



ESTABLISHING WOMEN AS CRITICAL STAKEHOLDERS IN INDIA'S JUST ENERGY TRANSITION

Evidences from Jharkhand,
Odisha and Chhattisgarh

MacArthur
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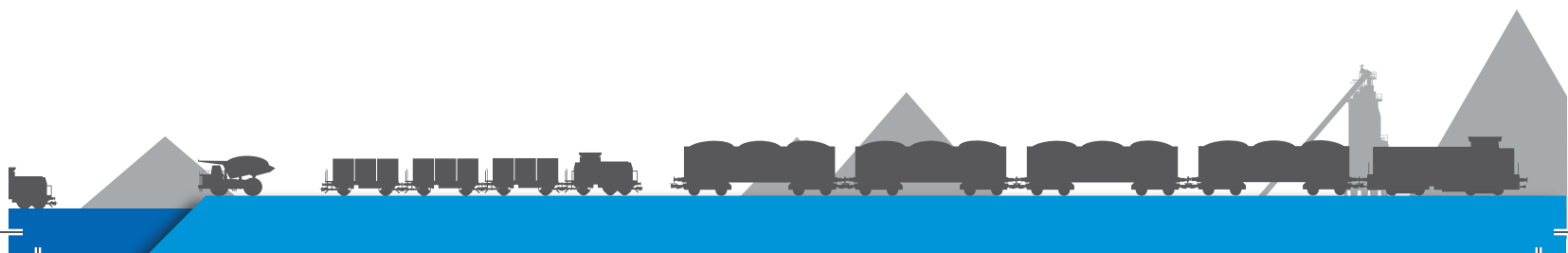
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Table of Contents

Abbreviations	4
List of Figures	5
Acknowledgements	6
Executive Summary	7
1. Background	11
2. The Need for a Gender-sensitive Approach	12
3. Who are the Women Affected by Coal Mining?	14
4. Methodology	15
5. The Gendered Nature of Vulnerability in the Coal Sector	18
5.1 Repercussions on health and well-being	18
5.2 Societal and domestic concerns	22
5.3 Implications on land and livelihoods	24
5.4. Lack of economic opportunities	25
5.5 Exclusion from institutions of mobilisation and governance	27
5.6 Blocked opportunities and outmigration	27
6. Recommendations	29
6.1 Addressing energy poverty	30
6.2 Financing for women-centric interventions	31
6.3 Coal Census	31
6.4 Health Interventions	32
6.5 Interventions for addressing social issues	32
6.6 Taking a step towards restorative justice	33
6.7 Leveraging governance mechanisms for women's rights	33
6.8 Imparting agency through SHGs	34
7. Conclusion	36
ANNEXURE I: Women in Coal Mining Areas - A Historical Perspective	37
ANNEXURE II : Case Studies of Other Countries	39
References	42



Abbreviations

AMD Acid Mine Drainage	NABARD National Bank for Agriculture and Rural Development
ANM Auxiliary Nurse and Midwife	NGT National Green Tribunal
ASHA Accredited Social Health Activist	NTFP Non-timber Forest Produce
CCL Central Coalfields Limited	PHC Primary Health Centre
CHC Community Health Centre	PMKKKY Pradhan Mantri Khanij Kshetra Kalyan Yojana
CIL Coal India Limited	PMUY Pradhan Mantri Ujjwala Yojana
CO45 Convention 45	PV Photo Voltaic
COPD Chronic Obstructive Pulmonary Disease	RE Renewable Energy
CSEP Centre for Social and Economic Progress	SC Scheduled Caste
DDU-GKY Deen Dayal Upadhyay Gramin Kaushal Yojana	SECL South Eastern Coalfields Limited
DISCOM Distribution Company	SHG Self Help Group
FRA Forest Rights Act	SIA Social Impact Assessment
GHG Greenhouse Gas	ST Scheduled Tribe
GRIDCO Grid Corporation of Odisha	TERI The Energy and Resources Institute
ILO International Labour Organisation	UNDP United Nations Development Programme
LARR Act Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act	VLP Village Level Programmes
LEDP Livelihood and Enterprise Development Programme	WHO World Health Organisation
MCL Mahanadi Coalfields Limited	
MEDP Micro Enterprise Development Programme	
MTR Mountain Top Removal	



List of Figures

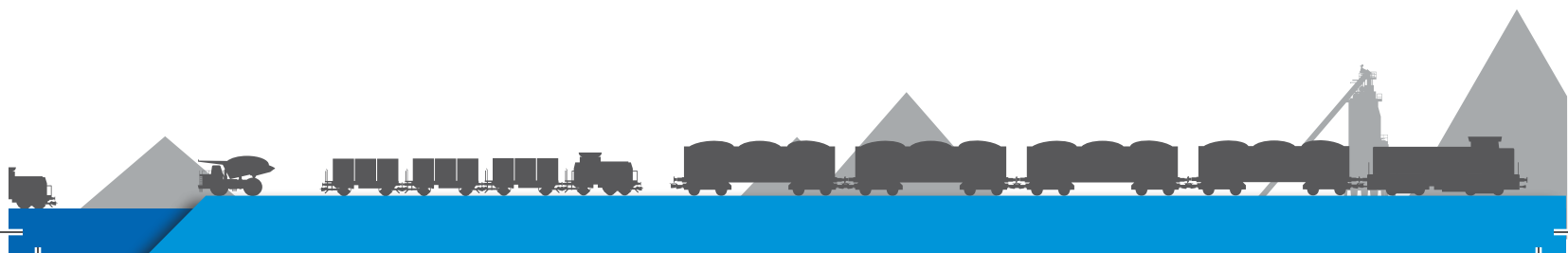
Figure 1: Study area in Odisha

Figure 2: Study area in Chhattisgarh

Figure 3: Study area in Jharkhand

Figure 4: Key issues and challenges that women face

Figure 5: Way forward to a gender-sensitive just transition in India's coal producing regions



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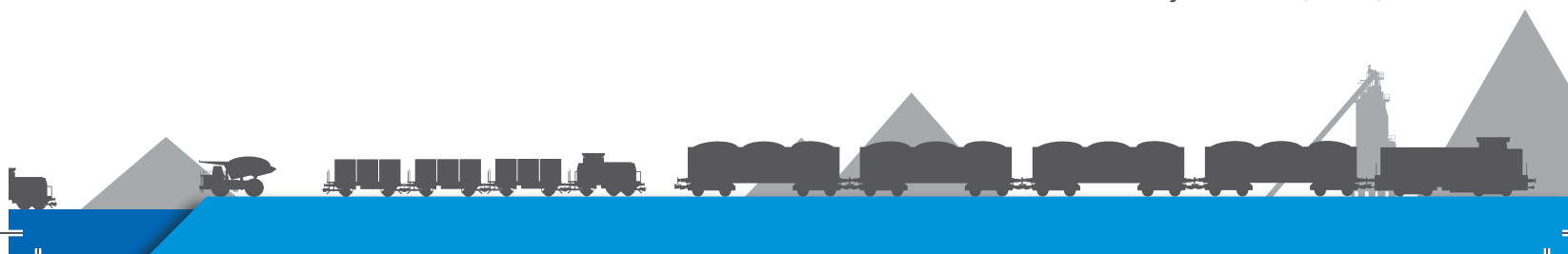
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Executive Summary

1. India is among the world's biggest coal producing and consuming countries while also employing a large number of people. Hence, any move away from fossil fuel-based energy production is bound to have a ripple effect along the entire coal supply chain. While just transition discourse has been around for a while addressing complexities of climate, energy and environmental justice, it is only beginning to gain ground in India after its commitment to net zero emissions by 2070 at COP26 in Glasgow, 2021.
2. It is important therefore to bring about a just transition away from fossil fuels, particularly coal, that is sensitive to the gendered impacts of decarbonisation as **"there is no climate justice without gender justice"**. This report is an attempt to bring to the notice of researchers, academicians, policy-makers and the lay person the various reasons why the welfare of women in the coal sector and in coal communities must be brought to centre-stage and to mainstream gender in India's just transition discourse and policy making.
3. The report does this by highlighting the need for a gender-sensitive approach to a just transition away from coal in India coming up with four key issues of concern:
 - **The underrepresentation of women in the energy sector:** In India, women comprise 10 per cent of the renewable energy sector while the global average for the same is 32 per cent most of which are in non-technical jobs.
 - **Job losses impacting families:** As men will lose their jobs to energy transition and the eventual need for a more skilled workforce, it will lead to financial hardships at home and subsequently an increase in outmigration and domestic violence.
 - **Lack of women's agency:** Women's underrepresentation in decision making forums reduces the chances that their concerns arising from mine closure are adequately heard or addressed. Additionally, women are already underrepresented in the energy sector and any policy that neglects the inclusion of women is bound to generate policies hostile to their specific needs and results in policy and regulatory outcomes that are inherently disadvantageous to them.
 - **Employment and informality:** Since women majorly engage as informal workers in the coal sector, they are also exposed to the dangers associated with such work. There have been instances of women illegally gathering coal at great risk to their lives but giving it to their husbands to sell it who end up getting paid for it instead.
4. Having identified the reasons behind the need for a gender-just transition, it is also pertinent to identify who are the women getting affected by coal-mining and related activities. In the case of India, the states that produce most of the country's coal also happen to be among the most economically backward. Moreover, most of the country's coal reserves also occur in tribal areas, hence, it is reasonable to deduce that **many women being affected by coal mining projects are economically disadvantaged while also being tribal**. This leaves them being doubly disadvantaged – being women as well as being from backward communities.
5. The report further elaborates the gendered nature of vulnerabilities present in the coal communities through 6 detailed areas of concern:
 - **Repercussions on health and well-being: Water pollution** caused by Acid Mine Drainage (AMD) leads to musculoskeletal disorders such as joint pain in women. The unhygienic water in the ponds which are used by women to bathe or clean clothes, dishes, etc., causes tinea infection due to ringworm as well as skin-related issues in the form of itching, hyperpigmentation, and rashes. **Dust pollution** caused by Mountain Top Removal (MTR) among other environmental impacts such as decline in quality of groundwater quality leads to fluorosis, Black Lung Disease a.k.a. Coal Workers' Pneumoconiosis as well as Chronic Obstructive Pulmonary Diseases (COPD).



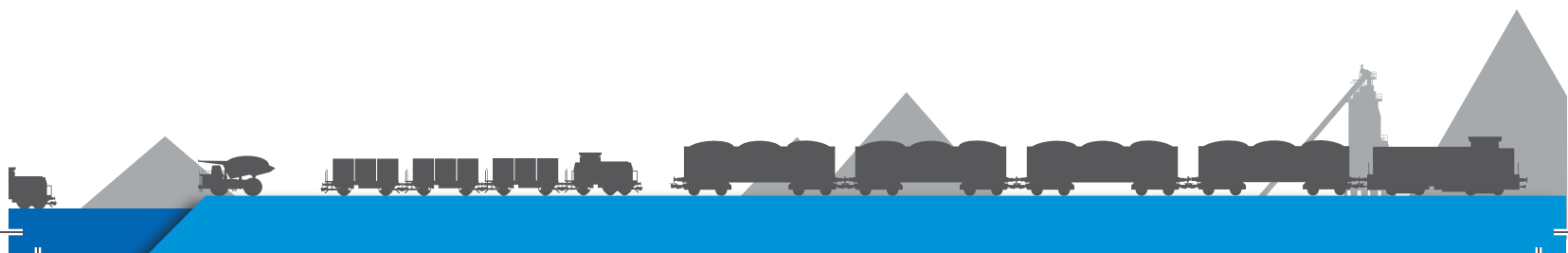
Coal is also often the primary cooking fuel used by women in these areas which leaves them doubly exposed to dust outside as well as inside their houses. The displacement of families due to coal mining activities further disrupts the access to traditional knowledge systems including local medicine practices and contact with traditional health care providers. Many tribal women and young girls from coal regions are trafficked to become domestic workers in big cities like Delhi. The influx of migrant workers to the mining areas have further increased the **vulnerability of local young girls**. Additionally, **the gaps in healthcare infrastructure** leaves women increasingly exposed to health impacts of coal mining. The hospitals set up by coal subsidiaries treat only minor ailments and refer most patients, especially the informal, contractual workers (who are not covered by company health insurance) to district hospitals for major issues. These are usually far off leading to a steep commuting expense which gets further compounded by the cost of treatment and medication. Health issues of women are in general not paid much attention to and the prevalence of such obstacles further discourages timely and quality access to healthcare.

- **Societal and domestic concerns:** The sudden loss of jobs and subsequent unemployment due to coal mine closure is one of the leading causes of alcoholism in coal-mining regions. Men spend a large share of their wages on country liquor leaving women to take primary responsibility of the household. It is also mostly women who engage in agricultural activities on the family land while men spend their time and money indulging in liquor. Alcoholism has also intensified the issue of domestic violence in these villages. Violence inflicted by inebriated men in their households is a common and widespread phenomenon in coal mining areas. This violence is not only physical but also intangible in the form of emotional or anticipatory violence.
- **Implications on land and livelihoods:** The Right to Fair Compensation and Transparency in Land Acquisition, Resettlement and Rehabilitation Act, 2013 (LARR Act, 2013) is a progressive piece of legislation but it provides compensation in the name of the head of the household who are usually men. Prior to the loss of land to coal mining projects, women used to engage in agricultural labour and kitchen gardening to supplement the household income but the loss of land meant that they lost that aspect of their agency in household decision making as they became completely dependent on the income of the male members in their family. Additionally, this has had a major impact on the lives of tribal women as they used to collect Non-timber Forest Produce (NTFP) from the local forests. This was also a social activity for them as they used to spend time together in forest collecting NTFPs but are now forced to earn money by working in the houses of those wealthier than them adversely affecting their social relations with the increase in inequality within and among tribal communities. Collection of NTFP also forms a key way for villagers, especially women, to engage in productive labour outside of their primarily reproductive duties within their household.
- **Lack of economic opportunities:** Until recently, women were not allowed to work in underground coal mines but despite the recent 2019 amendment to the Mines Act, 1952 which has overturned this ban, historical gender norms continue to dictate their employability. Moreover, there's a lot of information asymmetry at the local level that prevents them from finding out about relevant government schemes which can be leveraged to expand their economic opportunities.
- **Exclusion from institutions of mobilisation and governance:** Women form a miniscule share of the workforce in the energy sector which does not incentivise coal mining companies to consider women as important enough stakeholders in plans for a socially just energy transition. It is important to thus have women representatives at all levels of local governance to ensure gender just policies that reflect the reality of local experiences of coal mining and coal mine closure. Mobilisation of women is also a tough task as SHGs, which can be a key game player in economic



empowerment, are reduced to just micro-lending institutions with hardly any productive activity being engaged into. Circulating stories of successful women entrepreneurs would help instill a sense of hope and would inspire rural women to take up productive activities which provides them an alternative source of income.

- **Blocked opportunities and outmigration:** The most significant impact of coal mine closures is the collapse of local communities as well as social ties and this manifests itself in the form of outmigration, creation of ghost villages and increasing numbers of female-led households. The youth in these areas prefer migrating for work instead of continuing with agriculture. The creation of a mono-economy in coal-producing geographies has led to blocked opportunities as no other means of livelihood has managed to flourish in the region.
6. It is suggested considering the above findings that a transition away from coal can be made more gender sensitive by means of:
- **Addressing energy poverty:** Better access to modern energy as outlined in SDG 7 will have a compounding effect on social and health outcomes. Women will have to spend less time collecting firewood while also leading to less emissions for the environment and better health outcomes for women in the kitchen. Better health outcomes would also mean saving time spent visiting the doctor or acquiring medicines.
 - **Financing for women-centric interventions:** A national just transition fund must be created and it should be leveraged for an equitable outcome for women as well. TERI also recommends that considering the federal structure of India, a similar fund should also be created for the regional (state) and local level. This would create a ready pool of funds to tap into so as to address local issues and challenges. Existing finances in the form of DMF funds must be better utilised under the provisions presented by the Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY) scheme such that there is greater expenditure under the 'High Priority Issues' one of which includes women and child welfare.
 - **Coal census:** In order to begin supportive implementation work on the ground, a necessary pre-requisite would be to conduct a coal census. This exercise would give us an estimation of the number of people impacted and accordingly the level of intervention that is to be planned.
 - **Health interventions:** The foremost step to ensure a just transition with respect to women's health would be to carry out a detailed Social Impact Assessment study in the regions. This would ensure targeted health intervention and ensure better outcomes for women who otherwise spend a lot of time fetching water manually from wells, pumps, and borewells which often in coal mining areas have water that is high in mineral content and unfit for consumption. To tackle the indoor dust pollution caused by coal as cooking fuel, the **PMUY (Pradhan Mantri Ujjwala Yojana)** needs to be implemented better. While most families admitted to receiving the free gas connection, in the long run they all opted for coal because refilling the gas cylinder was a heavy expense. Finally, imposing a moratorium on further expansion of existing mines or setting up of new mines until comprehensive **health impact assessments** of the mines and power plants are completed and its recommendations are implemented would be crucial.
 - **Interventions for addressing social issues:** Societal ills such as alcoholism and associated criminal activity and domestic violence should be addressed. Mental health professionals under the **District Mental Health Programme** can be directed to assist victims of domestic violence by providing immediate medical and psychological care and help report such cases. ASHA workers have access to village-level health and they do door-to-door visits which can help detect domestic violence cases as they often remain unreported due to lack of trust, societal pressure, and fear of the perpetrator. Given the rampant alcoholism and substance abuse in the coal belt, rehabilitation centres must be established at gram panchayat level to ensure access and



affordability of families of the patient. **Community awareness programmes** must be promoted to help people access such services and encourage the community to come forward in advancing such initiatives. Regular follow-up visits must be made to report any relapses and take required actions.

- **Taking a step towards restorative justice:** Coal mining and coal closure is related to people getting displaced in large numbers and in India a large section of this displaced crowd includes the tribal community. There must be adequate cultural mapping to ensure that their traditional knowledge doesn't get lost in the process. It would also ensure that this crucial information gets well-documented and can be tapped onto in the future while planning local geography-specific interventions.
 - **Leveraging governance mechanisms for women's rights:** The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, (FRA, 2006) recognises women's rights to land as it requires new land titles to be registered in the names of both the spouses as the head of the household. It is also the only law that mandates women's participation in decision making forums. Such requirements should ideally be included in land or monetary compensation policies like the LARR Act, 2013, such that the outcome of land acquisition processes is more equitable. Also, the way the FRA mandates the **representation of women in gram sabha meetings** to reach quorum is significant as it moves beyond the tokenistic reservation of women's representation in gram panchayats and constituencies.
 - **Imparting agency through SHGs:** Women must be given greater agency through larger mandates in grassroots decision making and mobilisation – be it through panchayat or municipality participation or through SHGs. Women affected by coal mining must be targeted for skill-development and training programmes that don't just end at imparting relevant skills but also enhance the marketability of local produce to encourage entrepreneurship aimed at a more vibrant economic landscape in what is currently a mono-economy.
7. While just transition in India has long been understood as the resettlement and rehabilitation of project-affected people/families (Powell et al. 2022), there has not been an effort to understand the plight of women and children due to large-scale projects like coal mining let alone the impact of coal mine closure on them. There needs to be a common ground which can be gained through purposeful interaction with stakeholders, especially those who have a high interest but have little power to make things work in their favour. In demonstrating the many documented ways in which coal mining has affected women in various aspects of their lives and well being, and in showing how the shift from a coal-based energy economy has the potential to further disrupt an already dire situation, this paper makes a case for why women must be considered separately for just transition interventions and programmes.



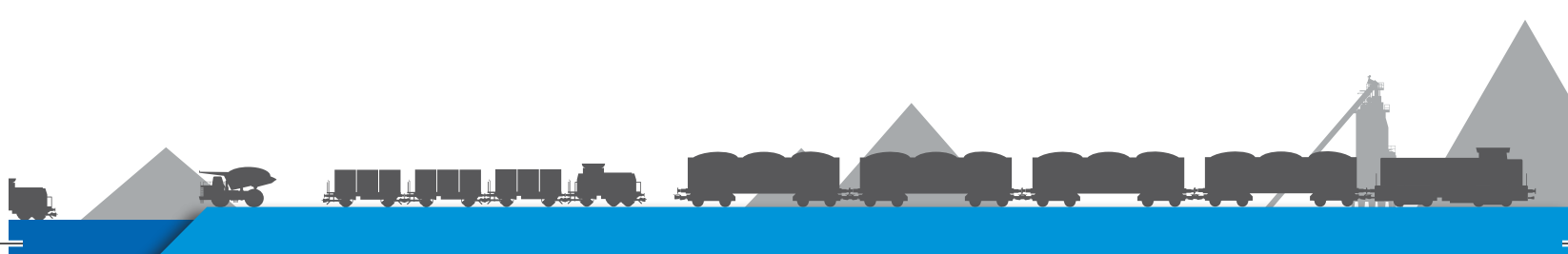
1. Background

Discourse on just transition worldwide is in its nascent stages and there has been little conceptualisation on what a just transition away from fossil fuel-based energy is going to look like for India. A just transition in India is also one fraught with different struggles unique to its position as a developing country with the highest population in the world and burgeoning energy demands which are only going to increase in the coming decades. While cutting down on carbon intensive energy is imperative to halt climate change, India also is the third highest carbon dioxide emitter and faces a lot of international pressure to reduce its carbon emissions. The world's largest coal producing company, Coal India Limited (CIL), is responsible for the production of 82% of India's coal. CIL is also one of the country's largest employers, with a formal workforce of 2,37,803 as of April 2023 while being the sixth largest greenhouse gas (GHG) emitting company globally. The coal value chain however involves many more industries and people - a shift away from coal production is estimated to impact 2.6 million people in the country. A large chunk of this population is informally employed on a contractual basis making it imperative for the formulation of a just transition policy for those whose livelihoods and means of income are bound to be adversely affected as we move to a greener future.

While there is a significant amount of research and literature that studies the prospects of energy transition in India, the impact of energy transition on communities that have grown around the coal mining industry calls for greater attention, dialogue and action-oriented research on this issue. The primary aim of this paper is to present evidence and make a case for why women should be considered as a social group that gets differentially impacted by energy transition. It does this by bringing together already existing evidence from the ground. This paper will look at the impact of energy transition on local communities, especially the women associated with coal mining and what a just transition will look like for them.



TERI team with the focussed group discussion participants at Angul, Odisha



2. The Need for a Gender-sensitive Approach

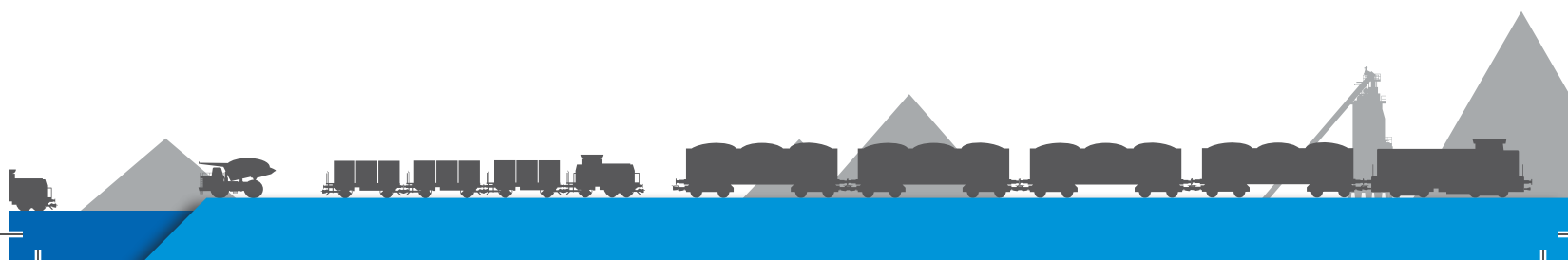
- **Underrepresentation in the energy sector:** In India, women comprise 10 per cent of the renewable energy sector (IEA and CEEW, 2019) while the global average for the same is 32 per cent, most of which are in non-technical jobs (IRENA, 2019).
- **Job loss impacting families:** The skilled versus low-/unskilled bias caused by a clean energy transition is liable to not only put masses of low-skill male labour out of work but also impact their families adversely as income of their primary breadwinners will be lost. While an impact on women might not directly include a loss of employment but they may experience a rise in the weight of household duties (World Bank, 2018). When males lose their jobs, domestic conflict and maybe gender-based violence may worsen (ibid.). Outmigration may cause disruptions in gender relationships, family relationships, and communal life (ibid.).
- **Lack of agency:** Women's underrepresentation in decision making forums reduces the chances that their concerns arising from mine closure are adequately heard or addressed. Not just this, but women are already underrepresented in the energy sector and any policy that neglects the inclusion of women is bound to generate policies hostile to their specific needs, further preventing the entry of women into the field. It also results in policy and regulatory outcomes that are inherently disadvantageous to them, even if they are not directly impacted by the closure of coal mines. This leads to the concentration of women in lower-level informal work which is manual, unsafe, and gives low wages (Lahiri-Dutt, 2007). This is reflected in how women are primarily engaged in cleaning activities, casual labour, and coal gathering (Banerjee, 2022).
- **Employment and informality:** Around 70 per cent of coal mining employees in India work informally, as per data from the 68th round of the National Sample Survey (Banerjee, 2022) and with increasing privatisation and contractualisation of labour in the sector, this number is only bound to have increased. This informal workforce, which includes a significant number of women, is 1.7 times more reliant on coal than the formal workforce. In regions like Jharkhand and Odisha, women are employed in tasks such as head loading, stone breaking, cleaning, and other coal processing-related



TERI team interacting with the attendees of the focussed group discussion at Talcher, Odisha



work (PTI, 2019). While they do not directly participate in coal mining, they engage in supportive roles such as working in workshops and drilling holes for blasting (ibid.). The dangers associated with informality are evident, as women also take part in illegal coal mining. Instances have been observed in Jharkhand where women venture into old mine sites, gather coal, and sell it in the local market, while men handle its sale (Banerjee, 2022). In Dhanbad, a major coal mining district in India, women wake up early to go to the local mine and transport coal from the depot to their male co-workers waiting at the mine's entrance (Joshi & Pardikar, 2021). Tragically, in early 2022, three abandoned mines being illegally mined collapsed, resulting in the death of four women and one man, along with others who were potentially trapped. The Eastern Coalfields and Bharat Coking Coal, which owned the mines, claimed that they were abandoned and fell under the jurisdiction of the district administration. These incidents highlight how women are compelled to engage in risky and insecure forms of employment. It underscores the importance of including women as key stakeholders in the just transition process to ensure equitable outcomes for them.



3. Who are the Women Affected by Coal Mining?

A demographic profile of major coal producing districts in central and east India gives an idea of the social identity of women in the region. The major coal producing regions of Jharkhand, Odisha, Chhattisgarh, West Bengal and Madhya Pradesh also have among the highest tribal populations in the country along with being relatively backward. According to the Fourth Report of the National Commission for Scheduled Tribes (2008–09) -



The tribal areas store bulk of the coal deposits (92%), bauxite (92%), iron ore (78%), uranium (100%), copper (85%), dolomite (65%) and the list goes on. Taking locational advantage, mineral-based industries have come up in the tribal belts, first in the public sector and now in the private sector also. However, these industries on the tribal soil, with very few exceptions, have been largely unable to relate to the tribal problems.



With most of the country's coal reportedly buried under tribal inhabited land it is reasonable to deduce that many women being affected by coal mining projects are also tribal, even though tribals make up only 8.6 per cent of India's population according to the 2011 Census. Similarly, one in six of 87,000 people displaced by Coal India Limited are reported to be Adivasis (Chandran, 2016).

Many major coal mining areas are concentrated in eastern India's Odisha, Jharkhand, and Chhattisgarh, which also have significant tribal population. Depending on the area, coal mining regions are mostly dominated by either backward, scheduled castes or scheduled tribes. For instance, in Odisha, the major coal producing districts in the west, i.e., Sundargarh and Jharsuguda are dominated by scheduled tribes and are Schedule V areas, while Angul is dominated by backward castes.



Tribal women from the villages adjoining the coal mines in Odisha

Many of these areas are also some of the most backwards districts of the country and a clear 'resource curse' is visible wherein the regions which are most resource-rich tend to be the most economically backward as well. As a result, the people of these regions majorly engage as informal, contractual labourers in the coal and related sectors. Since the informal labour dependence on coal mining is many times higher than the dependence of the formal workforce, the number of families—women and children—affected by the loss of jobs in the coal supply chain without social security is much higher.

Thus, the women most likely to be adversely affected by coal mining activities face a double disadvantage in terms of being both women and that too women from the backward/scheduled castes scheduled tribes. The economic backwardness of the region further exacerbates their vulnerability.



4. Methodology

This research was undertaken to ascertain how coal mining has a gendered impact on the lives of local communities, and if so, to understand how to plan for a just transition framework that is sensitive to these gendered differences.

Research Tools

A mixed method approach was adopted, utilising tools such as Focused Group Discussion (FGDs), Key Persons' Interviews (KPIs), in-depth community interviews and a socio-economic household survey were conducted for all the three states of Odisha, Jharkhand and Chhattisgarh.

State	Districts Covered	Time Frame for primary data collection	Household Surveys conducted
Odisha	<ul style="list-style-type: none"> • Angul • Jharsuguda • Sundargarh 	14 days	386
Chhattisgarh	<ul style="list-style-type: none"> • Surguja • Surajpur • Koriya 	10 days	352
Jharkhand	<ul style="list-style-type: none"> • Dhanbad 	7 days	258

Relevant indicators from the survey was be used to substantiate the research objectives. Data collected from the FGDs and KPIs was used to draw informed observations on how coal mining and coal mine closure has a differential gendered impact on the locals.

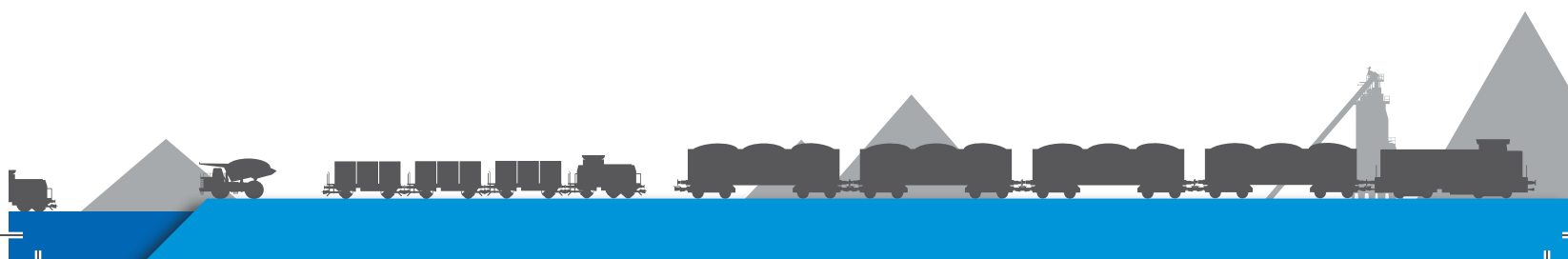
Collection of Data

Primary data: The study adopts a mixed method approach to collect data through the household survey and FGDs, key informant and in-depth interviews to capture the scenario on the ground.

Secondary data: Detailed literature review of journal articles, newspaper reports, and grey literature relating to the keywords of just energy transition, coal mining impacts, coal mine closure impacts, environmental clearance reports, etc., was conducted to supplement and triangulate the data collected from the field.

Study Sample Collection

The sampling to select the villages of interest for household survey was done using the purposive sampling technique — selecting villages and hamlets in close proximity to the closed, abandoned or discontinued mining project area. Within the villages selected, the survey sample was chosen using the purposive random sampling technique covering 20% of the village/hamlet population as reported by the sarpanch. Data was collected by the field partner over a period of two weeks in the selected states. However, for the purpose of this paper, the qualitative data was analysed to comprehend the complex reality and the ground scenario.



Selection of Study Site

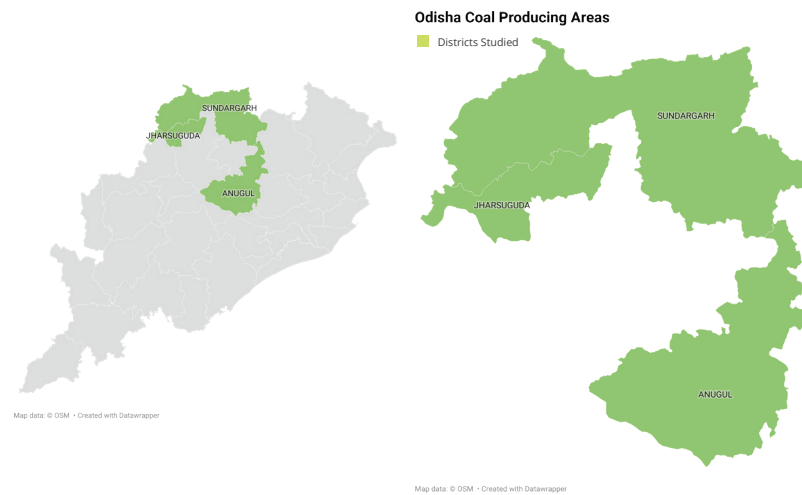


Figure 1: Study area in Odisha

Odisha is the second largest coal producing state in India, having exceeded its production target for the fiscal year of 2022–23 by 21 per cent (OB Bureau, 2023) and the villages selected were near operational and/or closed coal mine projects in the Ib Valley Coalfield and Talcher Coalfields which are situated in Sundargarh, Jharsuguda, and Angul districts, respectively. The coal mining industry in Chhattisgarh, dominated by CIL subsidiary – South Eastern Coalfields Limited, is characterised by relatively larger share of closed mines due to unprofitability or exhaustion of reserves. Most of the villages selected are near closed open cast or underground mines in the Surajpur, Surguja, and Koriya (newly christened as Chirimiri-Bharatpur-Manendragarh).

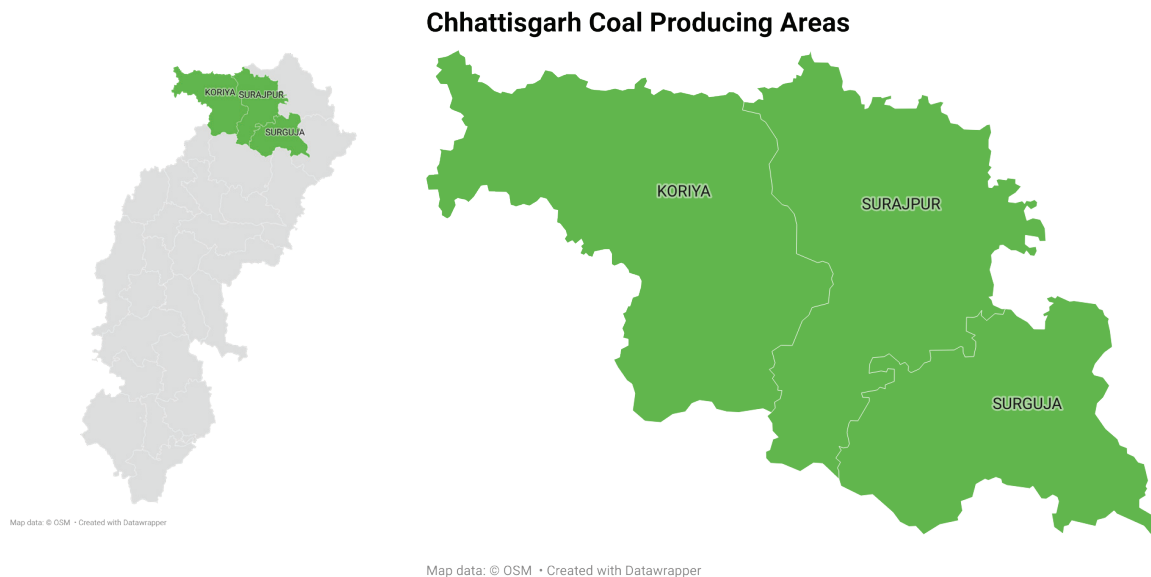


Figure 2: Study area in Chhattisgarh



The coal mining industry in Chhattisgarh is characterised by relatively larger share of closed mines due to unprofitability or exhaustion of reserves. Most of the villages selected are near closed open cast or underground mines in the Surajpur, Surguja, and Koriya (newly christened as Chirimiri-Bharatpur-Manendragarh).

In Jharkhand, the research was conducted in just one district, Dhanbad, which is also famously known as the 'Coal capital of India'. The primary focus was on the city of Jharia where fires in the coal fields is quite common and the presence of women in the coal mining activities was historically quite high.

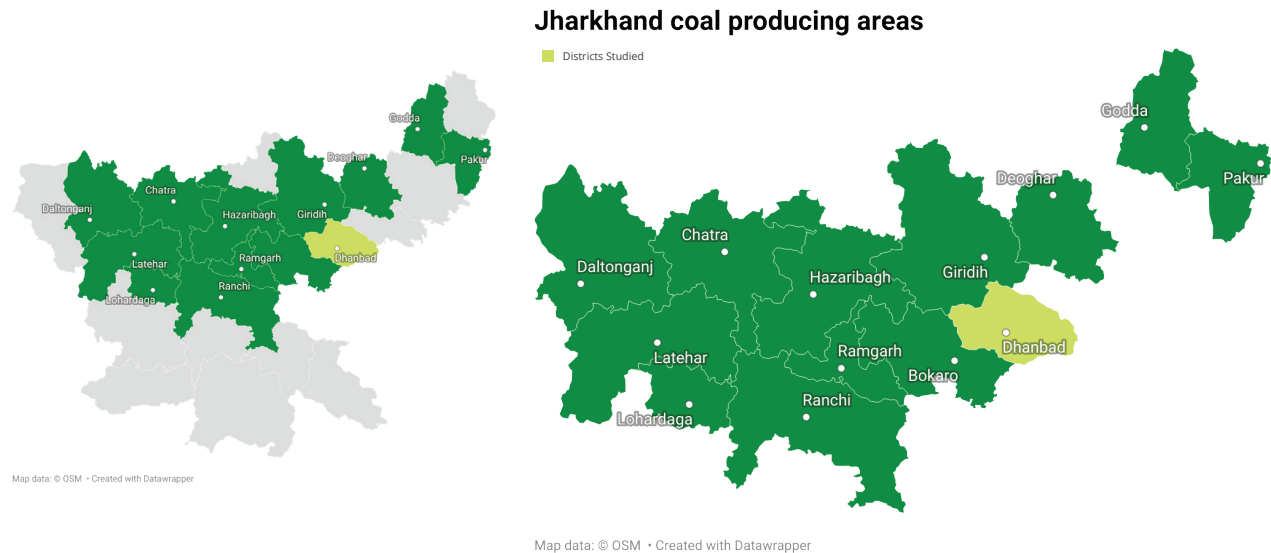
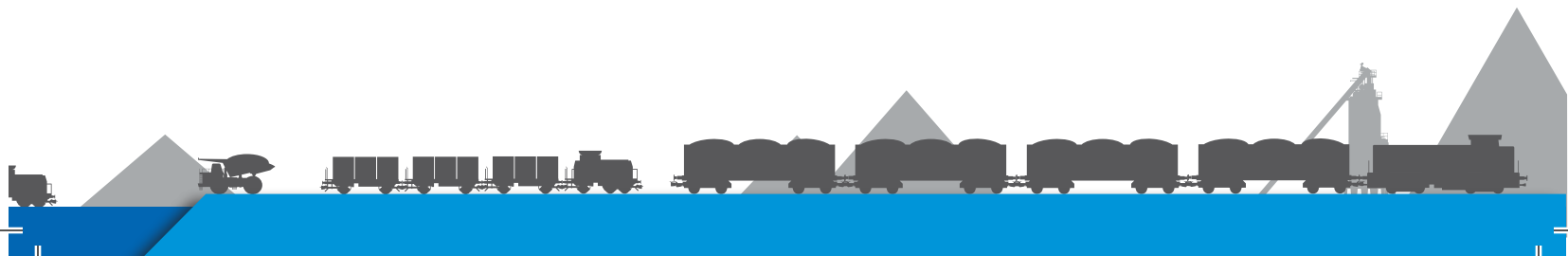


Figure 3: Study area in Jharkhand



5. The Gendered Nature of Vulnerability in the Coal Communities



Figure 4: Key issues and challenges that women face

5.1 Repercussions on health and well-being

In India as well as world over, coal continues to be the dominant source of energy production. Additionally, it's also one of the cheapest ways to produce energy making it economical for countries to rely on it despite its grave consequences on the environment as well as human health. Coal mining has led to severe health issues not just for the coal miners but also the local populace.

Water pollution: Coal mining, be it underground or open cast, exposes rocks containing sulphur which reacts with air and water to form sulphuric acid and causes Acid Mine Drainage (AMD) (Hendryx et al., 2020). This is one of the leading ways in which coal mining causes water pollution as this acidic



water overflows into the nearby streams and rivers and leads to elevated concentrations of acidity, iron, manganese, aluminium, and sulphate thus reducing the neutralising capacity of water.

- TERI's extensive fieldwork across the three coal mining districts of Odisha (Angul, Jharsuguda, Sundargarh) revealed that women in villages surrounding the coal mines go to a local, community pond for their daily bathing and household cleaning needs and these are stagnated bodies of water heavily contaminated with effluents from the coal and coal-dependent industries. Women across these three districts complained of musculoskeletal disorders such as joint pain which starts quite early on in their lives. Babita Barik, an ASHA worker from Gobra village of Angul district also mentioned that gastritis was common in women, which was a leading cause of joint pain. Similarly, in Majhi-sahi, a ST majority village in Angul district women further complained that carrying huge amounts of water from the ponds to their houses aggravated their joint pain issues. Thus, household responsibilities put women at a higher risk of exposure to health-related concerns.
- In all of TERI's field locations in Odisha, Chhattisgarh and Jharkhand, which included villages around closed/discontinued/abandoned coal mines, people complained of water table recession due to underground mining along with underground water being high in mineral content giving them a reddish/yellowish colouration.
- The medicine specialist of MCL hospital at Jharsuguda stated that tinea infection due to ringworm caused by unhygienic bathing conditions was also common. Uric acid was also high in the people residing in the region due to high mineral content in the groundwater.
- Additionally, skin-related issues in the form of itching, rashes and/or hyper-pigmentation are suggestive of contact dermatitis and dramatic hair loss is common among people in the region (Rinchin et al., 2018).
- In villages near Lodna mine in Dhanbad - a coalfield known for its long-term, ongoing underground fires - women have complained that the underground water is boiling hot and hence unfit for immediate consumption, more so in the summer months when their reliance on water is more.



Women collecting water from the tankers for their household needs

Case Study – Community Environment Monitoring, Chhattisgarh

They are an environmental justice group, who carried out a health impact assessment in Chhattisgarh near the South Eastern Coalfields Limited's (SECL) Gare Pelma ICV2&3 mines and the Jindal power plants, detailed in a report called **Poisoned** (Narayan, 2017). Samples of the air, water, soil, fly ash and sediment of the area were found to be severely contaminated with toxic heavy metals much above Indian water standards or of the WHO standards (ibid.). Of these, selenium, antimony, cadmium and lead were found to be particularly harmful for females because of the **impact they have on fertility and reproductive cycles** (ibid.). What is alarming is that water samples were taken from sources of water used for drinking, bathing, cleaning and irrigation purposes impacting the health of the locals directly (ibid.) but also affecting their agriculture practices as well as polluted water is bound to influence crop productivity and thus their incomes and food security.



Dust pollution: Mountain Top Removal (MTR) which constitutes blasting the mountains in order to reach the coal seams below is one of the primary causes in which coal mining leads to dust pollution. Further, as miners enter the mines to work and coal is transported, it leads to additional dust pollution. Fluorosis, Black Lung Disease aka Coal Workers' Pneumoconiosis as well as COPD are all rampant in coal mining areas. Cases of the latter in Sundargarh are known to have gone up by almost 45 per cent over the past decade (Panigrahi, 2022). While this impact is gender-neutral, women are doubly impacted in certain respects.

Case Study – Mettur coalyard

In the south of India in Mettur, a coalyard, pregnant women are advised by doctors to stay away because the area is blighted with what locals call “black wind” blowing in from the coal yard (Konkel, 2014). There are 1,500 low income households in the vicinity of the yard which are directly affected by the coal loading operations (ibid.). Community Environment Monitoring, the same environmental justice group that carried out the health impact assessment in Chhattisgarh, in a 2010 study found that the air in Mettur had particulate matter three to four times higher than the WHO’s pollution guidelines and are responsible for increased fatalities to pulmonary and cardiovascular disease (ibid.). The particulate matter also includes manganese and nickel, **known to impair the brain development of children (ibid.)**. These facts reflect the high cost that the country’s poor and vulnerable pay.

- Coal is the **primary cooking fuel** used in these regions, as was observed during TERI’s fieldwork in Odisha. It is easily available and cheap to buy making it the first choice despite various government interventions to switch to cleaner alternatives. This leaves **women doubly exposed to dust** — both outside and inside. The smoke and poisonous fumes from the low quality coal further affects the young infants also who are often accompanying their mothers.
- **Impact on children:** Studies in China indicated that surface coal mining was related to a higher occurrence of neural tube birth defects. Similarly, a study in Turkey revealed that children living near surface coal mining had elevated blood cadmium and lead levels, and another in Brazil found elevations in trace elements in children’s urine sample (Hendryx et al., 2020). Since women are considered as primary caregivers, such impact on their children leads to further complications in their lives.



As the night falls and women start cooking, little columns of smoke can be seen along the lanes as coal is used as the primary cooking fuel

Reproductive and sexual health: While peer-reviewed studies on prevalence of sexually transmitted diseases have not been carried out in the context of coal mining in India, there have been reports of how women in these regions are driven to sex work and are vulnerable to human trafficking (Agarwal and

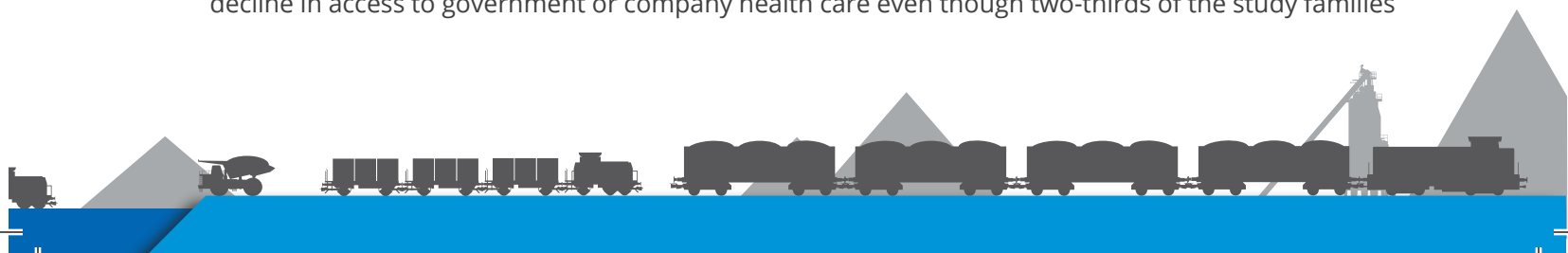


Singh, 2021). This has been reported from Chhattisgarh's mining areas like Bastar and Madhya Pradesh's Singrauli (ibid.). In the latter location, there are 650 sex workers who come from mining-affected families (ibid.).

- In a report to the UN Committee on the Rights of the Child, Dhaatri, an organisation working at “the intersections of women's rights and ecological harmony”, pointed out that tribal girls from Sundargarh in Odisha are trafficked to supply labour in lime kilns and are also forced into sex work (Dhaatri, 2016). Many tribal girls from coal mining affected areas in Jharkhand who also tend to be from displaced families are trafficked to become domestic workers in big cities like Delhi (ibid.).
- Locals have also noted that the influx of migrant workers to the mining areas have increased the vulnerability of local young girls (ibid.).
- Angul and Sundargarh in Odisha face high incidences of unwed mothers too, and this has been studied to be proportional to higher levels of illiteracy and dependence on daily wage labour among the victims and perpetrators (EnviroNics Trust, 2014). Many of the victims are also quite under-aged which makes the problem graver (ibid.). There have been indications that three contiguous blocks of Angul district, that displaced people are more vulnerable to sexual exploitation leading to increased cases of unwed mothers among them (Dhaatri, 2016).
- An interview with the gynaecologist at the MCL hospital of Jharsuguda revealed that menstrual irregularities were common in women there. He also associated the high prevalence of cervical cancer with coal dust and poor hygienic conditions of bathing areas.

Gaps in healthcare infrastructure: TERI's fieldwork from Odisha and Chhattisgarh found that the inadequacy of rural healthcare facilities left women exposed and vulnerable to the health impacts of coal mining.

- While coal subsidiaries are mandated to set up hospitals, they only treat minor issues and for major ailments, patients — in particular informal workers — are referred to the district hospitals which are often far away, leading to a steep commuting expense. This is compounded by the cost of treatment and medication which often puts the patients in a financially tough spot forcing them to resort to borrowing money. This often has a cascading effect as women get entangled in a chronic debt trap. Health issues of women are in general not paid much attention and the prevalence of such obstacles further pushes these issues under the carpet.
- Women of Bantabori-sahi in Angul district admitted to having taken loans to meet these costs and many had to even sell their land in order to repay it. Hence, for most women, the ASHA workers — Accredited Social Health Activist — workers and the ANMs (Auxiliary Nurse Midwife) who frequent the villages are the only two reliable sources.
- All coal subsidiary employees (formal and contractual) are entitled to health cards through which they can avail varying degrees of healthcare subsidies at empanelled hospitals depending on their employment status (regular or non-regular). However, the health cards are mostly available to formal workers and their dependents leaving the majority of the coal workforce, which is informal, without access to basic health checkup at these hospitals.
- Apart from the direct impact of environmental pollution on the health of women, the displacement of families from their homes prevents their access to traditional medicine systems and their usual health care providers. A study in the Hazaribagh and Chatra district of Jharkhand among women and their families displaced by coal mining projects showed that displaced people tended to go to untrained or semi-trained private health practitioners, more than they had before — from 2/3rd before being displaced to 3/4th after displacement (Lahiri-Dutt, 2007). The study also noted that after displacement fewer people availed treatment from Central Coalfields Limited's health services — marking an overall decline in access to government or company health care even though two-thirds of the study families



had a member with a job with CCL (ibid.). Seventy per cent of the respondents felt that their husbands' health had worsened post-displacement and 80 per cent felt the same about their children (ibid.). Incidence of malaria had also increased after displacement according to 25 per cent of the subjects (ibid.). This evidence suggests that healthcare provisions have worsened in spite of an increased need for healthcare services in these regions.

5.2 Societal and domestic concerns

Alcoholism: It is important to note that the issue of alcoholism is closely tied with coal mining as well as closure, income and domestic violence. A sudden loss of job and the subsequent unemployment is one of the leading causes of alcoholism in coal-mining regions. It is important to note that the issue of alcoholism is closely tied with ongoing coal mining as well as their closure, income and domestic violence. The industrial wage earning generates a demand for alcohol which often results into mushrooming of illicit installation and supply of country liquor. The sudden loss of job and the subsequent unemployment post-closure is also one of the leading causes of alcoholism in coal-mining regions.

- TERI's study of the Sundargarh district has shown that a large portion of the male population is habituated to spending a large share of their wages on country liquor, leaving the women to take primary responsibility of the household. It is also mostly women who engage in agricultural activities on the family land as well while the men while away their time and money indulging in liquor.

The vicious cycle of alcoholism

TERI's female FGD respondents in Chhattisgarh's Sarguja and Surajpur districts were more forthcoming in sharing the way alcoholism affects their lives. Production of traditional homemade liquor using the flowers of a locally prevalent tree called mahua (*Madhuca longifolia*) is prevalent among the homes of particularly ST households in the villages. Alcoholism and liquor production forms a vicious cycle in the study area, which is marked by an acute lack of employment. While traditional mahua liquor consumption is an important part of the local culture and customs, chronic alcoholism is a problem that began with the onset of coal mining activities in the area and continues even after the closure of coal mine projects, according to respondents. In the absence of steady sources of income, local women resort to making mahua liquor at home to supplement household finances. The problem is two-fold – very often it is the husbands of these women who are chronic alcoholics (a result of lack of employment) and the women make alcohol at home to keep the household fed with good food that the men demand. The women respondents described how their husbands would get angry if they did not like the food served to them and in order to ensure good food they need money, which is not sufficient if they don't make and sell liquor. The business is so profitable and rampant, that even when the mahua flower is not in season, locals can buy it from the market where it is sold in a dried state, allowing a continuous production of liquor in homes. Reportedly, ST houses are also legally allowed to keep up to 5 litres of liquor and each litre is sold for INR100. The input cost for producing 5 litres of the liquor is just INR120 (3 kilograms of mahua flowers, which costs INR120, required for producing 5 kg of liquor) hence it allows for a large margin of profit. This problem is not just that of alcoholism but most importantly of the lack of other well-paying income sources which highlights the need for a diversification away from the coal mono-economy such that locals are not just able to earn a steady and decent income but also move away from the social ills perpetuated by alcoholism among a host of other issues plaguing coal communities.



- Women from Chhendi-pada and Tikli-pada village of Odisha also claimed that the issue of alcoholism started when the coal mines came into operation. Increase in disposable income with simultaneous increase in number of liquor shops in the neighbourhood pushed men towards drinking.
- They further cited stress as a trigger for such addiction. The harsh working conditions and absence of alternate choices of income pushed men from the area to resort to drinking as a means of relaxation. However, such practices turned into addiction when despite mine closure and loss of income, men from these villages continued to drink. The issue also points at the lack of recreational avenues.
- With reduced or no income post mine closure, continued alcoholism has created social imbalances within these villages. A female respondent from Chhendipada informed the TERI team how her husband had been selling household ration and items to secure money for alcohol.



Dried Mahua flower which will eventually be used to make alcohol

- Women from Brajrajnagar complained that men in the village are even using land compensation money to buy alcohol. This has also resulted in vast amounts of debt, which has been eating into other urgent expenses of the family. Citing excessive alcoholism and consequent health issues, women reported using major portions of compensation money for hospital bills of their husbands and young sons.

Domestic violence: Alcoholism has intensified the issue of domestic violence in these villages. Men in intoxicated state behave aggressively towards their wives and inflict violence on a daily basis. This violence is mostly physical but, in some cases, remains intangible in the form of emotional or anticipatory violence.

Thwarted attempts at mobilisation

Since women find themselves at the receiving end of negative impacts of coal mining and closure, they have also made efforts at mitigation and solution. In Gopalpur village of Sundergarh, women voiced their concerns to a vote-seeking sarpanch on his visit to the village. They were promised a closure of the local liquor factory but no step was taken after the elections. Women from other villages, with the help of SHGs, raised their voices against local liquor shops at gram panchayat meetings. Brajrajnagar in Jharsuguda district, where door-to-door alcohol sale was prevalent, witnessed its Mahila Sangathan protest to prevent such practices. However, these sellers continued their sale on the outskirts of the village or in forest areas, easily accessible to men returning after the day's work. Women from Oram-pada in Sundergarh district went on to raise the issue at the collectorate. Given how controlled women's movements are outside their household and native village, it is a remarkable example of women's agency. Despite such efforts, women continue to be ignored. They are censored by the men of the household, as was the case of Brajrajnagar or manipulated by local political parties who prevent them from uniting on relevant issues.



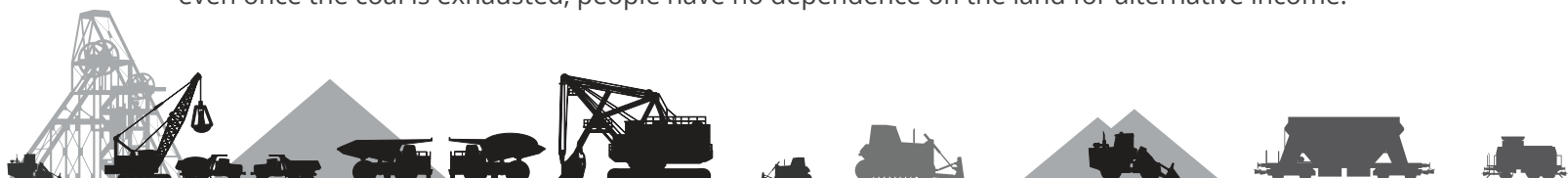
- In most cases, women manage household expenses and hence are subjected to beating and violence at home when they refuse to give money for alcohol. They reported feeling unsafe when men came home drunk.
- The problem of alcoholism is also deeply rooted in gendered divisions within society. Women from Gobara village pointed how some men are pressured into drinking as it is a matter of social status — “If a man doesn’t drink, he is not considered man enough” is a prevalent saying in the village.
- Another reason for domestic disputes is also the contrast between women’s traditional household responsibilities and the changing nature of their social positions as a result of job or political activity. When the strikes in the UK against mine closures ended, many women reportedly refused to take up their home caregiving duties. Very relevant to this paper in the context of coal mine closures, it has been observed that mining bans in Karnataka, Odisha, Goa, Jharkhand, and Chhattisgarh resulted in a depletion of incomes by more than half and this coincided with an increase in the incidence of domestic violence (Panigrahi, 2021).

5.3 Implications on land and livelihoods

Before coal mining operations start, large tracts of land are acquired by coal mining companies on lease from the central government under the provisions of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR Act, 2013). This Act sets down elaborate processes for the process of land acquisition including public consultation and stakeholder engagement. However progressive these legislations are, and can strengthen state response in favour of a just transition, it has been argued that they are not sensitive to the plight of women and children. The LARR Act is a relatively progressive piece of legislation but compensation is given in the name of the head of the household who is usually a married male.

Loss of production-related agency: Land also forms the basis of subsistence for many of the poor in the country and according to the Economic Survey of 2021, 47 per cent of the country’s population is dependent on agriculture for a livelihood (PIB, 2023).

- TERI’s study in Talcher documented that women used to engage in agricultural labour and kitchen gardening to supplement their husband’s incomes and grow their own vegetables. But the loss of agricultural land acquired for mining purposes meant that the people lost that aspect of their self-sufficiency and are now dependent on the vagaries of market for their necessities (Nayak, 2020). Having this additional source of income also gave women agency which was lost as the land got acquired.
- TERI’s observations from Talcher in Angul show that in communities settled adjacent to coal mines (as is the case for most of rural India), the distribution of land is heavily influenced by caste — upper castes own larger parcels of land, are able to maintain kitchen gardens, and have pucca houses as against the residents of lower caste settlements in a village.
- The loss of land to mining projects is what adversely affects a woman’s role in tribal dominated mineral resource rich areas like Odisha and Jharkhand and they are the ones who primarily engage in agricultural activities in these states.
- In Sundargarh’s Tikli-para, villagers complained about how they had to wash the spinach 2–3 times to remove the thick layer of coal dust that has settled on the produce. They also have to wash paddy to make it fit for consumption. Paddy that is contaminated this way with coal dust cannot be sold to mills or farmers’ cooperatives.
- The situation in Jharkhand is slightly different. TERI’s field visit to Dhanbad revealed that the land is unsuitable for agriculture as coal is available at quite shallow depths. Hence people give in to the coal and related industries representatives who come to buy the land for future mining operations. Thus, even once the coal is exhausted, people have no dependence on the land for alternative income.



Deprivation of NTFP-related livelihoods:

Apart from farming, the expansion of existing mines or the opening of new ones has meant the loss of forest cover which the women would access for the collection of NTFPs such as mahua flowers, tendu leaves, and this would supplement their regular income from farming.

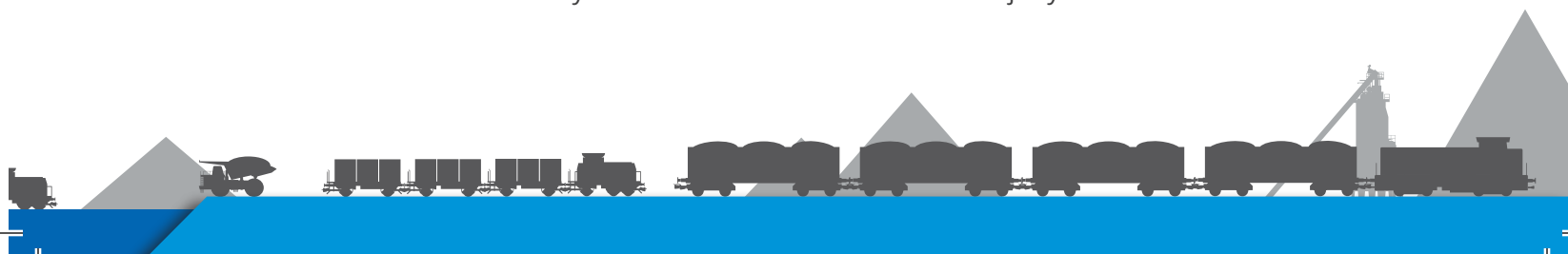
- This has a social impact in a way that the women who would go together for this activity were able to spend time together away from the house (Aggarwal and Singh, 2021).
- Once they lose the forest altogether or when the availability of forest produce is affected by the pollution caused by the mines, women are forced to earn money by working in the houses of those wealthier than them, adversely affecting their social relations with the increase in inequality within and among tribal communities (ibid).
- Village commons which were lost to coal mines were also a source of “food, fodder, fuelwood, timber, grass, straw, mulch, manure, and fencing material”, and Dalit and Adivasi women in the region were known to collect leaves from the forest to make plates and cups to use during festive seasons and grass to make mats and baskets (ibid.). Such collection of NTFP forms a key way for villagers, especially women, to engage in productive labour outside of their primarily reproductive duties within their household.
- Fieldwork by TERI in Odisha’s Angul, Sundargarh, and Jharsuguda showed that NTFP collection has drastically reduced since the start of coal mining operations and the situation does not improve when coal mines close too due to the extent of deterioration caused by coal mine activities.
- NTFP collection is of particular importance among tribal communities — half of Sundargarh’s population belong to the scheduled tribes. Study subjects from Gopalpur, reported a decrease in forest produce like mahua, tendu, dol, chironji, and chhattu. Tendu leaves across the three districts are used to make bidis and a thousand pieces are sold for anywhere between INR90 and 150.
- The Lajkura mines in Jharsuguda got its name from the forest which used to sit on the land being mined for coal. Locals recall it being an abundant source of tendu, chironji, and sal. They used to make bidis for sale using tendu leaves, datun with sal sticks, and plates with sal leaves, but they do not do so anymore.
- Across the three districts of enquiry most respondents said that the dust pollution caused by open cast coal mining projects had affected the quality of produce that was collected.



Women in Odisha making beedis from Tendu leaves

5.4. Lack of economic opportunities

Gender position has a bearing on employment opportunities and access. This is true especially for the coal belt which is characterised by extractive manual labour and is majorly a male-dominated sector.



- Furthering ILO's CO45, the Indian Mines Act, 1935 put a complete ban on women in underground mines as has been previously mentioned as well. Briefly allowing women in underground mines during the Second World War, the ban was reinstated by the Indian Mines Act, 1952. Section 46 of the act imposed a complete ban on underground work, with a curfew in open cast mines that allowed women only between 6:00 am and 7:00 pm. In February 2019, however, the Ministry of Labour removed ban on underground work along with relaxing the curfew time (Ministry of Labour and Employment, 2019). While the lifting of the ban was aimed to increase the participation of women in the coal workforce, the historical exclusion of women from employment in a predominantly masculine sector continues to shape people's attitudes.
- While government schemes do emphasise the importance of women and child health, interventions in agriculture and livelihoods rarely directly benefit the women. This gap is compounded by the fact that these mining-affected communities are so remote that the information asymmetry between what welfare measures are available to the people from the public authorities and what the people are aware of is huge (Aggarwal and Singh, 2021).
- During TERI's fieldwork in Odisha, it was found that some land oustees who got a job nominated their daughters and wives while they would spend time drinking and gambling. In either case, whether the woman has lost access to the agricultural land or has to go work in place of the family head — women are affected in ways that are not satisfactorily documented.



Underground Orient Colliery Mine no. 1 & 2 in Jharsuguda, Odisha

Case Study - Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)

It is part of National Rural Livelihood Mission and is a placement-linked skilling programme that aims at supporting youth between ages 15–35 years from poor families. While DDU-GKY has trained more than 12 lakh youth and placed around 7 lakh youth from rural India (Ministry of Rural Development, 2022), a study conducted by Evidence for Policy Design (EoPD), Harvard Kennedy School with 2600 former trainees in 2016 finds that young men are 13% more likely than young women to receive a job offer (Evidence for Policy Design, n.d). 70% males and only 56% females are likely to accept the job offer (ibid.). The study also investigated the reasons behind job refusal by trained young men and women. The contrasting gender experience reveals that trained women refused jobs on account of familial resistance and objection whereas for men competitive salary and personal preferences determined continued participation in the job. The scheme places youth in urban centres which in case of most women becomes a hurdle as migration is often unfavourable for them (International Growth Centre, 2018). The study recommended providing migration support to women, as receiving more migration support is associated with longer job durations (ibid.). It is important to assess on-ground gaps in implementation and experiences of these schemes, especially in case of women to ensure female labour participation, through schemes such as DDU-GKY within the coal belt continue to rise.



5.5 Exclusion from institutions of mobilisation and governance

Representation in decision making bodies: Enabling women's access to decision making bodies is crucial to ensuring that any just energy transition policy is cognizant of their needs and aspirations.

- As elaborated earlier in this paper, women form a miniscule share of the workforce in the energy sector and the low number in formal employment does not incentivise coal mining companies to consider women as important enough stakeholders in plans for a socially just energy transition. It is important to thus have women representatives at all levels of local governance to ensure gender just policies that reflect the reality of local experiences of coal mining and coal mine closure.
- The reality of female representation in decision making bodies is quite bleak given in the ten gram panchayats where multiple women-centric focussed group discussions were conducted by TERI, only three gram panchayats had a female sarpanch or panchayat member and only in three villages did the women say they participated in gram sabha meetings.

Self Help Groups: Women's SHGs however have proven to be a key way for women to mobilise themselves and collectively raise their voice against issues of water scarcity and accessible roads, however, this has been the case only in the Chhendipada gram panchayat of Talcher in Angul.

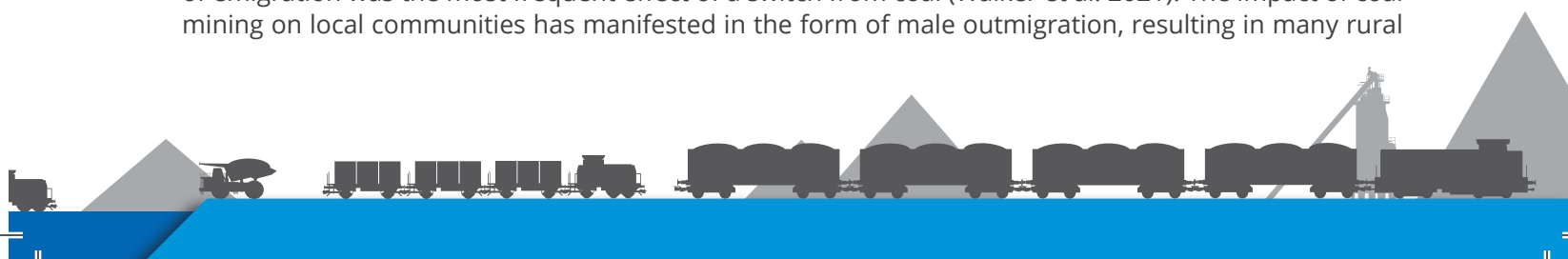


Women in Sundargarh, Odisha

- Only one SHG in TERI's study areas reported that they sold products that they made. Three said that they had received training in making incense sticks but they stopped making them anymore because they were not able to sell their produce.
- The majority only collected money and lent it to their members, but did not engage in any productive activity such as using the funds to engage in entrepreneurial activities. However, all women expressed a keen interest in being trained on how to run a business, make candles, bangles, learn how to tailor and sew, make baskets, etc.

5.6 Blocked opportunities and outmigration

A study on the impact of coal mine closure on women showed that the local community's collapse because of emigration was the most frequent effect of a switch from coal (Walker et al. 2021). The impact of coal mining on local communities has manifested in the form of male outmigration, resulting in many rural



households being run by women (ibid). All of the following points combined lead to a situation where women are left behind in villages and towns to look after the household as well as the agricultural fields:

- TERI's fieldwork in Odisha showed that the youth, especially the younger men, are increasingly migrating outside the state to earn a living as agriculture grows obsolete and in the absence of other avenues of employment in the area.
- The fieldwork also revealed that the youth were educated. Most families admitted to sending their children to school and many even sent them further for undergraduation degrees. However, despite their qualifications as engineers or science graduates, their scope of employment is minimal. Left with no other option, these educated young minds prefer to migrate to nearby districts or states in the search for a worthwhile job.
- The mono-economy that coal mining creates is another reason why other sources of employment fail to flourish in these regions. As a result, these areas now heavily rely on the coal industry for economic and social purposes, which has an impact on their infrastructure, way of life, environment, tax revenue, and state services (NITI Aayog, 2022). A classic example of the "resource curse", coal reserves are concentrated in states that are economically underdeveloped in India. In these regions, mining operations directly and indirectly provide some form of income to the local populace (NITI Aayog, 2022). The closure of coal-based assets would therefore cause disruption to the industry as a whole and the local communities, even if it is a necessary component of the transition in the long run (ibid.).
- In Dhanbad, TERI found out that many villages which were past colonies of coal subsidiaries were now occupied by local villagers who stayed there rent-free and would engage in illegal coal mining in the nearby closed mines. Since the subsidiaries continue supplying water and electricity to these colonies for free, the villagers prefer to stay here instead of shifting to the rehabilitation colonies which are far away and have no livelihood opportunities in their vicinity. This further elaborates how the mono-economy around coal is perpetuated over time and the reluctance people show to any change of status quo despite the risk to their lives and health.



6. Recommendations

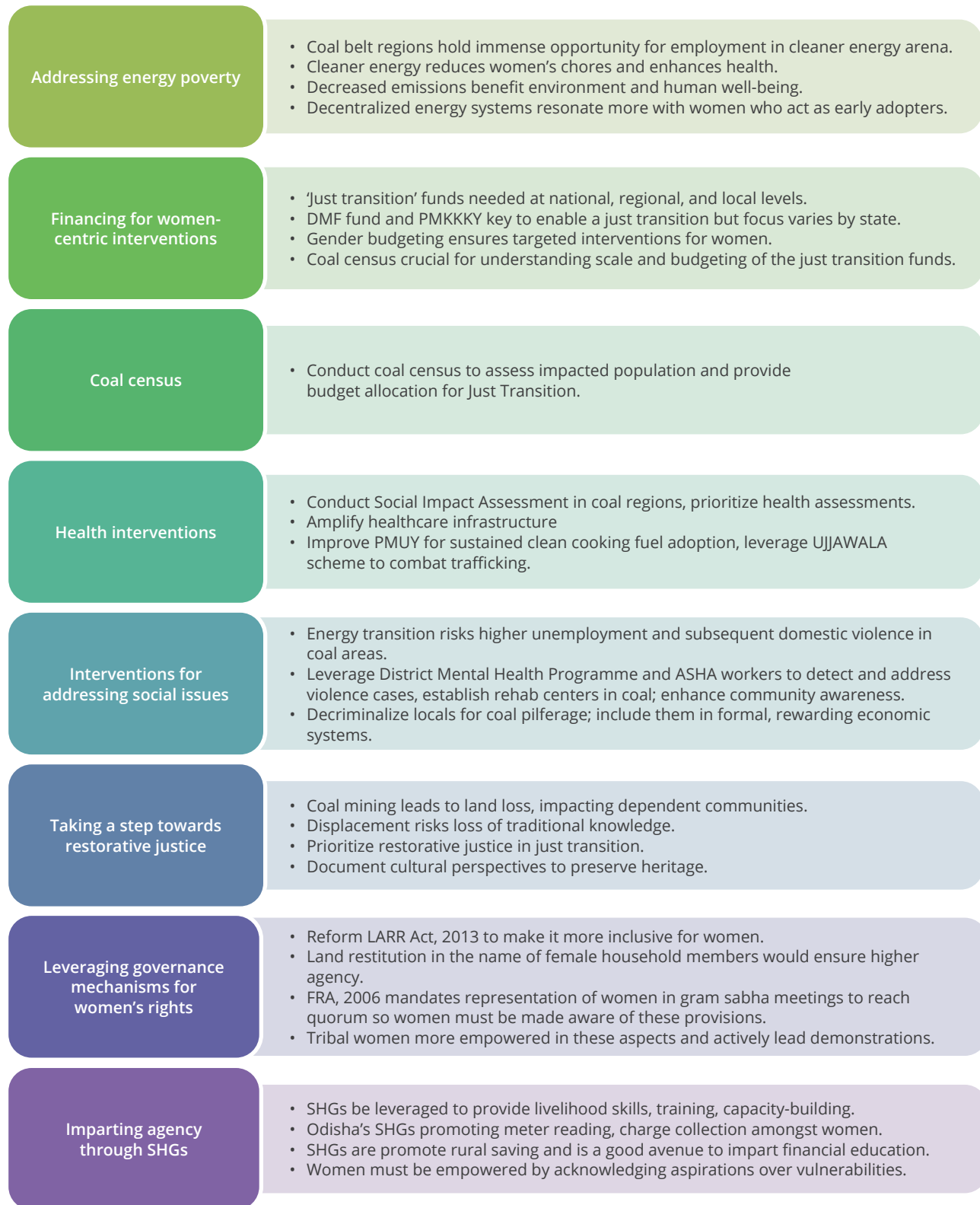
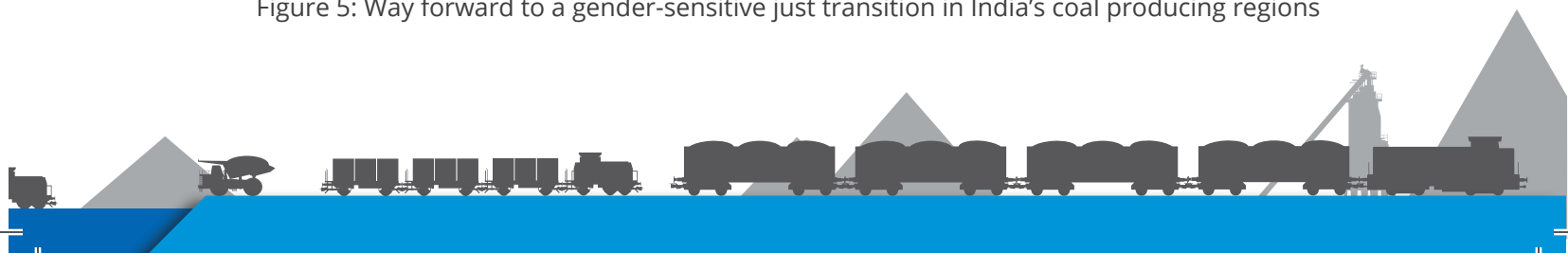


Figure 5: Way forward to a gender-sensitive just transition in India's coal producing regions



6.1 Addressing energy poverty

The use of firewood and similar biomass for fuel continues in rural areas including in the coal belt, where even pilfered coal is used as cooking fuel in households. While this might seem to be a problem, it is an opportunity for building capacity for cleaner energy alternatives not just as an energy source but also as an avenue for gainful skilled employment. SDG 7 – Affordable and Clean energy directly addresses this issue. Models like these have worked in the past to ensure a sustainable system to keep locals engaged in managing their energy needs and also increase their productivity.

Case Study - Jeevika - TERI Lighting a Billion Lives

It was a collaboration under the Bihar Rural Livelihoods Promotion Society which has seen a solar home system package of two light sources, a mobile port, a cooking stove, battery, panel and charge controller being loaned to women at an upfront cost of INR 500. The collaboration targeted women as the target beneficiaries, earmarking them for a clean energy loan. Follow-up studies have shown that the collaboration created opportunities for the women to get trained in technical and vocational skills (Mini, n.a.). The JEEViKA collaboration saw the women express an increase in confidence and an avenue for a positive power shift in their homes. The availability of electricity after dark meant that women were able to utilise the hours after dark to space out their daily activities and allow them more time during the day to engage in income generating activities (Pavithra, 2021).

- Access to cleaner energy sources means that women do not have to spend time collecting firewood and such activities while also allowing for reducing emissions for the environment and better health outcomes for women in the kitchen.
- Better health outcomes would also mean saving time spent visiting the doctor or acquiring medicines (Skill Council for Green Jobs, 2016).
- A decentralized energy system such as the ones elaborated in these case studies, tends to also have higher resonance amongst women as they constitute a large section of the early adopters.

Targeted interventions in households affected by energy production projects, in particular coal mining areas, will be of more consequence because these households already bear the brunt of air and water pollution more acutely than do households relatively less prone to the hazards of environmental pollution.



Source: <http://labl.teriin.org/gallery.php>



Case Study - Bhadla Solar Park

The development of solar parks in India funded by the Asian Development Bank in particular the Bhadla Solar Park saw the “creation of income generating activities and livelihoods for women” (Ward, 2021). It saw 150 women being provided vocational training in embroidery and handicrafts; 75 women being trained in basic accounting, finance management, and negotiation skills; and 415 women benefiting from Micro Enterprise Development Training on Animal Husbandry for goat rearing (ibid.). Rajasthan Renewable Energy Corporation Limited (RRECL), the implementing agency also promoted improved maternal/child health and safe motherhood by conducting health camps for 200 women and adolescent girls (ibid.). This is but a small case study of how the onset of renewable energy can be made a boon for the local population as well (ibid.).

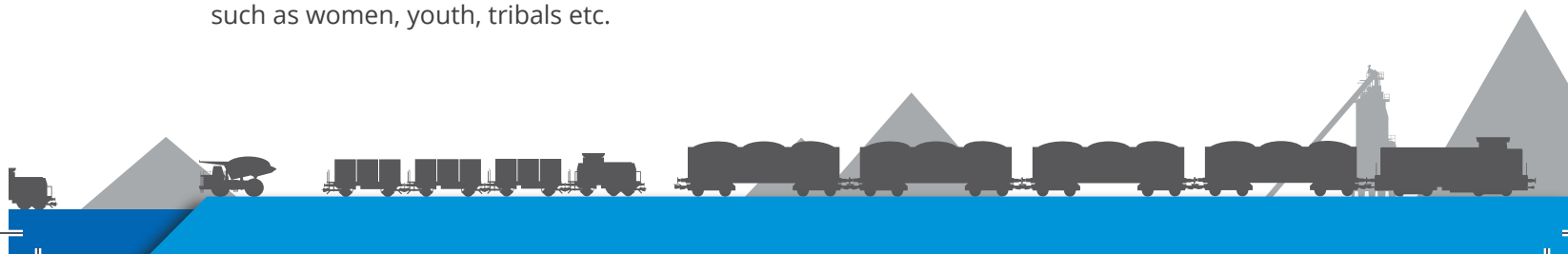
6.2 Financing for women-centric interventions

As part of transition plans, governments should establish national “just transition” funds. These should support activities to address climate action and related employment risks through the implementation of just transition plans for workers and vulnerable communities, regions, and industry sectors (Smith, 2017).

- TERI also recommends that considering the federal structure of India, a similar fund should also be created for the regional (state) and local level. This would create a ready pool of funds to tap into to address local issues and challenges. Additionally, to ensure that these funds are better utilised and managed for women-centric issues, it'll be equally pertinent to ensure that there are women representatives at governance levels.
- **District Mineral Foundation fund:** India is already working on this front and the DMF fund if tapped onto can lead the path towards just transition in India. Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY) — is connected to independent, non-profit DMF funds (ibid.). While the PMKKKY mandates that 60 per cent of the DMF funds be used for the eight high priority areas, one of which is welfare of women and children, only a few states such as Telangana, Chhattisgarh, and Tamil Nadu spent at least 60 per cent of their DMF funds in all (ibid.). However, other than for Chhattisgarh, a CSEP study showed that no other state used most of their funds on high priority areas but instead tended to focus on infrastructural development (ibid.).
- Gender Budgeting - within this structure of a Just Transition fund, we can earmark a certain portion for gender-related activities through enabling gender budgeting. This would ensure focused attention on the issue and enable targeted interventions thus ensuring better results.
- However, to figure out the corpus of such a national-, state- and local-level fund, besides the gender budgeting within it, it's crucial to know the number of people affected and that brings us to the next point.

6.3 Initiating a coal census

- Before we begin a discussion on Just Transition, conducting a coal census becomes pertinent. By deriving the number of people affected directly and/or indirectly as well as industries dependent on coal directly or indirectly, we will get an idea of the level of intervention that needs to be planned. Accordingly then, we can build a budget for the fund and section off portions of it for various segments such as women, youth, tribals etc.



Case Study

Society for Women's Action and Training (SWATI) has developed and employed a unique model to address issues of domestic violence in villages of Patan district in Gujarat. The initiative placed violence prevention and support centres in local hospitals. Given how controlled women's mobility is, healthcare access often comes easier to women than going to allotted centres within the village or to a police station. The model helped several women to seek help and also avoid further violence. To ensure anonymity and cut through social taboos, healthcare providers at village and district-level, such as ASHA workers and others at sub-centres, primary health centres (PHCs), and community health centres (CHCs) have been made part of an upward referral system (bottom-up approach) to refer women to hospitals where violence prevention and support cells are located (EPW, 2020).

6.4 Health interventions

- **Social Impact Assessment:** The foremost step to ensure a healthier just transition with respect to women would be to carry out a detailed Social Impact Assessment study in the regions. All stages of the lifecycle of coal produce harm for the human health and a detailed report of its impact would be crucial to chart out any intervention.
- To deal with acid mine drainage (AMD) which pollutes the local ponds that are frequented by women, water treatment plants should be set up which would also generate local employment.
- To tackle the indoor dust pollution caused by coal as cooking fuel, the PMUY (Pradhan Mantri Ujjwala Yojana) needs to be implemented better. While most families admitted to receiving the free gas connection, in the long run they all opted for coal because refilling the gas cylinder was a heavy expense. Large-scale awareness about the impact of dust inhalation in addition to further subsidy in gas prices would help curb this issue. Adoption of such cleaner practices would call for a sustained local campaign and Behavior Change Communication(BCC).
- Similarly, to tackle trafficking the UJJAWALA scheme needs to be tapped in as it is a comprehensive intervention for trafficking, rescue, rehabilitation and re-integration of affected women and their children.
- Imposing a moratorium on further expansion of existing mines or setting up of new mines is an imperative until comprehensive health impact assessments of the mines and power plants are completed and its recommendations are implemented (Rinchin et al., 2018). Furthermore, hospital infrastructure has to be amped up and health benefits such as under the Ayushman Bharat scheme need to be made available to one and all.

6.5 Interventions addressing social issues

A complete energy transition may result in high unemployment rates and that results in increased cases of domestic violence on women, especially in the coal belt. SDG 3 – Good health and well-being as well as SDG 5–Gender Equality will be addressed by tackling this ailment. A complete energy transition may result in high unemployment rates and consequently that may result in increased cases of domestic violence on women, especially in the coal belt. SDG 3 – Good health and well-being as well as SDG 5–Gender Equality will be addressed by making suitable interventions in this direction.

- Mental health professionals under the District Mental Health Programme can be directed to assist victims of domestic violence by providing immediate medical and psychological care and help report



such cases. ASHA workers have access to village-level health and they do door-to-door visits which can help detect domestic violence cases as they often remain unreported due to lack of trust, societal pressure and fear of the perpetrator. They can also help report instances of impending violence that often results in emotional trauma. Anticipation of violence must also be acknowledged and monitored to put in place a preventive mechanism against domestic violence.

- Given the rampant alcoholism and substance abuse in the coal belt, rehabilitation centres must be established at block panchayat level to ensure access and affordability of families of the patient. The number of rehab centres and de-addiction camps must also be increased. ASHA workers can also be employed to help report cases of alcoholism and to detect such cases sooner than at critical stages.
- Community awareness programmes must be promoted to help people access such services and encourage the community to come forward in advancing such initiatives. Regular follow-up visits must be made to report any relapses and take required actions.
- Along with the above, at administrative level, local liquor shops must be regulated. District-level execution of policies such as ban on alcohol consumption and sale must be strengthened to conduct regular checks and strict implementation.
- Decriminalising the local: A necessary pre-requisite to ensuring a successful just transition implementation program would be to de-criminalise the localities for engaging in coal pilferage. It is crucial to understand that they form the bottom-most rung of the society and engage in these activities out of mere helplessness. Hence to punish them for it would be unfair as it would rob them of the sole livelihood option that they have. Instead, by including them within the formal system, an attempt should be made to incorporate their skills in a more economically rewarding manner.

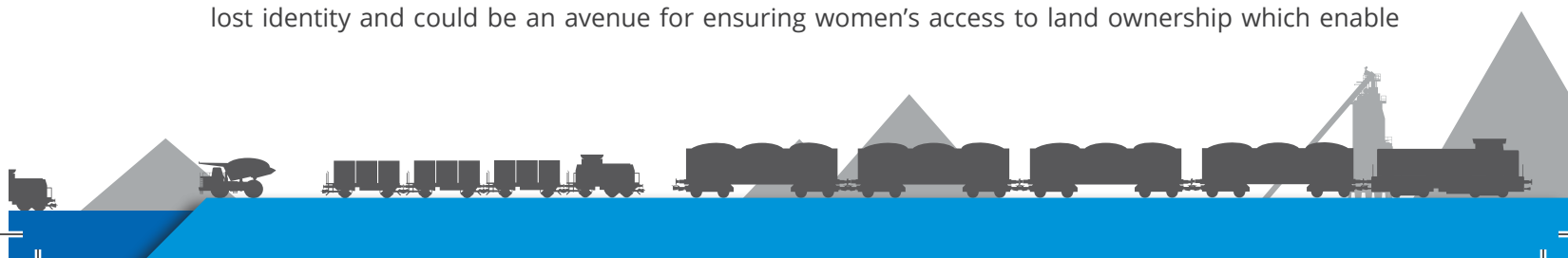
6.6 Taking a step towards restorative justice

An immediate repercussion of coal mining activities is the loss of land which directly impacts the people dependent on it, as is elaborated above. While land as a resource is of immense importance to these people, we must also acknowledge that these people are in themselves a huge resource. The migration of communities post-displacement leads to the loss of traditional knowledge and its inter-generational transmission. Restorative justice is thus a key aspect of just transition. There must be adequate mapping of cultural perspectives and this knowledge should be documented by competent authorities in order to preserve it.

6.7 Leveraging governance mechanisms for women's rights

Earlier in the paper, it was discussed how land compensation laws like the LARR 2013 and the Fifth and Sixth Schedules of the Indian Constitution do not adequately take cognizance of how important it is to enable women's access to land ownership for their empowerment such that their decision making powers are enhanced.

- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA, 2006) recognises women's right to land as it requires new land titles to be registered in the names of both the spouses as the head of the household for joint ownership. It is also the only law that mandates women's participation in decision making forums. Such requirements should ideally be included in land or monetary compensation policies like the LARR Act, 2013, such that the outcome of land acquisition processes is more equitable for the land oustees, particularly the women who are significantly more dependent on land for productive activities.
- This could also be done in the case of coal mine closure when the mined land can be restituted to the affected communities such that they take ownership of any reclamation and repurposing activities that is planned for the mining sites. Land restitution would address in principle the sentiment of lost identity and could be an avenue for ensuring women's access to land ownership which enable





Women working in the rice fields in Sundargarh, Odisha

a degree of empowerment. Considering households and families as a homogenous unit nullifies women's decision-making agency and it is important that this be addressed in India's coal belt where vast tracts of land were acquired for mining leases.

- The way the FRA mandates the representation of women in gram sabha meetings to reach quorum is significant as it moves beyond the tokenistic reservation of women's representation in reserved gram panchayats and constituencies. However, in spite of these requirements in law, findings from the ground reveal that people are largely unaware of these provisions and remain ignorant of the importance of mainstreaming women's voices, hence, programmes that address this gap in awareness are indispensable to a women-centric just transition.
- Observations from the field, particularly in Jharsuguda's Brajrajnagar showed that women are keen on taking up leadership roles in the community and local governance bodies but are often aggressively discouraged from doing so by boycott or force. Elsewhere and in our observations from Chhattisgarh's coal mining areas too we found that women are not aware of panchayat meetings and are not involved in the proceedings of local governance bodies.
- A zila parishad member in Talcher in a key person interview expressed the need for women in the area to participate in local governance bodies, but because women's concerns are often in contradiction to the revenue generating interests of local political and economic interests, they are actively dissuaded from participating in gram sabhas and such forums. Such issues can be elaborated.
- It is mostly in tribal dominated regions where the FRA is nominally enforced (more often than not on the orders of the NGT or the Supreme Court) that women actively take part in demonstrations and act as responsible pressure groups to ensure that the community's rights and needs are addressed in the process of land acquisition.

6.8 Imparting agency through SHGs

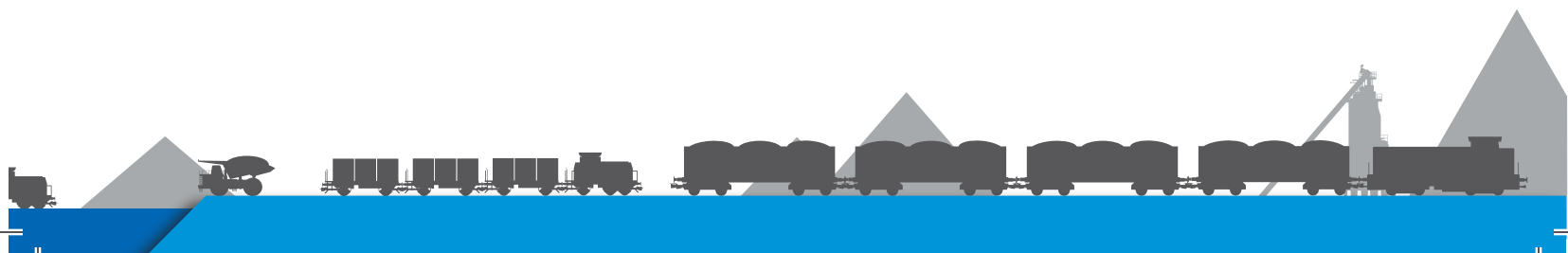
- **Gender-led economic diversification:** creating alternative livelihood options has to be the first step to address the mono-economy created around coal. Having a women-led economic diversification would help pave the way to financially empower women in a sustainable manner. Diversified livelihood strategies should be designed basis a detailed value chain analysis and assessment of agro and forest produce based potential, available resources, and demands. This would involve establishing backward



and forward market linkages, leveraging existing schemes, convergence of sub-national bodies, district mineral foundation (DMF) and CSR arms for reviewing budget allocation, and re-prioritizing key thrust areas. Local crafts and farm-based product promotion, leveraging appropriate technology, and establishing market connect are some initiatives that could be supported. Exploring alternative economy that promotes entrepreneurial ecosystem has to be made an important facet of the whole process.

- **Self Help Groups:** An important agent of mobilisation are women self-help groups (SHGs). They are a means of encouraging financial saving behaviour among rural populations. Institutions like NABARD through schemes such as Micro Enterprise Development Programme (MEDPs), Livelihood and Enterprise Development Programme (LEDP), Village level programmes (VLPs), etc., aims at strengthening SHGs by providing support around sustainable livelihood and skilling. Mission Shakti, which was launched by the Government of India in the 15th Finance commission period 2021–22 to 2025–2026, aims at working towards women's safety and empowerment. Within the 'Samarthya' sub-scheme, provisions for training, skill development, capacity-building, financial literacy, etc., are included to increase the female labour force participation.
- In Odisha, Mission Shakti has been focusing on employing women SHGs in the state for productive activities. According to the annual activity report of Department of Shakti, Government of Odisha, nearly 70 lakh women have been organised into 6 lakh groups in all blocks and urban local bodies (Government of Odisha, 2021).
- Though this is a significant achievement, TERI's field observations in 3 coal districts of Odisha reveal that SHGs have limited themselves to serving as sources of microfinance. Besides a few, most SHG members reported not receiving or participating in any professional training productive activities within the communities.
- An attempt at engaging women within energy sector resulted in participation of 1317 SHGs in 21 districts in meter reading and charge collection activity of DISCOMS of GRIDCO (Government of Odisha, 2021). These women were able to reach 943,811 consumers and earned a profit of INR10.15 crores in commission (ibid.).
- As mentioned above, women in the coal belt engage in farming. Within Odisha, around 4000 SHGs have been employed in horticulture through activities such as mushroom cultivation, hybrid vegetable cultivation and floriculture (Government of Odisha, 2021). Training schemes for agro-based income generating activities are in place. However, significant portions of the total number of SHGs in the state are still untouched by such initiatives.
- A good starting point to address women's issues is also to understand how they perceive their vulnerability. Instead of labelling them as vulnerable and weak, we should focus on how aspirational they are, especially the women in these challenging situations, and leverage that to empower them.

Keeping the coal belt in mind, policy must target the women from these areas who are suffering due to absence of opportunities and will suffer further as energy transition takes away jobs of male members of the family. This double burden must be prioritised under such schemes. SHGs from coal districts should be targeted for skill development and capacity training, preparing women for the decades to come.



7. Conclusion

India's struggle with planning and implementing a just energy transition is unique and fraught with multiple struggles as we're a developing country hosting the largest population in the world. Our environmental and developmental aspirations are often at loggerheads with each other and hence we aim to rise economically while also keeping our carbon footprint low – a contentious combination. In the midst of these macro-issues, the concerns pertaining to women calls for greater attention as they form an important section of the demography who often struggle to find a place of prominence. This paper is an attempt to highlight these gendered nature of vulnerabilities and establish how women must also be considered an important stakeholder in any just transition discourse.

Basis fieldwork done in the top coal-producing geographies of India, this discussion paper raised certain key issues of women such as surmounting health concerns due to air, water pollution, gaps in healthcare services, societal and domestic concerns due to alcoholism and domestic violence. Additionally, women are also faced with battling loss of land and related agency as well as blocked opportunities. The lack of alternative economic opportunities further exacerbates their problems and underrepresentation at the institutional level is a worry.

There needs to be a common ground which can be gained through purposeful interaction with stakeholders. This paper suggests a way forward through focused interventions which are aimed at addressing each of the aforementioned key concerns. Establishing a national level just transition fund is the first step to ensuring finance to implement the proposed interventions. A coal census must be conducted to determine an estimate of the level of intervention that is required. Government mechanisms must also be leveraged to give women the much needed agency and mobilising them together for a collective voice and active participation in local discourse. Furthermore, addressing energy poverty would lead to significant improvements in their health outcomes. Restorative justice must also be ensured and cultural mapping must be prioritized to ensure traditional knowledge is preserved.

Thus, by illustrating the many ways in which coal mining has affected women's lives and well-being and demonstrating the various ways in which corrective measures must be taken, this paper makes a case for why women must be considered as an important stakeholder for just transition interventions and programmes.



Women in the villages of Jharsuguda, Odisha



ANNEXURE I

Women in Coal Mining Areas - A Historical Perspective

In a write-up on women working in the coal industry in colonial India, Lahiri-Dutt, a well-known academic on gender in extractive industries, claims that “women’s work as part of the family labour unit was specific to eastern India,” especially the Raniganj and Jharia coalfields, as “a result of British efforts to create a ‘captive’ labour force that would not return to the fields during the cropping season.” (Lahiri-Dutt, 2012). In addition, the poor earnings in the coal industry made it essential for the family’s female members to work, and it was much preferred that they join their male relatives in the mines (ibid.). This served as the basis for the family labour unit, a system whereby whole families in Eastern India worked together to mine coal and were compensated on a piece rate basis.

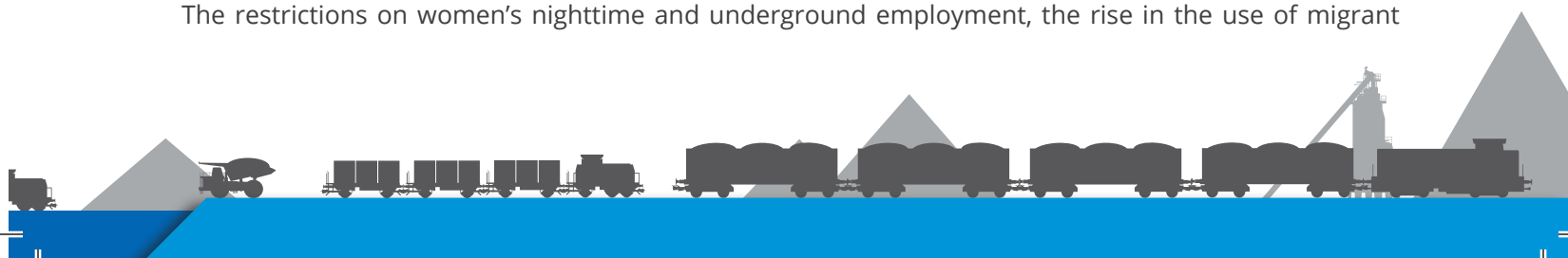
Women were employed as kamins or gin girls in colonial India’s coal mines, which were in Raniganj, Giridih, and Jharia (Lahiri-Dutt, 2001). Simeon (1996) depicts the family unit splitting into pairs, with the male relative (referred to as the malkatta in this example) cutting the coal and the female relative (referred to as the kamin) carrying this coal using baskets on their heads for a considerable distance to load it (Lahiri-Dutt, 2001). A group of three women (called gin girls because they operated the engines) ran small-beam engines that were utilised for both pumping and winding simultaneously (ibid.). Gin girls were no longer required after the invention of steam engines, and women were generally employed in surface work in open-pit mines and subterranean mines as well (ibid.). They eventually found work loading coal chopped by their male companions on a massive scale. This was appropriate for the shallow open-pit mines known as pukuriya khads, as well as for slope (ibid.).

However, from the 1920s, there was a transition from open cast mining to shaft or pit mining, and because of the huge capital investments, colliery owners preferred a steadier and more skilled workforce (ibid.). This excluded the Adivasis—for whom dedication to land as farmers outweighed their commitment to their employment in coal mines (ibid.). Coal mining corporations began hiring contractors who brought in labour from western Bihar and eastern Uttar Pradesh – then the United Provinces (ibid.). Adivasis left the collieries to work in the plantations of Northern Bengal and Assam in response to the influx of caste Hindu migrants (ibid.). As a result, most of the women coal miners, who were primarily Adivasis, left coal mining along with the males in their families, changing the mix of coal mine employees to one that was predominantly male and immigrant. Thus, it was a combination of the mechanisation of women’s labour and the contractualisation of labour due to the need for skilled migrant labour that led to the transition of Adivasis, and with them the women of their families who accounted for most of the female labour – away from coal mining. It was a process that was unjust for the women involved since after losing their jobs in coal mines they were unable to add to the household earnings unlike before.

This gender unjust transition in the Indian coal mining industry was accelerated by the barring of women from working underground in mines with the enforcement of the legislation in 1939 that prevented women from engaging in underground work and eventually the Mines Act, 1952 itself. The number of women employed in coal mining decreased from 44 per cent at the beginning of the century to less than 6 per cent at its close, despite the fact that coal mining production significantly increased over the course of the twentieth century (Lahiri-Dutt, 2012).

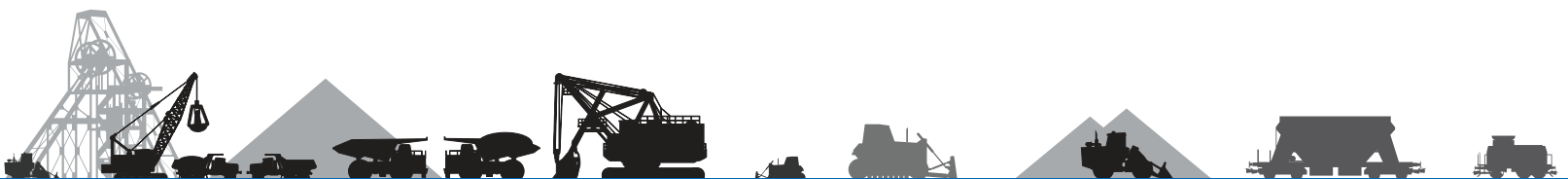
Simeon (1996) noted that women made up 37.5 per cent of the coal mining workforce in 1920 but that number dropped to 11.5 per cent by 1938 and he credits this change to the mechanisation of coal-producing operations like loading, hauling, and screening. This was coupled with the concurrent decline of tribal labour in the mining industry, and the majority of women employees were tribal (Simeon, 1996). Early in the 20th century, there was a strong demand for labour due to low levels of mechanisation in the coal mines and women made up a third of the coal mining workforce (Khaitan, 2020). Coal mines were the largest employer of women in the mining industry during this time (Lahiri-Dutt, 2012).

The restrictions on women’s nighttime and underground employment, the rise in the use of migrant



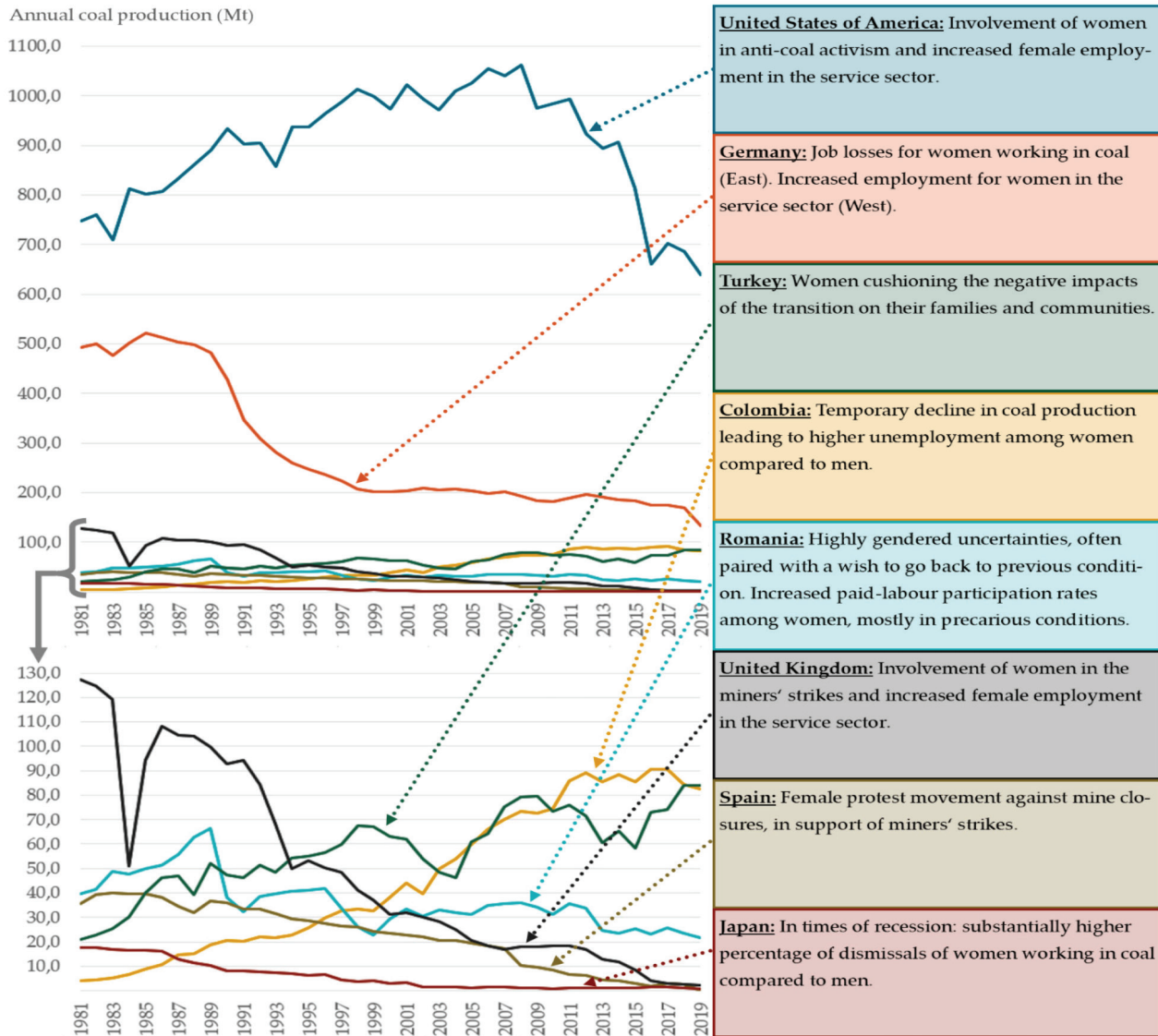
labour, as previously indicated, and the mechanisation of traditionally female-dominated industries are all blamed for the fall in female labour. The former was kickstarted by the UK's 1842 Mines Act and other industrialised nations soon followed suit. While it is acknowledged that this was done to protect women and child labourers and that it was hailed as a "victory of the working class to free themselves from unsafe work practices and exploitative labour conditions," others have argued that it was "the first and one of the most discriminatory labour legislation" against women because it was the first time that women were barred from a profession (Lahiri-Dutt, 2020). This law has also been interpreted considering shifting moral perceptions and what were once seen to be the obligations of motherhood, "the idea of home, family life, and motherhood... which restricted women's participation in the labour market." (Romano & Papastefanaki, 2020). With the adoption of the International Labour Organization's Convention 45 (C045), which forbade women and young people from working in any type of underground mine, in 1935, these sentiments, which were common in traditional Victorian Britain, spread across the globe. C045 was ratified by 38 member nations and entered into force in 1937 (ILO, n.d.).

India ratified the convention and its application in Indian legislation was seen in the Mines Act of 1952 according to which 'no woman shall, notwithstanding anything contained in any other law, (a) be employed in any mine which is below ground, and (b) in any mine above ground except between the hours 6 am and 7 pm'. Lahiri-Dutt (2011) argues that this was the outcome of patriarchal views that governed the nature of work deemed appropriate for women, that their physical safety and domestic duties took precedence over their ability to work outside the home. When the Mines Act outlawed the participation of women in underground mines, the women in question were women who were poor and belonging to the lower castes and scheduled tribes. There was no re-training of these female mineworkers to help them transition to alternative ways to earn an income. Lahiri-Dutt (2011) says that these women, being barely literate, did not have many other options than to work on temporary jobs near the collieries or in stone quarries where the working conditions were harsher and their engagement being informal kept them out of the ambit of formal legislation.



ANNEXURE II

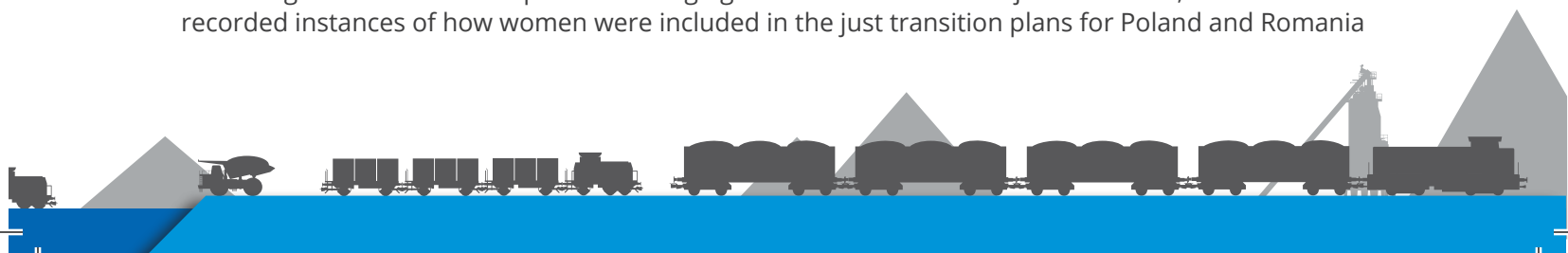
Case studies of other countries



Source: Walker et al, 2021

The figure above is from a study that assessed the impact of transitions away from coal on women which found that women in the coal industry were involved in factory jobs or care-based activities (Walker et al. 2021). The study found that since certain coal districts lacked alternative sectors and few choices for women to obtain other work, forcing them to perform largely unpaid labour, there were severe gender disparities in duties and capacities prior to the adjustments (ibid.). Consequently, the changes resulted in considerable layoffs for the bulk of male workers, although the consequences on women were seen in the secondary and tertiary job sectors (ibid.). To offset the decline in household income, women took on additional paid jobs (ibid.).

According to a World Bank report on managing coal mine closure for a just transition, there are recorded instances of how women were included in the just transition plans for Poland and Romania



(World Bank, 2018). Most surface employees in Poland's coal reform programme were women who were first denied access to the Miners Social Package, which was only available to men who worked in underground mines and coal cleaning plants (ibid.). Surface workers were added to the eligibility requirements, bringing women into the labour divestment process (ibid.). The Polish experience also demonstrated that while many of the male mining workers would not pursue lower paying positions in other sectors, women were more open to exploring other career options (ibid.). Women's nonprofit organisations in Poland's Silesia region significantly contributed to helping people, families, and communities adapt to the downsizing and layoffs in the Polish coal industry by giving aid, counselling, and shelter to those in need and addressing domestic violence, alcoholism, and drug abuse issues, which grew because of the layoffs (ibid.).

In Romania, interaction with mine employees and community representatives not only helped to the acceptance of mine closures but also contributed considerably to the design of social and labour support measures for workers, their families, and communities (ibid.). The World Bank was in charge of the closures because many of the mines weren't profitable, but men were given redundancy payouts. The money however ran out in a matter of months, causing considerable political turmoil. This shows that it is important to not just involve the men who lose their jobs in the coal sector but also their families and possibly other public authorities to ensure a holistic reform away from the coal mining industry such that it benefits children, women, and men alike.

In a study done on coal mine closure in Bosnia and Herzegovina, it was found that the country has a strong gender divide when it comes to control and access to natural resources (Lehtmetts & Del Luca, 2023). Men typically hold 70% of the land and 97% of the privately owned forests due to social norms that favour male landownership (ibid.). The sustainable use of non-wood forest products in Bosnia and Herzegovina, however, might be greatly aided by elderly women in rural areas who are knowledgeable about the resources found in forests (ibid.). The most impacted and marginalised populations frequently possess critical information, which is in line with feminist perspective theory (ibid.). Deprived groups may therefore possess information and experience that could lead to answers. This could also be one aspect of a just transition intervention in India given that NTFP collection is primarily the responsibility of women and that coal mine operations and consequently coal mine closure have negatively impacted women's agency derived from the collection, use and/or sale of NTFP produce.

The nature of women's engagement in informal coal mining can be better understood from studies done in South Africa's Mpumalanga (Lahiri-Dutt et al., 2022). There are many different types of informal mining, and the number of people who rely on it for a living varies greatly, but it particularly employs a lot of women (ibid.). For instance, women (and occasionally children) gather coal for domestic use in the Mpumalanga district of South Africa, whereas coal is scavenged for sale in Soweto. A South African respondent stated that while scavenging in abandoned underground mines requires more organisation and is typically led by men, it typically involves women when it occurs close to residential areas (ibid.). Given that South Africa belongs to the Global South and has a large share of informal labour in its coal mining workforce, it would be useful to draw parallels between the experiences of South African women in coal and similarly positioned Indian women.

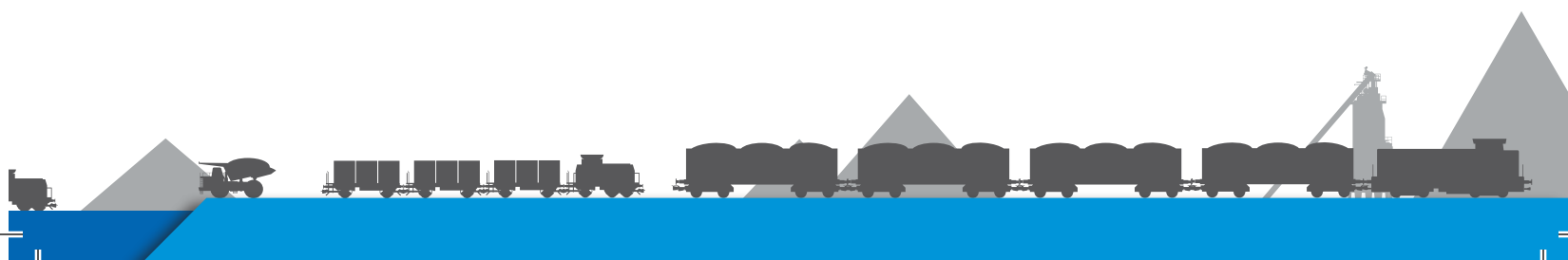
In a bid to empower women in RE and economically, the UNDP is supporting a Green Climate Fund (GCF) project entitled "Accelerating the transformational shift to a low-carbon economy in the Republic of Mauritius", which provides basic training on solar PV installation for female entrepreneurs who can then potentially integrate RE in their business activities. ¹Beneficiaries even get the chance to learn to manually repair and fix the PV, which boosts their interest in technology and elevates their experience with RE (UNDP, 2019).

These experiences provide valuable lessons for India, which is only just starting out on its just

¹ Details available at <https://www.undp.org/sites/g/files/zskgke326/files/migration/mu/GV-02---Green-Energy--web.pdf>



transition policy making journey. While women do not form a significant part of the formal coal related workforce here, it is still important to include them, since they are likely to pick up the slack in income if the primary earning member of their household loses their job. In such an event it is crucial to ensure that they are not forced into undesirable conditions of labour out of distress, even though these situations are unfortunately already prevalent in India's coal mining areas. As seen in the cases above women are less picky with alternative income options and more likely to take up additional jobs to pick up the slack in household income. Thus, directly or indirectly women are impacted by the shift in economy towards cleaner energy and it is imperative that they be able to take part in the benefits of this change.

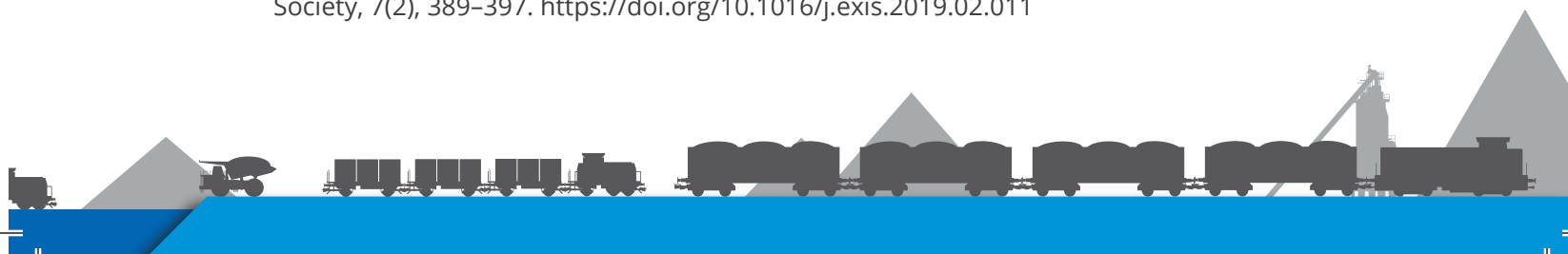


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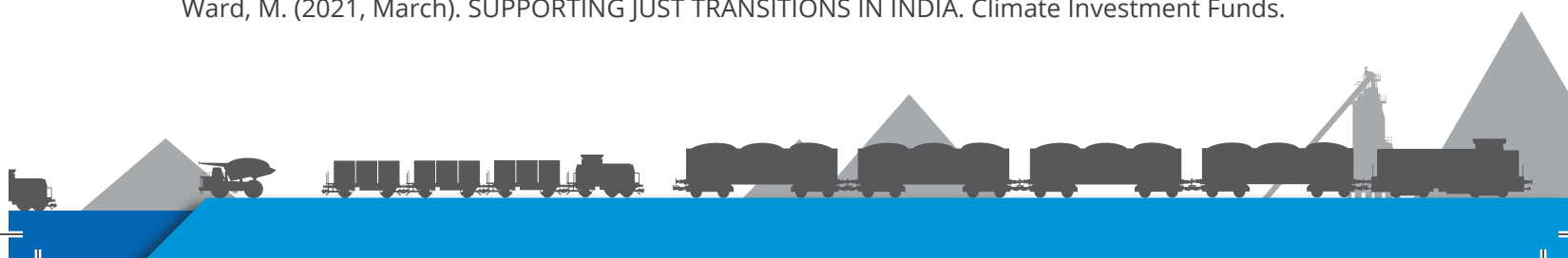
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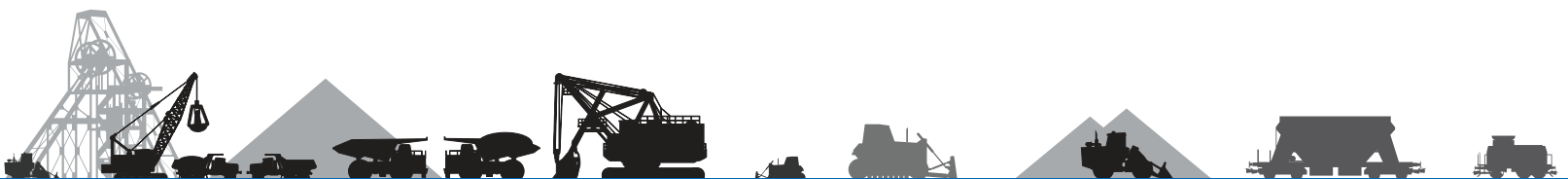


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