudden closure of the Panki Power Plant in the name of protecting environment.

Figure 36: Interview with Ms. Abha Chaturvedi, Vice President of Vidyut Utpadan Karmachari Sangthan

On this matter, she said, 'It was not a sudden decision. Planning of power plant closure started between 2005–2010. Since then, the vacant posts were not filled; no new recruitments were done, so it is very clear that the planning of closure in management level began then itself.'

According to Ms. Chaturvedi, almost 50% of the people in the power plant are unskilled and face a number of challenges in finding employment. She explained:

*The transition should happen through **proper planning.** First, the workers should know about the possible externalities emerging from the move. This will help them to accept the change. The management should collaborate with trade union leaders and arrange awareness campaigns where they can provide insight about the contemporary problems and other employment opportunities.*

Furthermore, Ms. Chaturvedi also stressed upon the rehabilitation of workers if the transition happens:

There are many workers who have been working for 30 to 35 years in power plant, if the power plant gets closed, they will lose their job. We know around 250 workers who have lost their jobs due to closure of the plant. The authority should provide training for upgrading the skills needed for new energy sector.

Views of Trade Union Leader(s) From Singrauli Coalfields. Mr. Prashant Singh, secretary of Coal India ITI employee's association from Kakri coal mine, explained that discussions are going on with delegates to implement solar plants by the Northern Coalfield Limited (NCL). At the same time, he highlighted the local unemployment problem because of labour outsourcing in the coal mine. The same outsourcing problem was found to be prevalent in the Bina coal mine as well.

He realized that 'Coal India ke andar transition ka planning already start ho gyi hai. Ab hum dheere water or solar kii taraf shift honge, par isme abhi time lagega' (planning for transition has already started within Coal India. Eventually we will shift toward water or solar energy, but it will take time).

Moreover, Mr. Singhal also anticipated significant unemployment rates through this energy transition: 'Transition will have both advantages and disadvantages: it will introduce new technologies. But, where there is need for 10 workers, after transition, it will be done with only one.'

While, one of the leaders of the Centre of Indian Trade Unions (CITU) emphasised the need for vocational training of the contractual labourers who work within the coal pit. However, he was disappointed at the authority's indifference towards the training for the non-contractual ones. A similar scenario was witnessed in West Bengal.

Views of Trade Union Leader(s) From Raniganj Coalfields. Based in Raniganj, Paschim Bardhaman, West Bengal, Mr Amar Singh, the secretary of All India Trade Union Congress Eastern Coalfield Limited (AITUC ECL) emphasised the dependency on coal for energy generation in India (Figure 37). On this matter, he said, 'Currently, 70% of energy sources in India completely depend on coal. At this moment, finding the alternative to coal is quite challenging and looks like we are daydreaming.' Regarding the environment protection, he informed that the coal mining is done while abiding by the environment clearance rules regardless of the mine being open cast or underground.

Figure 37: Interaction with Mr. Amar Singh, AITUC leader in Bansra Colliery

On the other hand, Bharatiya Mazdoor Sangh (BSM), central secretary, Raniganj, stressed upon the livelihood issue, i.e., the condition of labourers after closure of the units. In this regard, he told that the individuals who were working in a unit that was closed were not given work in another unit and they became unemployed.

The secretary added, 'There are few collieries that have been closed, including Jemari Colliery and Tirat Colliery; neither contractor nor the workers have any jobs now. Only the permanent workers got transferred.'

Views of Trade Union Leader(s) From Bandel Thermal Power Plant (BTPS). BTPS is also going to face unit closure in unit 1 and 2. In this context, the following points demonstrate the situation and the ways the trade unions (here, BTPS Jatiyatabadi Thika Shramik Union) are dealing with the affects that the plant closure will have on workers: (Figure 38: A collage of posters by BTPS Jatiyatabadi Thika Shramik Union written in vernacular language Bengali):

- The union said that authorities are purposively portraying BTPS as a sick plant and recommending for the plant closure.
- Union also pointed out allegations regarding fund misuse and authority's oppression over contractual workers.
- According to the union, the authorities are trying to portray that the authority is willing to work, but only by putting up lights and sign boards at the gates; actually they are depriving the contractual workers and causing workers unrest.
- The trade union is aiming to unite all the contractual workers so that they can get justice during the unit closure.

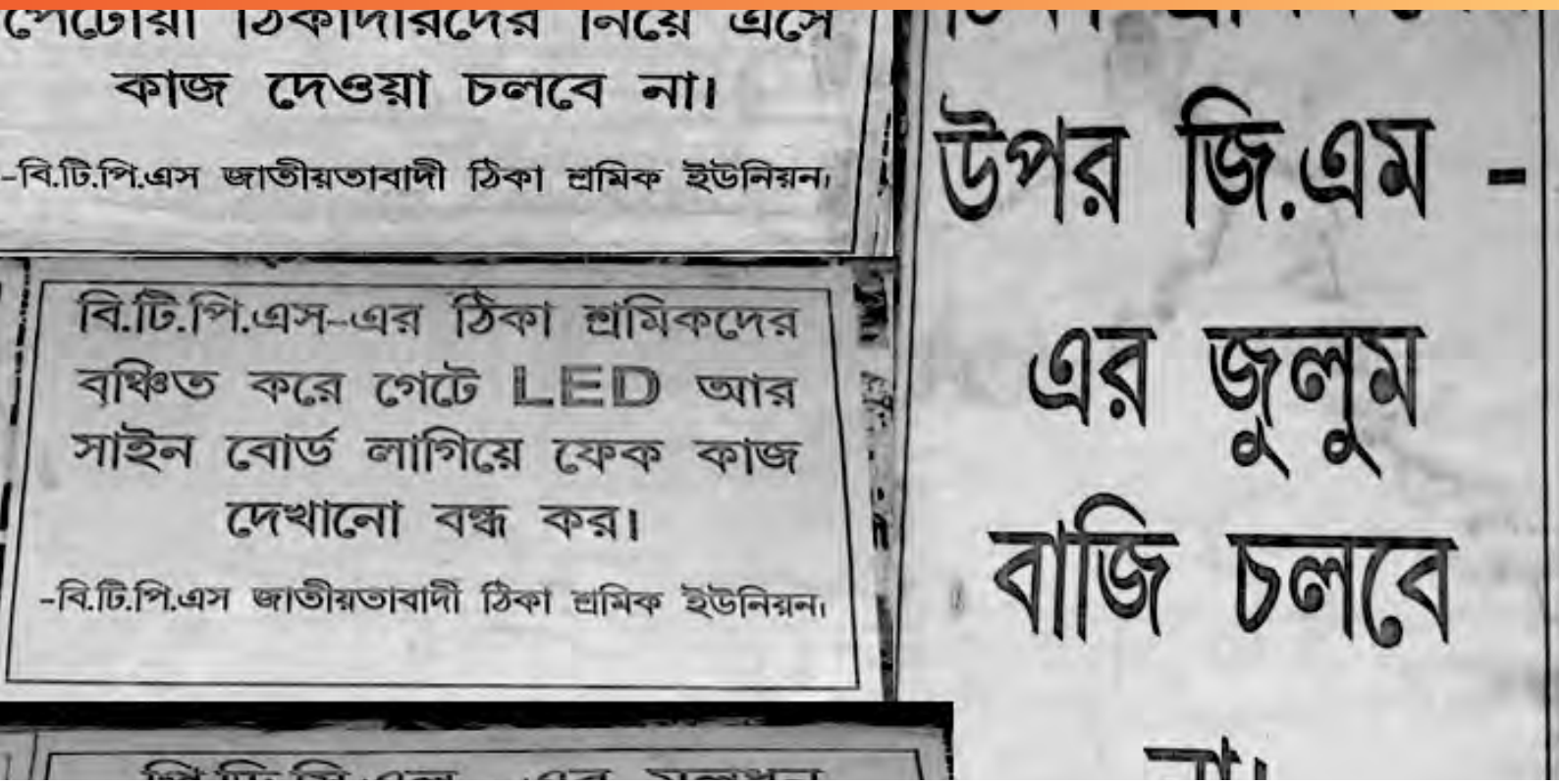


Figure 38: Issues raised by B.T.P.S Jatiyatabadi Thika Shramik Union during protest to stop unit closures (A collage in vernacular language-Bengali)

3.3.2. Perception of Just Transition from the Ground-Level Dialogues

A just transition for all requires a holistic approach that takes into account a wide range of stakeholders, including the public and business sectors, local communities, academic institutions and civil society. In the case of the coal sector, trade union also comes under the most important stakeholders in the process of a just transition. As a first critical step, **social dialogue is required for foregrounding inclusivity in the process by gathering everyone in a common room**, emphasizing the voice of the stakeholders', and coining out where the opportunities lie, whether this transition can be for all, and what is needed to make the transition 'just'.

Regarding the imperative strategies on just transition in India, basic point of inquiry is still in a very primitive stage. While there is wide disarray and disagreement among the stakeholders regarding the form, shape, nature and social outcome of energy transition that is taking place nationally, policy discourse over the last few years on shifting from coal-based energy has primarily focused on how to best rush into green energy. Hence, to realistically make the energy transition a 'just' one, unbiased, inclusive and rigorous dialogue has to take place to recognize and hear the unheard voices from the ground. In this just transition dialogue, every stakeholder should be equally important; as such, they have to drop their respective biases, came clean about their own motives, and listen carefully to the concerns of each other so that the dialogue can lead to a constructive and forward-looking strategy-making discourse.

For this purpose, the research team of JTRC organized local stakeholder discussions in both Uttar Pradesh and West Bengal with the key stakeholders from coal mines and power plants. In a trade union office of Bina coal mine in Singrauli coalfield of Uttar Pradesh just transition dialogue was conducted with trade union representatives, principal of the local educational institution and representative of local civil society organization Banvasi Seva Ashram. The discussion intended to know the environment, health and livelihood concerns in the respective coal mines. Another discussion was organized with the key stakeholders from Panki power plant of Uttar Pradesh, where representatives were from trade unions, civil society organizations and government institutions participated in the event. To get a deeper and more contextual insight on the reality of a just transition, an initiative had been taken to sit with the key stakeholders from both the select power plants and coal mines from West Bengal. The major stakeholders, including trade union leaders and general members, thermal power station officials, permanent and contractual labourers, environmentalists, journalists, just transition researchers, and academicians, were meaningfully engaged in this just transition dialogue. The summarized findings from these above-mentioned workshops are presented in Table 6.

Table 6 **Summary of the Findings related to Key Stakeholders of Just Transition**

Stakeholders	Relevant findings
People in Coal Mines	• Pollution has irreversibly damaged the traditional agriculture system in the area a decade ago.
	• Respiratory problems and skin diseases are prevalent in the area due to coal dust.
People in Power plants	• There is a lack of consultation with the people who are getting affected by plant closure and policy change.
	• Workers in power plants face health and safety concerns
Coal Dependents	• The coal workforce is already undergoing gradual reduction due to technical advancement. Energy transition would further harm the workers' livelihood.
	• A just transition can take place gradually if it is accompanied by provision of opportunities for alternative livelihood.
	• Outsourced workers are the most vulnerable as they are subjected to the most adverse job conditions.
	• Affected workers can be encouraged to move toward entrepreneurship but the workers are unaware of the related government schemes
	• During the process of plant closure the permanent workers are taken care of; contractual workers are left without jobs and fair compensations.
	• Skills development is one of the most important factors as the just transition will enforce a shift in jobs as well
Gender	• Female workers get little attention in the event of closure
	• Female workers need dedicated redressal
Trade Union	• Trade unions are the torch-bearers in achieving the concept of a 'just transition' within the coal community
	• Trade unions enable the voice of the workers (including permanent, contractual and daily wage workers) to reach the higher authorities to ensure that the workers have a decent quality of life, job security, and good physical and mental health
Others	• Civil society organizations (CSOs) can play a vital role in creating awareness
	• Governments must shift into a mission mode for the just transition
	• Waste management bodies can help to get some low-cost alternative energy sources for some industries such as cement industries, thus replacing the high demand for coal
	• The aspect of 'climate change' must be mandated in every policy making step.
	• European Foundation for Quality Management (EFQM) model can be followed during the transition for business excellence.
	• Corporate social responsibility (CSR) also came out as a notable point during the dialogue.
	• Corporate interest must not override justice concerns for the common people.

3.3.3. Researchers' Observations of Stakeholders From the Field

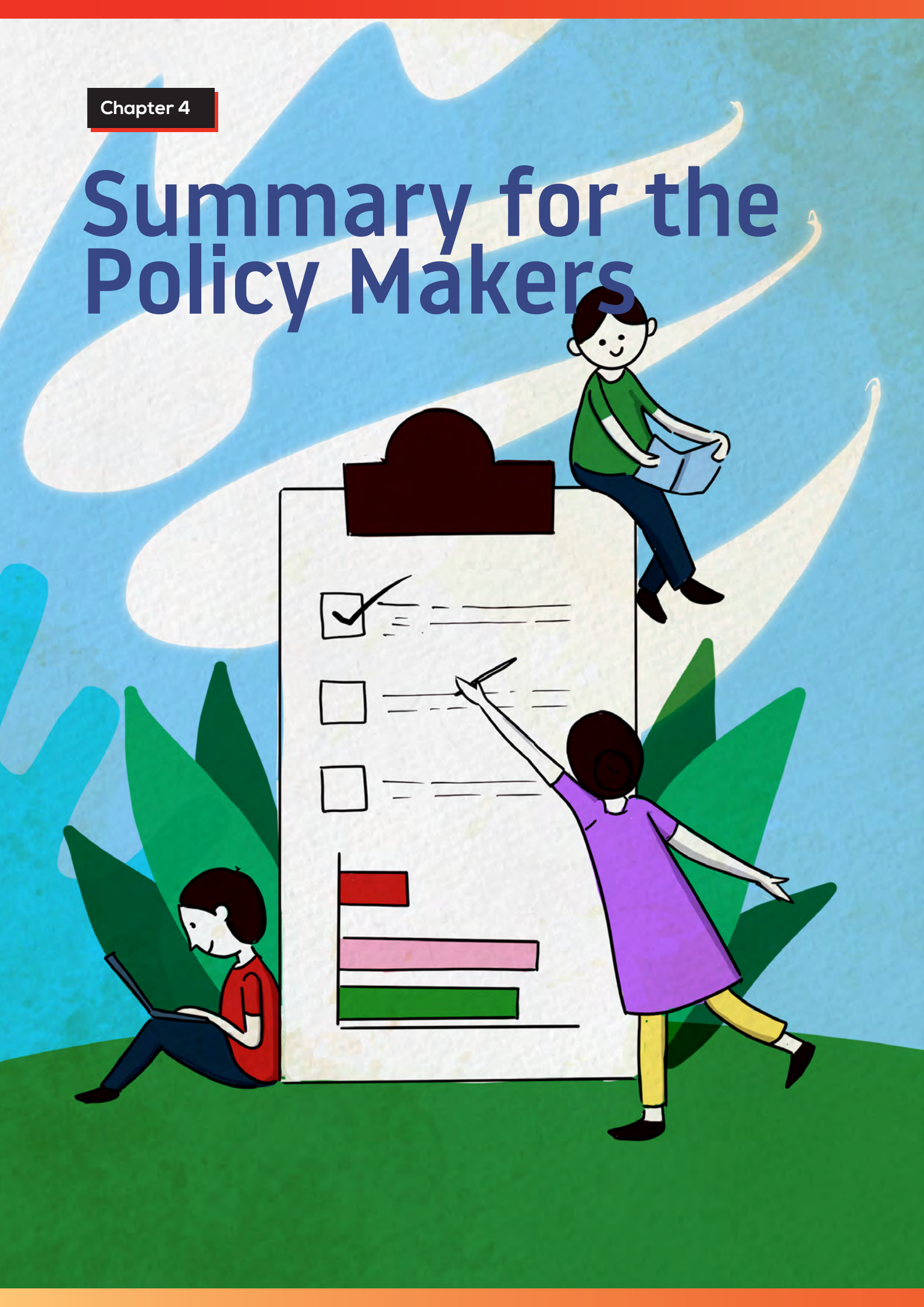
The JTRC team conducted their field work in two of the major coal-dependent states of India: Uttar Pradesh and West Bengal. Both areas are rich in minerals, and their economic and social wellbeing depend largely on coal and power industries. Due to increased rates of pollution resulting from coal industries in surrounding areas, serious health problems such as respiratory diseases and silicosis have become local issues. Furthermore, the fly ash resulting from the power plants and coal mines negatively impact the agriculture in both states, and the biodiversity of those places are in distress. In this context, the key state and stakeholder-specific observations are as follows (Table 7):

Table 7 **Researchers' Observations from the Field**

Stakeholders	Relevant Observations	Concerned State
People in Coal Mines	• A tribal dominated village within 5km radius of Obra thermal power plant has no electricity connection	Uttar Pradesh
	• Colour of the trees that are in the surroundings of coal mines has turned grey as they are constantly covered by the dust	
	• Surrounding villagers suffer from health hazards due to pollution from the coal mines	West Bengal
	• The market area of Raniganj denotes that this colliery area is monetarily affluent.	
People in Power Plants	• People around the villages nearby Panki power plant, mainly depend on the power plant, local market or agriculture for livelihood	Uttar Pradesh
	• In Obra, fly ash and dust from the power plant pollutes nearby agricultural land	
Coal Dependents	• Inability to work with the advanced technology installed in the thermal power station has caused mass unemployment in the areas surrounding the Obra thermal power station	Uttar Pradesh
	• In surrounding villages of Singrauli, the livelihood of the villagers is becoming increasingly difficult day by day even working in agriculture also is getting impaired	
	• Most of the contractual labours are untrained in Raniganj coalfields	West Bengal
	• The youth of Raniganj coalfield still aspire to get a job in the coal mining industry, and they attend the nearby Harashankar Bhattacharya Institute of Technology and Mining.	
	• The workers are afraid of disclosing mine associated risks because if it comes on report, there can be mine closure and subsequent job loss	
	• The residential area in Jemari Colliery is not renovated. The labour quarters are in very poor conditions.	
Women	• Majority of the women engaged in Singrauli coal mines are working under contractual positions	Uttar Pradesh
	• In Panki thermal power station, only a few female workers work, but those are in regular positions	
	• Coal mine industries are more welcoming to unskilled female workers than thermal power stations	
	• Very few women work in the coal sector, and the women workers get the job as compensation after their husband or father dies	West Bengal
	• In surrounding villages of coal mines, women are mostly engaged in making of briquette as household industry	
Trade Union	• In Bansra Colliery, trade unions are not allowed to intervene in coal mines' operations despite the potential risks and pollution	West Bengal

Chapter 4

Summary for the Policy Makers



Significant common understanding on a set of procedural rules **are there** for putting just transition policy into practice, even though there may not be complete consensus on what constitutes a "just transition"—as a crucial component of achieving social justice or a imperative climate action.

The success of just transition requires years of advocacy built by grassroots stakeholders, for whom just transition has not been a practical solution to policy issues but the impetus for social change in response to injustice, even though just transition is enjoying renewed attention.

Unfortunately, policymakers do not have the luxury of time for the systemic or structural transitions that are ongoing. However, planting the seed today for long-term plans of tomorrow, especially for transitions that are already underway, will help guarantee that there is appropriate planning and support.

Figure 39: Finding the Scope of Policy Intervention

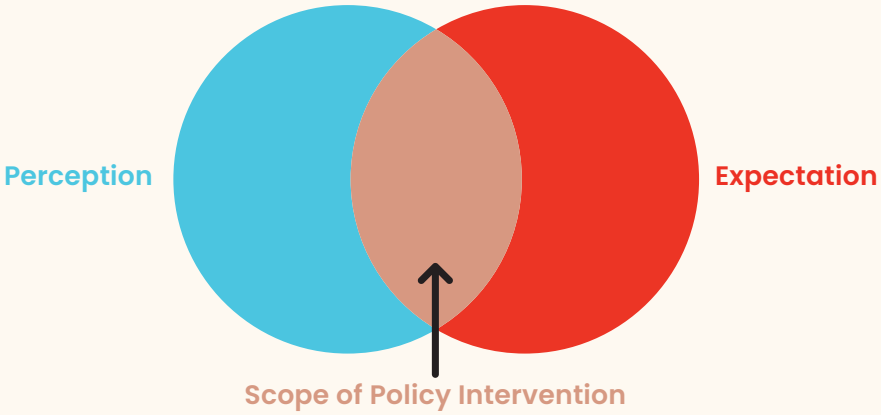


Table 8 Stakeholders' Perception of Just Transition

	Intensity of expectations		
	Coal Downside	**Environment Protection**	**Community Livelihood**
Type of Unit	👤👤	👤👤	👤
Nature of Dependency on Coal Sector	👤	👤	👤👤
Gender	👤👤	👤	👤
Trade Union Membership	👤	👤👤	👤👤

👤 No perceptual difference 👤👤 Perceptual difference

Source: Developed and computed from the Survey by JTRC (2022)

Table 9 Stakeholders' Expectations in Just Transition

	Intensity of expectations		
	Coal Downside	**Environment Protection**	**Community Livelihood**
From Government	👤	👤👤👤👤	👤👤👤👤
From Company	👤👤	👤👤👤	👤👤👤👤
From Trade Union	👤	👤👤	👤👤👤👤

👤 No response 👤👤 Low response 👤👤👤 Moderate response 👤👤👤👤 High response

Source: Developed and computed by JTRC (2022)

Policymakers must think about how policies can be implemented when developing long-term plans, from identifying where transitions will take place to assuring decent livelihood as well as protecting the environment. For decades, the researchers shown that perception is influenced by expectations and the overlapped area can be the focus of policy makers (figure. 39). The relation between perception and expectation is how one is experienced versus what one expect from the institutions he/ she belongs to. Accordingly, in the present study, three dimensions of just transition perception, i.e., coal downside, environment protection and community livelihood with the four stakeholder groups has been cross-tabbed whose result has been delineated in the previous section,here again the result has been presented in a nutshell in Table 8. Further, the aforementioned dimensions are cross-tabbed with respondents' expectations from government, company and trade unions (Table 9). Here are the three points that will guide as summary for the policymakers:

- People want that the prime goal of government, company and trade union must be protection of livelihood of those individuals who are going to be affected because of energy transition.
- As per the response, it is revealed that both the government and company should focus on environmental protection.
- People mostly expect one thing from trade union, i.e., union's support for the sustenance of community livelihood throughout the process of energy transition.

As policy makers begin to look at building just transition plans to accompany mitigation efforts, several key factors must be kept in mind, here the report presents stakeholders' expectations from government, their company and trade unions as the key inputs for the policymakers (Figure 40). The expectations within the pre-determined components such as coal downside, environment protection and community livelihood have again been accommodated here. Workers, communities, and trade unions should have a seat at the table when discussing relocation, training, and safety nets for making just energy transition, otherwise, decision makers can wrongly assume who will desire which options.

Interaction with the Grassroots Stakeholders

Figure 40: Summary for Policy Makers: Expectations from Stakeholders (n=902)

	Government	Coal Company	Trade Union
Coal Downside	No one showed consensus on coal phase down	Start solar power plant on site of thermal power plant. Ensure social dialogue and representation of workers and trade unions in closure planning	No one showed consensus on coal phase down
Environment Protection	Control the pollution generated from coal mines or power plants	Control the pollution generated from coal mines or power plants, give special attention to land degradation	Control the pollution generated from coal mines or power plants
Community Livelihood	Engage with communities to give undisturbed access to social capitals to sustain regional economies and promote wellbeing in terms of educational facility, water supply, health facility, provision of electricity and road connectivity	Deliver better job entitlement and decent work environment Promote reskilling and retraining, dearness allowance, retirement support or closure benefit Establish a company strategy and plan to protect community in the context of just transition	Apply both labour and human right Support workers in demanding affordable access to livelihood, key goods and services and enable the whole community to participate actively in the transition.

Note: Developed and designed byJTRC (2022).

Chapter 5

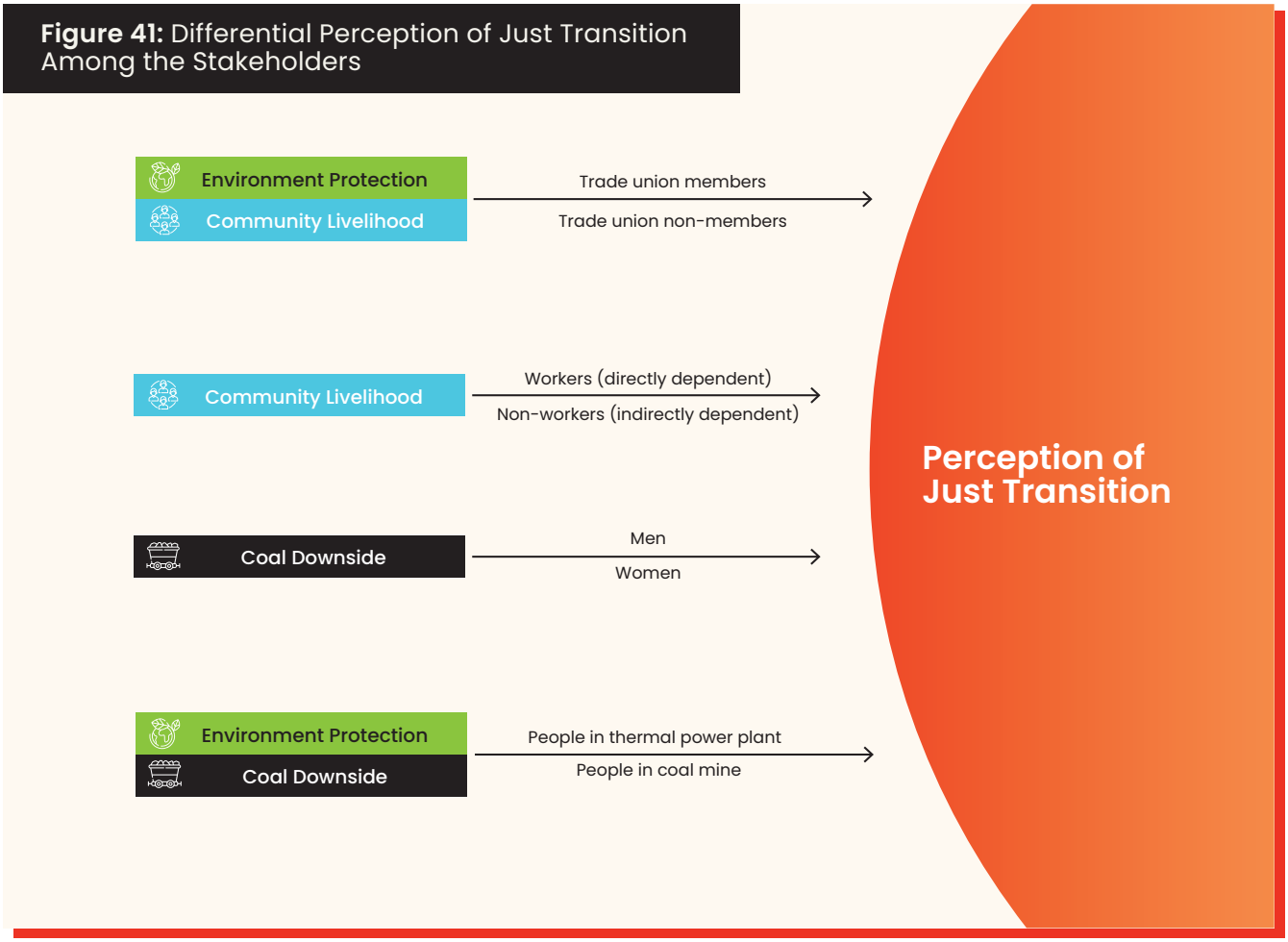
Conclusion and Future Direction

Just transition denotes a responsible transformation to a low-carbon economy while maintaining employment rates and ensuring other interests of fossil fuel-dependent communities. It includes the interests of both the workers from the coal mines and power plants. Furthermore, just transition also involves both those who are directly dependent on coal mining and power generation activities and those who are linked with these two sectors indirectly, including small businessmen in the local market, transport workers, local school teachers and many more. In this study, the JTRC survey team interviewed a sample of members from the coal-dependant community at the ground level in two states of India: Uttar Pradesh and West Bengal. The report meticulously describes the situations of its study power plants and coal mines located in the aforementioned states. Accordingly, a clear policy gap for the power plant areas was observed. In this regard, no publicly available closure guideline exists for the power plant units even though they have gone through multiple closures over the decades for environmental reasons. Moreover, the team has also interviewed some key decisionmakers on the ground to elicit their responses on the possibilities of environment-friendly resource management in coal-rich areas.

Furthermore, the perceptions of just transition prevailing among the trade unions, labours and other stakeholders are also explored. To demonstrate these perceptions in a structured manner, a just transition perception scale was constructed, and it accommodated three components, namely coal downside, environment protection and community livelihood.

Subsequently, the analysis concluded that the perception of just transition differs between the members and non-members of trade unions hailing from coal mine and power plants altogether.

Figure 41: Differential Perception of Just Transition Among the Stakeholders



Source: JTRC (2022)

In particular, environment protection and community livelihood were key factors in the perceptual differences between the members and non-members of trade unions. Dependent communities (i.e., workers and non-workers) of the coal-based sector also displayed different perceptions regarding just transition. In particular, the direct (workers) and indirect (non-workers) dependents demonstrated perceptual differences on community livelihood. Furthermore, the present study also measured gendered perception of just transition; in this regard, coal downside is the only component in which differences were found. Another point of scrutiny was whether there are any perceptual differences regarding just transition between the people of thermal power plants and those of coal mines; accordingly, the findings indicated that both coal-based units differ upon coal downside and environment protection components, but they perceive community livelihood similarly. Figure 41 depicts the whole summary of stakeholders' differential perception of just transition in a single picture.

Ultimately, using basic descriptive analysis and observations, the report by JTRC has presented key themes around just transition perception by key community stakeholders (workers, trade unions, men and women, and other dependant stakeholders) in this report. However, a significant scope exists for further refinement of JTRC perception of just transition scale by incorporating further justice-related dimensions. Additionally, the study has employed snowball sampling technique, which is a non-probabilistic sampling method, whereas random sampling could provide more unbiased result. In the coming report, team JTRC plans to apply more rigorous analysis to explore key factors shaping just transition in coal regions. JTRC will discuss key problems that stakeholders envisage in the due process of transition with the cases of land acquisition conflict, job loss in power plants and related issues. The team will also suggest possible solutions to these long-existing and complex problems that policy makers may find useful in planning just transition.

Just transition denotes a responsible transformation to a low-carbon economy while maintaining employment rates and ensuring other interests of fossil fuel-dependent communities.

Glossary of Just Transition

Adaptation: The process of adjustment to actual or predicted climate and its effects in order to minimize the harm or take advantage of beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climatic effects; human involvement may facilitate this.

ANOVA: Analysis of Variance (ANOVA) is used to determine whether differences between data sets are statistically significant. It functions by examining the levels of variance present within each group using samples drawn from each.

Ash Pond: An ash pond is a geotechnically built building with an all-around earthen wall that serves as an impoundment for the wet disposal of bottom ash and fly ash from a power plant. The most typical technique employed in all power plants is the wet disposal of ash into ash ponds.

Bottom-up Approach: Decision-making and process execution start at lower levels and proceeds upwards.

Civil Society Organizations (CSOs): Any voluntary, non-profit organisation of citizens that is based locally, nationally, or internationally.

Clean Coal: The industry term "clean coal" is being frequently used in reference to carbon capture and storage, a cutting-edge theoretical procedure that would completely remove or greatly reduce carbon dioxide emissions from coal-based plants and permanently sequester them. More broadly, the phrase is now used to refer to methods for improving the effectiveness and acceptability of coal extraction, preparation, and use from an environmental standpoint.

Clean Development Mechanisms (CDMs): Article 12 of the Kyoto Protocol allows a nation that has agreed to restrict or reduce its emissions in accordance with the Kyoto Protocol (an Annex B Party) is permitted to carry out an emission-reduction initiative in developing nations.

Climate Justice: Justice that combines developmental issues with human rights in order to create a rights-based approach to reducing the effects of climate change.

Coal India Limited (CIL): CIL is a PSU owned by the Central Government of India which controls its operations through the Ministry of Coal. Coal India Limited has 352 mines (as on 1st April, 2020) of which 158 are underground, 174 opencast and 20 mixed mines. CIL produces coal through seven of its wholly owned subsidiaries, one foreign subsidiary in Mozambique and another one owned by the parent holding company. CIL further operates 12 coal washeries, (10 coking coal and 2 non-coking coal) and also manages other establishments like workshops, hospitals, and so on.

Coal Mine: A mine or pit from which coal is obtained

Common but Differentiated Responsibilities (CBDR): Equity and fairness in the sharing of responsibilities under international environmental law. Its use in the context of climate change raises several issues on how to allocate country responsibilities for mitigation and adaptation measures.

Community: A group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings.

Conference of the Parties (COP): The supreme body of the United Nations Framework Convention on Climate Change. It currently meets once a year to review the Convention's progress.

Corporate Social Responsibility (CSR): Enhancing safety protocols and working conditions throughout the supply chain, as well as encouraging the development of goods and services that deal with environmental and social challenges.

District Mineral Foundation (DMF): A trust established as a non-profit organisation to work for the interest and benefit of people and districts affected by mining-related operations. It is supported by donations from district residents who hold significant or minor mining concessions, as determined by the Central or State Government.

Emissions Gap: The difference between the greenhouse gas emission levels consistent with a specific probability of limiting the mean global temperature rise to below 2°C or 1.5°C in 2100 above pre-industrial levels and the GHG emission levels consistent with the global effect of the NDCs, assuming full implementation from 2020.

Energy Justice: Energy justice is the pursuit of equity in the social and economic aspects

of energy system participation, as well as the reduction of social, economic, and health costs on people who are disproportionately impacted by the energy system. Communities on the front lines of pollution and climate change, working-class people, indigenous communities, and those historically disadvantaged by racial and social injustice are all specifically prioritised in energy justice. Energy justice aspires to provide all communities with clean, affordable, democratically managed energy.

Energy Transition: By the second half of this century, the global energy system will have transitioned from being based on fossil fuels to being carbon-free. Its core is the necessity to minimize CO2 emissions related to energy in order to prevent climate change.

Environmental Justice: Environmental justice is the equitable treatment and meaningful participation of all people in the creation, implementation, and enforcement of environmental laws, regulations, and policies, regardless of their race, colour, country origin, or income level.

Equality: Equality means 'the state of being equal.' It's one of the ideals a democratic society, and so the fight to attain different kinds of equality, like racial equality, gender equality, or equality of opportunity between rich and poor, is often associated with progress toward that ideal of everyone being truly equal.

Equity: Equity is something fair and just. Fairness of treatment according to needs. This may include equal treatment or treatment that is different for each party but which is considered equivalent in terms of rights, benefits, obligations and opportunities.

Governance: The arrangements, procedures, and activities by which public and private parties collaborate to achieve societal objectives. This encompasses official and informal institutions as well as the conventions, laws, rules, and procedures that go along with them for selecting, supervising, implementing, and monitoring of political and geographic policies at all levels, from global to local.

Grassroots: People at a local or low level rather than at the center or upper levels of a particular sector.

Greenhouse Gases: The atmospheric gases responsible for causing global warming and climatic change. The major greenhouse gases are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Less prevalent, but very powerful, GHGs are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).

Incidental Sampling: A researcher pick up data or information's from those who fall into hand or present at the time of research. It continues the process till the completion of the sample size.

Injustice: Trade unions are organizations formed by workers from related fields that work for the common interest of its members. They help workers in issues like fairness of pay, good working environment, hours of work and benefits. They represent a cluster of workers and provide a link between the management and workers.

Institutions: Rules, norms, and conventions that direct, restrict, or facilitate human activities and behaviours. Institutions may be developed publicly, such as through laws and regulations, or unofficially, such as through traditions or practises. The inception, adoption, and implementation of climate action and climate governance may be influenced by institutions in a variety of ways, including those listed above.

International Labour Organizations (ILO): The ILO was created in 1919, as part of the Treaty of Versailles that ended World War I, to reflect the belief that universal and lasting peace can be accomplished only if it's based on social justice. In 1946, the ILO became a specialized agency of the United Nations. Its unique tripartite structure gives an equal voice to workers, employers and governments providing a unique platform for promoting decent work for all women and men.

Justice: Moral or legal principles connected to treating people fairly and equally, frequently in accordance with societal ethics and ideals.

Lock-in: When a market is forced to adhere to a standard even though participants would benefit from an alternative, this is known as lock-in.

Mine Developer and Operator (MDO): MDO is a concept where in a coal block owner contracts entire operations to a third party, which takes the responsibility of land acquisition, resettlement and rehabilitation, mining, developing and operating the particular mine by investing in it and then supplying the coal at a tender determined price to the power plants of the mine owning state electricity boards.

Low-carbon Economy: A low carbon economy is one that attempts to reduce greenhouse gas emissions while still running a typical economic

structure. Countries that are attempting to lessen the effects of global warming now have this framework as their long-term objective. The Kyoto Protocol, which urged countries to cut their carbon emissions, marked the beginning of the transition to low-carbon economies. This movement has continued with the Paris Agreement, which was signed in 2015.

Migration: Migration is the act of moving from one nation, location, or region to another in search of more favourable conditions for settling down. In-migration and out-migration are the two types of migration. In-migration is people moving into another area within their own country and out-migration is people moving out of their area to another area within their own country.

Mitigation: A human effort to lessen greenhouse gas sources or improve sinks in the context of climate change. Examples include strengthening building insulation, switching to solar or wind energy, using fossil fuels more efficiently for industrial processes or electricity generation, and expanding forests and other "sinks" to absorb more CO2 from the atmosphere.

Mixed Methods Research: incorporates or links both qualitative and quantitative forms of inquiry. A rigorous strategy to responding to research problems is provided by mixed methods design for researchers across research fields. This method is appropriate when analysing complex systems holistically, such as the mega-project. The risk of chaos is increased when different types of data, notation system, terminology, and method diagrams are combined. Readers must therefore be given a clear explanation of the research design. An essential component of this research design is triangulation. Moderate harm or take advantage of beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climate and its effects; human intervention may facilitate this.

National Green Tribunal (NGT): The National Green Tribunal has been established on 18.10.2010 under the National Green Tribunal Act 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal shall not be bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice.

Nationally Determined Contribution (NDC): Submissions by countries that have ratified the Paris Agreement which presents their national efforts to reach the Paris Agreement's long-term temperature goal of limiting warming to well below 2°C. New or updated NDCs are to be submitted in 2020 and every five years thereafter. NDCs thus represent a country's current ambition/target for reducing emissions nationally.

Non-state and Subnational Actors: 'Non-state and subnational actors' includes companies, cities, subnational regions and investors that take or commit to climate action.

Non-probability Sampling: Researchers, or other participants, choose the sample as opposed to randomly selecting it, so not all members of the population have an equal chance of being selected for the study.

Open Cast Project (OCP): Open-pit mining, also known as open-cast or open-cut mining and in larger contexts mega-mining, is a surface mining technique of extracting rock or minerals from the earth from an open-air pit, sometimes known as a borrow.

Overburden: Overburden in mining is the material that is present above an area that is conducive to economic exploitation, such as the rock, soil, and ecosystem that are present above a coal seam or ore body. Overburden is often referred to as waste or spoil. The material that is left over after commercially useful components have been removed from the typically finely processed ore is known as tailings and is different from overburden. During surface mining, overburden is removed, but it normally contains no harmful elements. During reclamation, overburden can also be used to rehabilitate a depleted mining site.

Paradigmatic Shift: In this sense, a paradigmatic shift refers to a significant change in the underlying assumptions of a field. In this instance, a transition from behaviourism to cognitivism to social constructivism denotes a change in understanding of how people's minds function and, consequently, how to most effectively offer instruction.

Purposive Sampling: Purposive sampling, also known as judgmental or selective sampling, is a form of non-probability sampling in which

researchers depend on their own judgment when choosing sample respondents from the determined population to participate in their surveys.

Qualitative and Quantitative Research: Qualitative research focuses on understanding a research query as a humanistic or idealistic approach. This method is used to understand people's beliefs, experiences, attitudes, behaviour, and interactions. It generates non-numerical data. Whereas quantitative approach is based upon numeric and methods that can be made objectively and propagated by other researchers.

Snowball Sampling: Snowball sampling is a non-probability sampling method where currently enrolled research participants help recruit future subjects for a study. For example, a researcher who is seeking to study leadership patterns could ask individuals to name others in their community who are influential. This technique is called "snowball" because the sample group grows like a rolling snowball.

Social Dialogue: Social dialogue is defined by the ILO to include all types of negotiation, consultation or simply exchange of information between, or among, representatives of governments, employers and workers, on issues of common interest relating to economic and social policy. Social Justice: The term used to describe just or equitable social relationships that aim to solve issues of economic distribution, resource access, opportunity, and assistance in accordance with ideals of justice and fairness.

Societal Transition: A radical, structural change of a societal (sub)system that is the result of a coevolution of economic, cultural, technological, ecological, and institutional developments at different scale levels.

Sustainable Development Goals (SDGs): The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who're furthest behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technological Transition: Technological transition describes how these technological innovations occur and are incorporated into society.

Thermal Power Station: A thermal power station is a type of power station in which heat energy is converted to electrical energy.

Top-down: A situation in which decisions are made by a few people in authority rather than by the people who are affected by the decisions.

Trade Union: Organizations formed by workers from related fields that work for the common interest of its members. They help workers in issues like fairness of pay, good working environment, hours of work and benefits. They represent a cluster of workers and provide a link between the management and workers.

Transition: Transition is a passing from one form or stage to the next.

Vocational Education and Training (VET): Imparting knowledge and training in skills connected to a particular profession, occupation, or vocation that the student or employee intends to pursue. Vocational education can be pursued in a formal educational setting as a secondary or tertiary course of study, as an initial training programme while working, for example as an apprentice, or as a hybrid of formal education and on-the-job training.

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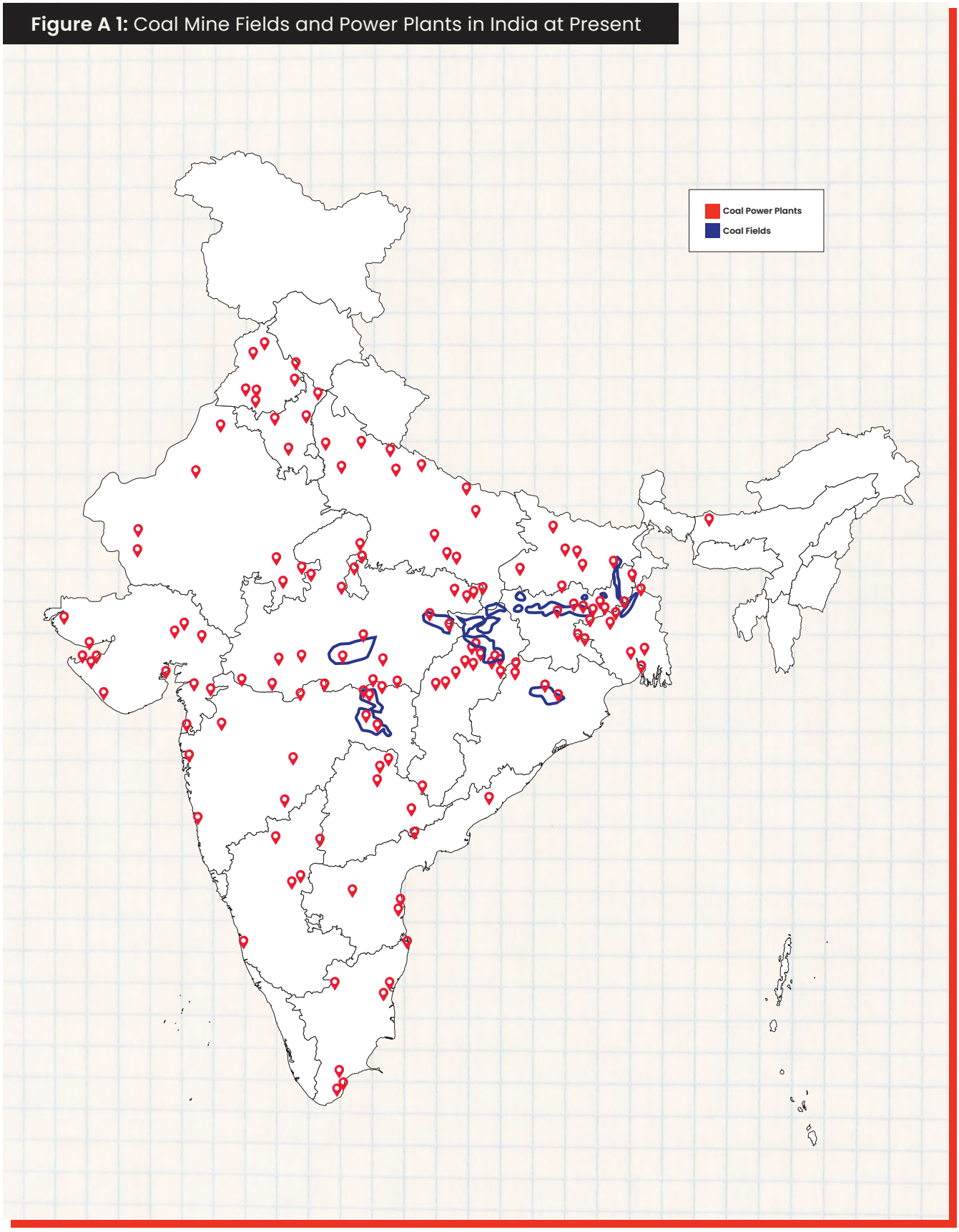
Appendix A

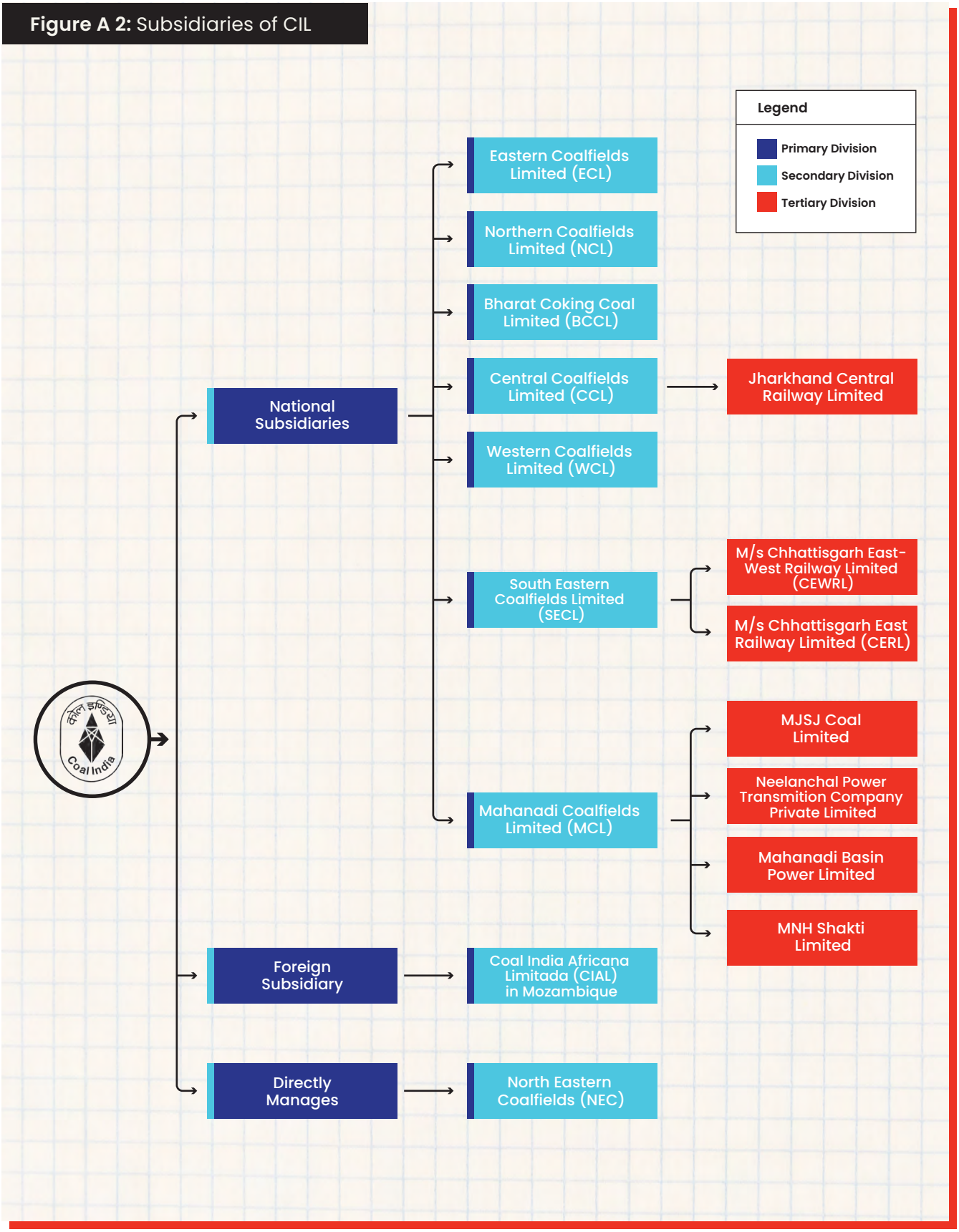
Profile of the Study Areas

Figure A 1: Coal Mine Fields and Power Plants in India at Present



Source: NITI Aayog/Indian Space Research Organization, 2022

Figure A 2: Subsidiaries of CIL



Source: From the official website of CIL (http://archive.coalindia.in/en-us/contactus/subsidiaries.aspx; 2022)

Table A 1 Key Socio-economic, Physiographic and Natural Resource Profile of the States: Uttar Pradesh and West Bengal

Parameters	States	
	Uttar Pradesh	West Bengal
Total population (Census of India, 2011)	199812341	91276115
Male	104480510	46809027
Female	95331831	44467088
Sex ratio (females per thousand males) (Census of India, 2011)	912	950
Population density (/km2) (Census of India, 2011)	829	1028
Literacy rate (Census of India, 2011)	67.68%	76.26%
Male	77.28%	81.69%
Female	57.18%	70.54%
Area (km2) (Census of India, 2011)	240928	88752
Number of districts (Census of India, 2011)	75	23
Installed capacity of power utilities (MW) (CEA-GOI], 2022)	20483.54	8583.41
Percentage of electrified villages (Census of India, 2011)	100	100
Average annual rainfall (mm) (NRI department, Government of Uttar Pradesh, 2021)	990	1625
Average per capita income (INR) (Kanwal, 2022a; Kanwal 2022b)	65000	113000
Number of agricultural labourers (Roy & Ahmed, 2013; Press Information Bureau- Government of India [PIB-GOI], 2012)	13400911	7362957
Household industry workers (Statista, 2021)	3031164	2172070

Table A 2 **Key Demographic and Socio-economic Profiles of the Sample districts of Uttar Pradesh and West Bengal**

	Uttar Pradesh	West Bengal			
Parameters	Kanpur Nagar district (Census of India, 2011)	Sonbhadra district (Census of India, 2011)	Hooghly district (Department of Planning, Government of West Bengal, n.d.)	Paschim Bard-haman district (Department of Planning, Government of West Bengal, 2011)	Purulia district (Department of Planning, Government of West Bengal, n.d.)
Demographics					
Total area (sq km)	10863	6788	3149	1603	6259
Urban area (sq km)	323	125	329	928	148
Rural area (sq km)	2832	6779	2820	6096	6111
Population (uidai, 2020)	5169097	2101547	5877723	8218972	2930115
Population growth rate (%)	9.92	23.8	9.46	11.92	15.52
Population density (/km2)	1499	270	1800	1800	468
Literacy rate (%)	81.31	64	82.55	78.75	64.48
No. of towns	10	18	77	71	28
No. of villages	1003	1429	25	316	2,468
Cultivable land area (thousand ha)	234.84	138.81	220.35	75.34	318.70

Table A3 Workforce Profile of the Sample Coal Mines and Power Plants

Power Plant/Coal Mine	Total Workforce	Direct dependent workforce	Indirect dependent workforce	Rural/Urban	Local industries
Sample power plants and coal mines from Uttar Pradesh					
Panki Thermal Power Plant	1500 (regular workers) + 4500 (contractual workers)	6000	2000	Urban	Leather industry, Kanpur industrial area
Obra Thermal Power Plant	1800 (regular workers) + 3500 (contractual workers) 10000 (direct workers in stone mining) 200 (external contractors and suppliers)	5300	1000	Rural	Stone mining industry
NCL Kakari Coal Mine	732 (regular workers) + 280 (contractual workers)	1012	8000	Urban	Renusagar and Anpara power plant
NCL Bina Coal Mine	1120 (regular workers) + 560 (contractual workers)	1680	11000	Rural	
NCL Khadiya Coal Mine	1414 (regular workers) + 1500 (contractual workers)	2914	8000	Rural	NTPC power plant
Sample power plants and coal mines from West Bengal					
Bandel	700 (permanent worker) +1100 (contractual workers)	1800	3000	Urban	Tribeni Tissues Limited, Steel factory, Metal industry, Food processing industry
Santaldih	700 (permanent workers) + 1500 (contractual workers)	2200	8000	Rural	Coal washer at Bujudih
Kunustoria Coal Mine	5000 (permanent workers) + 1100 (contractual workers)	6100	5000	Rural	Coal washer, Aluminium factory
Satgram Coal Mine	5000 (permanent workers) + 1300 (contractual workers)	6300	8000	Rural	

Source: Collected by JTRC (2022) from the concerned coal mines and power plants.

Table A4 Operational Details of the Sample Power Plants

Project	Power plants from Uttar Pradesh		Power plants from West Bengal	
	Panki Thermal Power Station (Swapdial, n.d.)	Obra Thermal Power Station (Swapdial, n.d.)	Bandel Thermal Power Station (Global Energy Monitor, n.d.; Swapdial, n.d.)	Santaldih Thermal Power Station (Swapdial, n.d.; Global Energy Monitor, n.d.)
Owner	Uttar Pradesh Rajya Vidyut Utpadan Nigam	Uttar Pradesh Rajya Vidyut Utpadan Nigam	West Bengal Power Development Corporation	West Bengal State Electricity Distribution Company Limited
Commission year	1967	1967	1965	1974
Approved capacity in megawatts (MW)	220	1350	450	
Installed capacity in megawatts (MW)	220	1350	450 (now 330 MW as unit 3 and 4 are closed from 2018; each had a 60 MW capacity)	980
Status	Under construction (two units ceased operations in 2018 and a unit is scheduled to be completed by December 2022 (Siddiqui, 2019).	Operational	Operational	Fully operational
Coal source	Coal mines of Bharat Coking Coal Limited (BCCL), Eastern Coalfields Limited (ECL) by means of Railways	Jharia Coal fields	CIL (90% of the coal necessity is provided by the indigenous mines and the rest of the 10% is imported)	
Water source	Adjacent canal	Adjacent Obra dam on Rihand River	Hooghly River	Damodar River (Panchet Dam Reservoir)
Primary fuel	Coal	Coal	Coal	Coal
Type of plant	Sub-critical	Sub-critical	Sub-critical	Sub-critical
Beneficiary states	Uttar Pradesh and its neighbouring states	Uttar Pradesh and its neighbouring states	West Bengal and its neighbouring states	West Bengal and its neighbouring states
Unit sizes	1 unit x 660 MW	50 MW x 5 + 100 MW x 1 + 200 MW x 5	4 x 60 MW, 1 x 210 MW	4 x 120 MW, 2 x 250 MW
Units operational	1	5	5	6

Source: Collected by JTRC (2022), from company offices of sample power plants

Table A5 Difference Between Coal Mine and Thermal Power Plant (from Survey)

Parameter	Coal mine	Thermal power plant
Coal production and use	Coal mine produces fuel (coal) to run thermal power plant	Thermal power plant generates electricity
Abundance of female workers	Female workers are mainly found in contractual positions	Women mainly hold executive and peon positions; they are rare in contractual positions
Indirect dependency of local community	Indirect dependency of local community is more intense on coal mine	Indirect dependency of local community is comparatively less intensive on thermal power plants

Source: JTRC (2022)

Details on Sustainable Programmes Undertaken by Northern Coalfields Limited (NCL) Singrauli (PSU Connect 2022a; PSU Connect 2022b; PSU Connect 2022c)

NCL Empowering Local Youth Through a New CSR Initiative

Northern Coalfields Limited (NCL), Singrauli, has taken a new Corporate Social Responsibility (CSR) initiative by conducting in-car driving training for 360 local youth living in and around the Khadia. NCL has signed a Memorandum of Understanding (MoU) with ITI Dudhi, Sonbhadra, to train the youth for over 400 hours of in-car driving to make them employable and self-reliant.

Sustainable Mining with 'Environment First'

NCL has started working on a total of nine projects that will focus on environmental reclamation after their completion in the year 2023–24. Moreover, tree plantation, use of non-blasting production technology, standard and safe blasting, sand construction from surcharge, construction of separate coal corridor, construction of new roads in the surrounding area, continuous water sprinkling, regular use of road sweeping and fog cannon machines, improvement of health facilities, promotion of tourism and clean energy access in Singrauli region are also included in the mission of 'Environment First'.

Workshop on Women Empowerment and Conflict Management

Women's rights in the work place, legal provisions, raising voice against injustice, gender neutrality and work life balance were discussed at the workshop. During this session on conflict management, the major causes of differences, disputes and conflicts arising in the workplace and suggestions to avoid them were also discussed to develop a healthy work culture.

Plantation Campaign Under 'Project Ankur'

Under this campaign, from March 1, 2022, to March 5, 2022, the employees of all the projects of NCL, their family members, and other beneficiaries were encouraged to plant at least one tree and take care of it. Moreover, the employees were also motivated to upload their photographs with the tree through the 'Vayudoot-Ankur' app.

Coal Giant NCL is Moving Towards Renewable Energy to Become a Net-Zero Company

In line with the nation's commitment to energy transition and improving the share of clean energy, NCL Singrauli is also responding positively to these shifts and moving swiftly towards producing renewable energy to become a net-zero company under the aegis of its sustainable development cell. With its robust energy strategy, the company is

highly focused on the goal of generating 270 MW of solar power for internal consumption by the year 2025–26, with an approximate capital expenditure of 440 crores. Moreover, the company has already started working on a 50 MW ground mounted solar project in the Nigahi area along with a 3.37 MW rooftop solar project in offices and townships of the company including its headquarter. Furthermore, NCL is also adopting the energy-efficient measures across mining and other major operations, developing the new first mile connectivity projects. In line with the company's commitment towards energy conservation and environmental protection, the installation of about 77,000 light emitting diode (LED) lights, more than 500 energy-efficient air conditioners (AC), more than 22,000 fans, e-vehicles, water heaters, motors, auto timers, etc., is in progress, and the work is expected to be completed by the year 2022–23. All these initiatives emphasise the company's commitment towards becoming a net-zero company and implementing energy efficiency measures to save the cost, environment and society at large.

Table A6 **List of Indian Coal Districts**

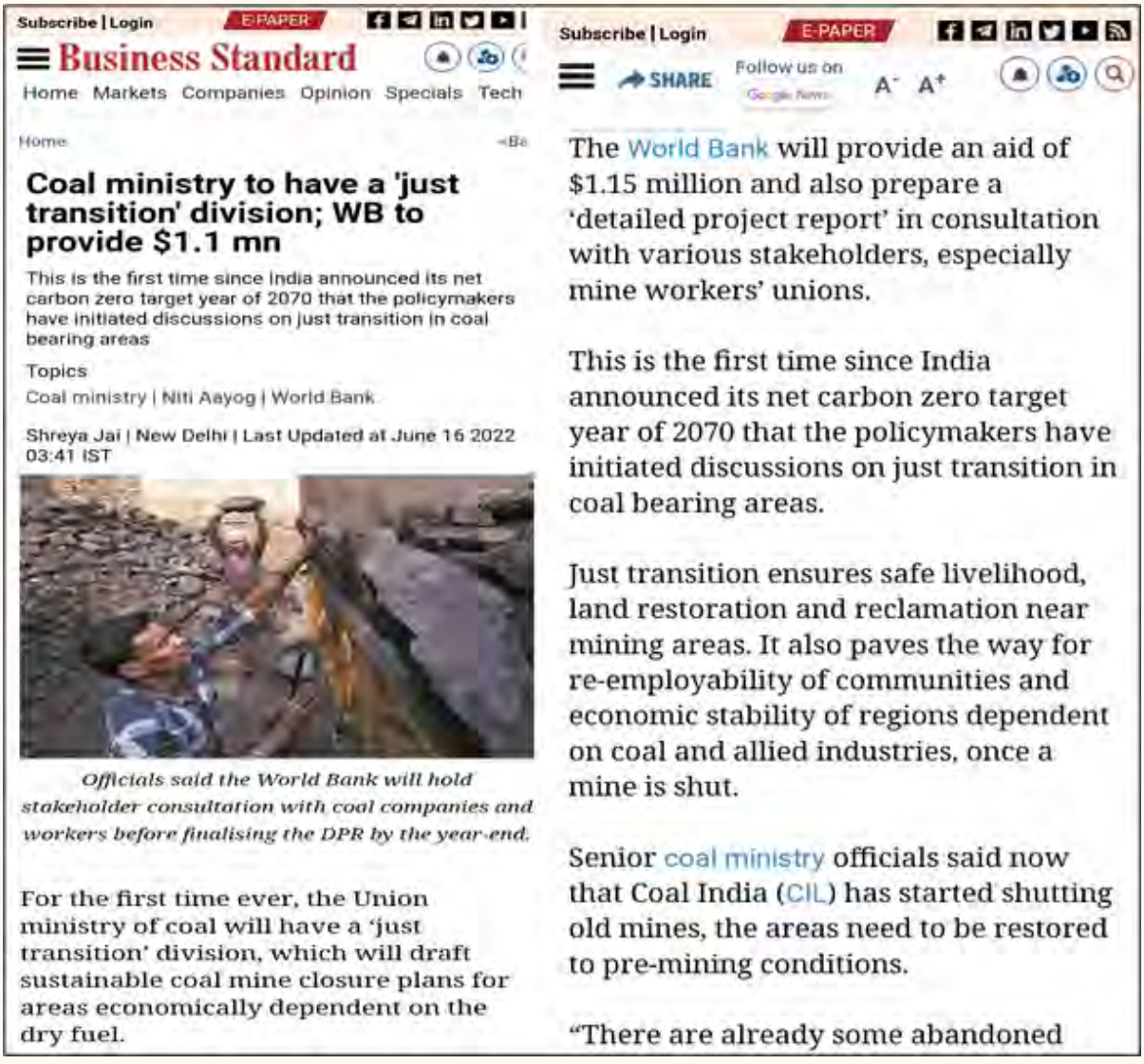
States	District
Jharkhand (Government of Jharkhand, n.d.)	Jharia, Bokaro, Deoghar, Chatra, Palamu, Latehar, Hazaribagh, Ramgarh, Garwah, Dhanbad, Giridih, Pakur, Godda, Sahibganj and Dumka
Odisha (India Minerals Yearbook, 2014)	Sundergarh, Angul, Jharsugada and Dhenkanal
Chhattisgarh (Mineral Resources Department-Government of Chhattisgarh, n.d.)	Korba, Koria, Sarguja, Manendragarh-Chirmiri-Bharatpur, Surajpur, Raigarh and Surguja
West Bengal (Industry sector- Government of West Bengal, n.d.)	Paschim Bardhaman, Purulia, Bankura and Birbhum
Madhya Pradesh (India Minerals Yearbook, 2014)	Singrauli, Hoshangabad, Narsimhapur, Betul, Umaria, Shahdol, Anuppur and Chhindwara
Telangana (Department of Mines & Geology-Government of Telengana, n.d.)	Bhadradri Kothagudem, Pedapally, Jayashankar Bhupalpalli, Khammam, Komram Bheem Asifabad, Mancherial
Maharashtra (Western Coalfields Limited, n.d.)	Nagpur, Chandrapur, Yeotmal
Bihar (Govt of Bihar Undertaking, n.d.)	Bhagalpur
Andhra Pradesh (Department of Mines & Geology- Government of Andhra Pradesh, n.d.)	West Godavari and Krishna
Uttar Pradesh (India Minerals Yearbook, 2014)	Sonbhadra
Meghalaya (India Minerals Yearbook, 2015)	Khasi Hills, Jaintia Hills and Garo Hills
Assam (Press Information Bureau-Government of India, 2018)	Dibrugarh, Tinsukia and Sivasagar
Nagaland (Directorate of Geology and Mining-Government of Nagaland, n.d.)	Mon, Mokochung, Wokha, Dimapur, Peren and Kohima
Sikkim (Government of Sikkim- Mines & Geology Department, n.d.)	South Sikkim
Arunachal Pradesh (India Minerals Yearbook, 2018)	Changlang

Appendix B

News Media Coverage

News Media Coverage on the Initiative of the Coal Ministry of India to have a 'Just Transition' Division

Figure B 1 : Image Representing the News on Initiative of Coal Ministry of India to Have a 'Just Transition' Division



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Coal ministry to have a 'just transition' division; WB to provide $1.1 mn

This is the first time since India announced its net carbon zero target year of 2070 that the policymakers have initiated discussions on just transition in coal bearing areas

Topics

Coal ministry | Niti Aayog | World Bank

Shreya Jai | New Delhi | Last Updated at June 16 2022 03:41 IST

Officials said the World Bank will hold stakeholder consultation with coal companies and workers before finalising the DPR by the year-end.

For the first time ever, the Union ministry of coal will have a 'just transition' division, which will draft sustainable coal mine closure plans for areas economically dependent on the dry fuel.

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The World Bank will provide an aid of $1.15 million and also prepare a 'detailed project report' in consultation with various stakeholders, especially mine workers' unions.

This is the first time since India announced its net carbon zero target year of 2070 that the policymakers have initiated discussions on just transition in coal bearing areas.

Just transition ensures safe livelihood, land restoration and reclamation near mining areas. It also paves the way for re-employability of communities and economic stability of regions dependent on coal and allied industries, once a mine is shut.

Senior coal ministry officials said now that Coal India (CIL) has started shutting old mines, the areas need to be restored to pre-mining conditions.

"There are already some abandoned

Source: Business Standard: June 16, 2022

News Media Coverage on the Power Plants and Coal Mines in this Study

Power Plants and Coal Mines from Uttar Pradesh

Figure B 2 : Image Showing the News on Coal Crisis

ZEE NEWS

HOME

MAJOR coal crisis! 14 power plants temporarily shut in Uttar Pradesh, 8 due to lack of fuel

Zee Media Bureau Oct 09, 2021, 10:11 PM IST

8 power plants in Uttar Pradesh have stopped functioning due to a shortage of coal while six others have been shut temporarily due to other reasons.

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New Delhi: With the country running low on coal, 8 power plants in Uttar Pradesh have stopped functioning. Six other power plants have been shut in the state due to other reasons, taking the total of temporarily stopped power plants to 14.

Currently, the power demand stands at about 20,000 to 21,000 MW. However, the supply remains at only 17,000 MW. To tackle the shortage, authorities have announced a power cut of four to five hours in a few rural areas.

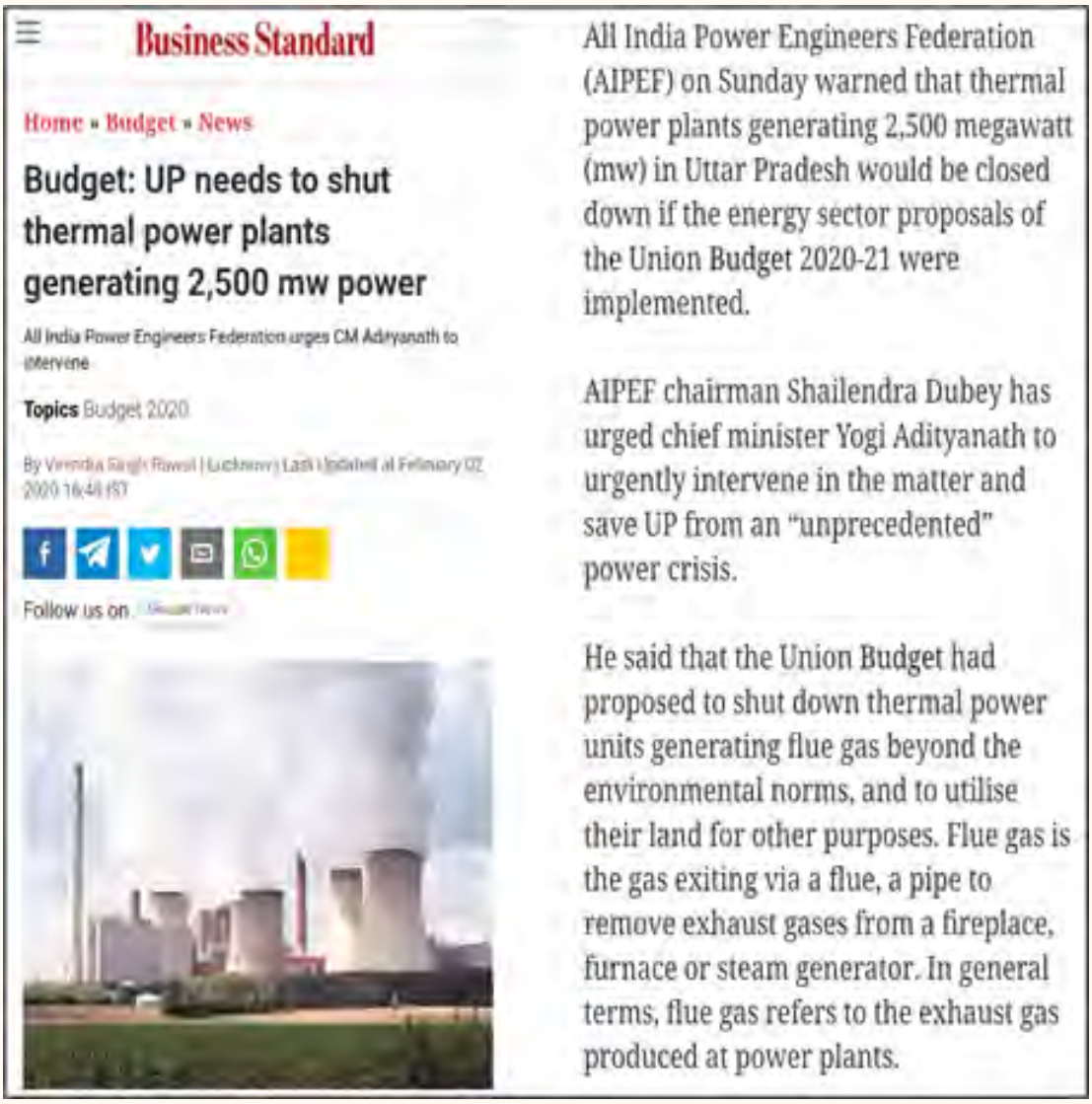
These 14 power plants supplied 4520MW to the state. With the shortage of power, the per-unit electricity rates are now shooting up to as high as Rs 20 on the exchange. As a result, the Uttar Pradesh government is now forced to buy electricity at Rs 15-20 per unit.

Among all, Uttar Pradesh State Electricity Products Corporation Limited's plants remain the most affected. Moreover, authorities are yet to pay the arrears on coal due to which they are now facing difficulties in procuring new coal.

Here's the list of power plants that have been temporarily shut:

Source: Zee Media Bureau: October 09, 2021) in Uttar Pradesh

Figure B 3 : Image Representing Closure of Thermal Power Station Station



Business Standard

Home » Budget » News

Budget: UP needs to shut thermal power plants generating 2,500 mw power

All India Power Engineers Federation urges CM Adityanath to intervene

Topics Budget 2020

By Virendra Singh Rawat | Lucknow | Last Updated at February 02 2020 16:48 IST

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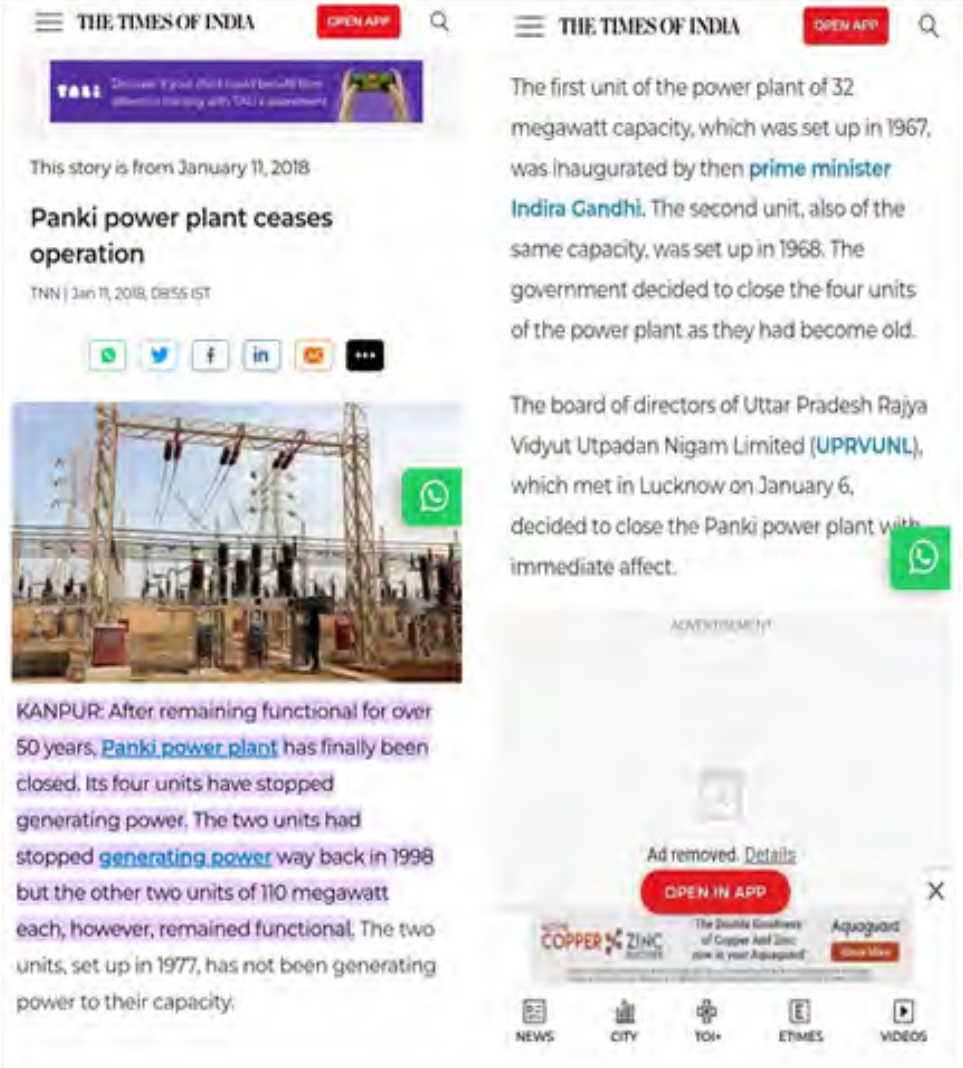
All India Power Engineers Federation (AIPEF) on Sunday warned that thermal power plants generating 2,500 megawatt (mw) in Uttar Pradesh would be closed down if the energy sector proposals of the Union Budget 2020-21 were implemented.

AIPEF chairman Shailendra Dubey has urged chief minister Yogi Adityanath to urgently intervene in the matter and save UP from an "unprecedented" power crisis.

He said that the Union Budget had proposed to shut down thermal power units generating flue gas beyond the environmental norms, and to utilise their land for other purposes. Flue gas is the gas exiting via a flue, a pipe to remove exhaust gases from a fireplace, furnace or steam generator. In general terms, flue gas refers to the exhaust gas produced at power plants.

Source: Business Standard: February 02, 2020) in Uttar Pradesh

Figure B 4 : Image Representing the News on Closure of Panki Thermal Power



Source: The Times of India: January 11, 2018

Figure B 5 : Image Representing the News on Unit Closure in Obra Thermal Power Station

रविवारीय हिन्दुस्तान

www.livehindustan.com

100 मेगावाट की दो इकाइयां होंगी समाप्त

ओबरा। रूस के सहयोग से ओबरा में लगाई गई 50 मेगावाट क्षमता की पांचो इकाइयां सहित 100 मेगावाट क्षमता की दो इकाईयो का अस्तित्व समाप्त होकर अब इतिहास बनकर रह जाएगा।

उच्च परियोजना प्रबंधन ने 50 मेगावाट क्षमता की पांचों इकाइयों सहित 100 मेगावाट क्षमता की छठवीं एवं आठवी इकाईयों को डिस्मेंटल करने का आदेश दे दिया है। यही नहीं डिस्मेंटल किए जाने के बाद निकले सामग्रियों को 204 करोड़ रुपये में कोलकाता की एक किनार स्टील कंपनी को बेचने का अनुबंध भी किया गया है। इन इकाइयों को डिस्मेंटल किए जाने के बाद खाली हुए स्थान पर 800 मेगावाट क्षमता की नई इकाई की स्थापना करने की कवायद की जा रही है।

बतादें कि जल्द ही ताप विद्युत गृह की इकाईयों को डिस्मेंटल करने का काम शुरू हो जायेगा।

Source: Hindustan: May 29, 2022

Figure B6 : Image Representing the News on NCL

ANI

Union Minister of Coal and Mines Pralhad Joshi (File Photo/ANI)

Union Minister Pralhad Joshi reviews coal production at Northern Coalfields in Singrauli

ANI | Updated: Oct 19, 2021 20:20 IST

New Delhi [India], October 19 (ANI): Amid fears of inadequate coal supply, Union Minister for Coal and Mines Pralhad Joshi on Tuesday visited the Northern Coalfields Limited (NCL) in Madhya Pradesh's Singrauli to review coal production.

Taking to Twitter, Joshi said, "Jayant OCP is one of the oldest and biggest coal projects of @NCL_SINGRAULI. Visited the mine and reviewed coal production and offtake."

During his visit Joshi emphasised on dispatching more coal to thermal power plants.

"Emphasised on scaling up excavation activities to dispatch more coal to thermal power plants," he said in a tweet.

The Union Minister said he interacted with mineworkers at Jayant OCP and motivated them to increase the coal supply.

"Interacted with mine workers at Jayant OCP and motivated them to go above and beyond to assure coal supply to the nation," Joshi tweeted.

Source: ANI: October 19, 2021

Power Plants and Coal Mines from West Bengal

Figure B 7 : Image Representing the News on Environmental Pollution and Health Hazards due to Fly Ash From Bandel Thermal Power Station

thehindubusinessline.com

BusinessLine

When lungs are as black as coal

Gurvinder Singh

Coal Pollution | Updated on: Jun 01, 2021

Dirty coal is leaving West Bengal gasping for breath

* The ash pond has polluted everything and made the people living close to it severely ill

* A 2007 study had found instances of severe health complications among people living in a 10-km radius from the three thermal power plants at Kolaghat (East Midnapore), Bandel (Hooghly district) and Bakreshwar (Birbhum district)

Source: Business Line: June 01, 2021

Figure B 8 : Image Representing the News on Declaration of Santaldih Thermal Power Station as the Most Efficient Power Plant in India

THE TIMES OF INDIA

THIS STORY IS FROM SEPTEMBER 24, 2021

Santaldih thermal plant rated India's most efficient

CITY / Sep 24, 2021, 06:00 IST

TOI

Kolkata: Santaldih Thermal Power Station, under the West Bengal Power Development Corporation, has been rated the most efficient thermal power plant in the country in April-August 2021. During the April-July period, Santaldih had ranked third behind Korba and Sasan.

Source: Times of India: September 24, 2021

Figure B 9 : Image Representing the News on Rehabilitation for Displaced People Residing in Places Surrounding Raniganj Coalfields

NEWS CLICK

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No Rehab in Sight, Thousands Live in Areas Made Vulnerable by Mining in Bengal's Raniganj Coalfields

Availability of land for resettling mining-affected families caught in political slugfest between Centre and state government.

Ayaskant Das 21 Jan 2022

All that remains of the dilapidated house of Tapan Pal in Harishpur village of Paschim Bardhaman following an incident of earth subsidence in July 2002

Paschim Bardhaman: More than 12 years after a grandiose plan was formulated to resettle habitations affected by land subsidence incidents in the Raniganj coalfields of West Bengal, thousands of families continue to live in areas that could collapse any moment subsuming their lives and properties. As is evident on the ground, a political conflict over land has further worsened the fate of those living in areas rendered void by underground coal mining and subsequent sub-terranean fires.

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Eastern Coalfields Limited (ECL), a subsidiary of the Centrally-owned public sector major Coal India Limited, which owns the collieries in Raniganj, alleges tardy work by the state government in rehabilitating the mining-affected families.

On the other side, the state government alleges that land identified for the proposed housing colonies is not being made available readily by ECL to Asansol-Durgapur Development Authority (ADDA), the nodal agency for resettlement. The ADDA passes the buck to the West Bengal

Trapped for livelihood

Soon, the mines became the only source of livelihood for locals, while making the area unsafe to live in. The inhabitants, mostly Santhals, are aware of the potential dangers they are creating for their community by working in the mines. But, they had no option but to work there at lower-most rung.

Illegal mining and coal pilferage have left the villagers with no other source of livelihood either. They cannot depend on agriculture, sericulture or fishing. They are forced to join the illegal sector as a substitute to subsistence agriculture and a way to earn money quickly.

"We cannot depend upon agriculture. Our land is gone. So people with fewer skills are often trapped in the curious cycle of need and greed," says Pushpak Das, a resident of the area.

Source: News Click: January 21, 2022

Appendix C

Scale for Measuring Perception of Just Transition

Likert (1932) developed a different method for the construction of attitude scale. In this regard, the following various steps are involved in Likert's method:

- The researcher gathers statements that can be answered in a multiple-choice format, typically with five options: strongly agree, agree, undecided, disagree, and strongly disagree.
- A set of individuals are presented with these assertions, and they are asked to reply by selecting which of the five options they agree with for each item.
- Different weights are assigned to each item that is responded to. The weight ranges from 5 to 1. For favourable statements, a weight of 5 is given to strongly agree, 4 to agree, 3 to undecided, 2 to disagree and 1 to strongly disagree, and for the unfavourable statements, the order of weights to be given is reversed so that strongly agree receives 1 and strongly disagree receives 5.
- The technique is called as the method of summated ratings because an individual's response to each item can be interpreted as their assessment of their own attitudes on a 5-point scale, and their overall score is determined after all these weights are added up.
- Item analysis is the last step in the process of items selection. This item analysis phase is likely the key element that sets it apart from Thurston's method of equal appearance intervals.

The research in measuring perception in the field of just transition is very limited; thus, we have employed an innovative Likert scale by framing statements that can easily gauge the attitude of respondents towards the transition. A similar technique has been used by Ulf and Dobers (2020) while using the Factorial Survey Experiment method. They have used four survey items on a four-point scale to assess the attitude of respondents regarding fairness in implementing renewable energy (wind, biomass and solar). Similarly, we have used eight statements (items) to measure the perception on a Likert scale. The summary of steps in finalizing the scale is provided below (Table C 1).

Table C1 **Just Transition Scale Development Process**

Steps	Scale Development Process
	Selection of items
Step 1	Selection of items from the literature
	Formulation of questions on the Likert scale
	Judges rating
Step 2	Suggestions through face-to-face interactions with local forest officials, researchers and company officials
	Testing the schedule
Step 3	Face-to-face interviews with the community
	Scale refinement through analysis
Step 4	Reliability analysis (Cronbach alpha)
	Item validity (item correlation and ANOVA)

Selection of Items

In this report, we studied coal mine areas where people have a low level of education, living in remote areas around the coalfield and stand-alone power plants. Regarding language, we relied on their vocabulary range in asking the questions and probing for the items. For example, we used coal (and not fossil fuel) in the statements to measure their perceptions regarding just transition based on the themes derived from the literature. While most of the referred literature discussed wind, solar and biomass in the context of renewable energy, we used locally popular terms of renewable energy while probing the respondents (solar energy and hydro energy) (Table C 2).

Table C2 **Key Literature for Selection of Items**

Literature	Key theme of measurement	Relevance to the items
Lin and Rodriguez (2013)	Perception of wind turbine use in improving local economy and protecting environment	Renewable energy and environment
Badora et al. (2021)	Reduction of CO2 emission and use of nuclear energy to address climate change	Nuclear energy and ecology
Edubirdie (2017)	Males and females perceive solar energy products differently	Gendered perception of renewable energy
Zhang et al. (2020)	Use of fossil fuels is likely to pollute the environment	Environment
Yoon and Kim (2016)	Use of fossil fuels is likely to harm people's health	Public health
Bockarjova and Steg (2014)	Relying on fossil fuels is likely to disrupt the country's development	Economy
Bockarjova and Steg (2014)	Using renewable energy to reduce environmental problems	Renewable energy and climate change mitigation
Linzenich et al. (2020)	Energy infrastructure and risk perception	Energy
Djurisic et al. (2020)	Benefits of renewable energy in the quality of life and employment	Renewable energy and livelihood
Johnstone et al. (2021)	Union's role in energy transition	Trade union and livelihood
Lazo and McClain (1996)	Pollution due to coal	Coal, community and environment
Thomson and Kempton (2018)	Impact of coal plants on environment and health	Coal, community and environment

Judges Rating

The items were downsized in two stages. At first, the list of 15 items was scrutinized by an expert panel consisting of seven members from a pool of variety of stakeholders (two from research institutions, two company representatives, two forest officers, three trade union representatives, and one field-data collection expert). All members of the panel have more than 15 years of expertise in their respective fields. The members examined the list of items and assessed how much each item denoted the perception of just transition. The experts also facilitated the process of retaining items with strong face validity and excluding the redundant items. Following DeVellis (2016), an item was only kept if a minimum of 70% of the experts assigned it to the same dimension. Hence, the following eight items were selected for further analysis:

- Coal damages the environment.
- Coal mine/ power plants cause health problems for the community.
- Government should find an alternative to coal.
- Government should close the units of mines/ power plant causing pollution.
- Government should replace coal power plants with solar and other energy plants.
- Coal mine/power plants should remain for livelihood, even if it means small destruction of the environment.
- Livelihood issues must be prioritized along with the special concern for the environment.
- At any cost, the environment should be prioritized.

Testing of Schedule

JTRC conducted the pilot study in the field by interviewing the community in West Bengal and Uttar Pradesh. Afterwards, the study ensured the correctness of the language (Bengali and Hindi) and organized the order of the items in the interview schedule. Then, the schedule was finalized.

Scale Refinement

Table C3 **Reliability Test for all the Items**

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.664	.673	8

The present study analysed the eight-item scale over a pilot sample of 85 collected from both states. The results suggested a good Cronbach alpha (C-α) score (0.664). This left no further possibility of improving the overall score by deleting any item (Table C 3). The item correlation also stood very low (-0.008) to moderate (0.728). ANOVA testing ($F > 40$, $p < 0.001$) confirmed that there was significant variation between each item of the scale used. Thus, the eight items remained for the measurement of the perception regarding just transition.

Table C4 **KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.662
Bartlett's Test of Sphericity	Approx. Chi-Square	1260.129
	df	28
	Sig.	.000

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was applied as it indicates the proportion of variance in the items that might be caused by underlying factors. A value higher than 0.5 generally indicates that a factor analysis may be useful with the existing data (Table C 4) (IBM, n.d.).

Table C5 **Total Variance Explained**

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	2.197	27.460	27.460
2	1.801	22.518	49.978
3	1.107	13.844	63.822

Finally, to validate the proposed scale, principal component analysis is resorted to examine the appropriateness of the eight items in explaining the perception of just transition. Varimax rotation (Allen, 2017) is performed, attempting to clarify the relationship among the factors. This rotation maximizes the variance shared among items. By doing so, the results more discretely represent how data correlate with each principal component. Maximizing the variance means decreasing the correlation on any other factor. A factor loading of 0.4 was set as a minimum cut-off. Items possessing a value below 0.4 within the three factors were removed. The three components altogether accounted for a total variance of 63.822% where the first one contributed 27.460%, 22.518% was contributed by the second one and the third component described 13.844% of the total variance (Table C 5).

The first component accommodated the first four items, i.e., 'coal damages the environment' (0.870), 'coal mines/power plants cause health problems for the community' (0.883), 'government should find an alternative to coal' (0.569), and 'government should close the units of mines/power plants causing pollution' (0.450). The second component also got four items, i.e., 'government should find an alternative to coal' (0.403), 'government should replace coal power plants with solar and other energy plants' (0.627), 'livelihood issues must

Table C6 **Rotated Component Matrix**

Rotated Component Matrix*			
	Component		
	1	2	3
Coal damages the environment	.870		
Coal mine/power plants cause health problems for the community	.883		
Government should find an alternative to coal	.569	.403	
Government should close the units of mines/power plants causing pollution	.450		-.567
Government should replace coal power plants with solar and other energy plants		.627	
Coal mine/power plants should remain for livelihood, even if it means small destruction of the environment			.805
Livelihood issues must be prioritized along with the special concern for the environment		.728	
At any cost, the environment should be prioritized		.783	
Extraction Method: Principal Component Analysis			
Rotation Method: Varimax with Kaiser Normalization*			

Note. Rotation converged in five iterations.

be prioritized along with the special concern for the environment' (0.728), and 'at any cost, the environment should be prioritized' (0.783). The third component accommodated only two items: 'government should close the units of mines/power plants causing pollution' (-.567) and 'coal mine/power plants should remain for livelihood, even if it means small destruction of the environment' (0.805) (Table C 6).

Table C7 **Component Loadings of the Principal Components Influencing Perception of Just Transition**

Principal components	Items	Factor loading	Variance	Cumulative variance	Factor renaming
1	Coal damages the environment	0.870	27.460	27.460	Coal downside
	Coal mine/power plants cause health problems for the community	0.883			
	Government should find an alternative to coal	0.569			
	Government should close the units of mines/power plants causing pollution	0.450			
2	Government should find an alternative to coal	0.403	22.518	49.978	Environment protection
	Government should replace coal power plants with solar and other energy plants	0.627			
	Livelihood issues must be prioritized along with the special concern for the environment	0.728			
	At any cost, the environment should be prioritized	0.783			
3	Government should close the units of mines/power plants causing pollution	-.567	13.844	63.822	Community livelihood
	Coal mine/power plants should remain for livelihood, even if it means small destruction of the environment	0.805			

Finally, the dimensions are reduced from eight to three, and the three components were renamed as coal downside, environment protection, and community livelihood respectively (Table C 7). The dominating items (item with highest factor loading[11]) under the first component highlight the environmental (0.87) and health (0.88) problems related to coal followed by willingness to seek alternatives for coal (0.56), and altogether, these items demonstrate coal downsizing; thus, the component is renamed as 'coal downside'. Likewise, the dominant items in the second component express concern for the environment and employment in the renewable sector and got renamed 'environment protection'. On the other hand, the third component explicitly displays concerns regarding livelihood as the closure idea received negative sentiments (-0.56), while coal continuation got significant positive (0.80) loading. Thus, the third one was renamed 'community livelihood'. However, there is ample opportunity to include more dimensions for the respective scale to better measure perceptions regarding just transition, and this signifies the future scope of the current research.

11 Factor loading is the correlation coefficient for the variable (in PCA item) and factor (in PCA, it is component). Factor loading shows the variance explained by the variable within that factor. A factor is a set of observed variables that have similar response patterns.

Just Transition Research Centre (JTRC) leverages high quality academic environment to conduct cutting edge research to address the academic and policy requirements of the national and sub-national levels. The centre's aim is aligned primarily with the seventh sustainable development goal of the United Nations: affordable and clean energy for all.

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