

HARNESSING OPPORTUNITIES FOR A JUST TRANSITION IN INDIA



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1. INTRODUCTION

India's need for clean and affordable energy is extremely critical for supporting economic activities and for addressing numerous developmental challenges faced by the country. The earlier paper had undertaken a deep investigation of the linkages that surround the Indian coal economy and the possible economic, societal and cultural implications particularly in mining rich states as we may witness phasing out coal. The aspect of 'Just Transition' and its concomitance with the energy transition in India becomes imperative. The Paris Climate Agreement that was adopted by the United Nations includes just transition as an important aspect. Just Transition possibly has its roots in the key principles of Article 3 of the UNFCCC, which among other principles, states that 'responses to climate change should be integrated with social and economic development, and recognize the specific needs of developing country Parties that are particularly vulnerable to the adverse effects of climate change'.

It suggests that the societal dimensions need to be taken into consideration by supporting transition of the workforce alongside formulating and implementing measures to mitigate climate change threats. Just transition is not a predefined set of rules or guidelines, but a larger socio economic development-

oriented vision and relevant dialogue and an agenda shared by workers, industry, and governments that need to be negotiated and implemented in their geographical, political, cultural, and social contexts.

The concept of just transitions has not been used explicitly or extensively in India until very recently, where various programs and initiatives at the state and local level have been able to demonstrate and offer important insights into how development, social reforms, clean energy access, and climate considerations could be brought together.

In this regard it becomes imperative to understand the linkages of new nuanced developmental models and the key enablers that will facilitate a just transition in India's energy sector.

Objective and Scope

In the first paper we addressed the key challenges associated with energy transition in India, like potential shrinking revenue sources from mining sector, loss in livelihoods, maintenance of social-infrastructure challenges and illegal mining and associated socio-economic development challenges.

However, this particular paper provides deeper insights and opportunities emerging

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current from isolated yet good practices for supporting just transition in India and policies that may play a critical role. It further goes on to understand the enablers that have and will facilitate just transition and further

deepen learning on how future policies need to be designed, regions to be planned for development, and capacities of communities and institutions need to be strengthened.

2. IMPROVING OVERALL DEVELOPMENT PARADIGM IN MINING REGIONS

The coal sector plays a very important role in the Indian economy. From an energy perspective, it is one of the most abundant and affordable energy fuel and coal-fired power dominates the total electricity generated in the country. It also has a huge socio-economic contribution. Coal is a major source of revenue and employment for resource rich states like Jharkhand, Odisha, Chhattisgarh, West Bengal and Madhya Pradesh. Royalty from coal is an important source of revenue for the coal dependent states. Other than the economic revenue, coal mining often gives stimulus to the local economy through the creation of jobs and contribute to the development of local infrastructure like health, education, transportation, water and sanitation.

Despite these developments, some of these districts still lack behind in the socio-economic parameters. Out of all the coal mining districts, 16 districts are included in the list of the 117 districts identified under the Aspirational Districts Programme.

The Aspirational Districts Programme, which aims at expeditiously improving the socio-economic status of 117 districts, focusses on five main themes - Health & Nutrition, Education, Agriculture & Water Resources, Financial Inclusion & Skill Development, and Basic Infrastructure, which have direct bearing on the quality of life and economic productivity of citizens. Table 1 summarizes the socio-economic parameters of the coal mining districts identified under the Aspirational District Programme.

Table 1: Key indicators of socio-economic performance in coal mining districts

State	Coal District	Child Nutrition (Child Below 5 years of age underweight) (%)	Households with an improved drinking-water source (%)	Households using improved sanitation facility (%)	Households using clean fuel for cooking (%)	Literacy among Males (%)	Literacy among Females (%)	Infant Mortality Rate (Deaths per 1,000 live births)
Chhattisgarh	Korba	29.5	80.2	34.3	26.5	82.9	66.2	52
Chhattisgarh		37.7	91.1	32.7	22.8	85.7	66.3	39
CHG Urban		30.2	97.3	64.4	70.7	93	81.6	
CHG Rural		39.6	89.2	26.6	7.6	83.1	61.3	
Jharkhand	Dhanbad	40.6	78.9	28.6	20.5	86.2	68.3	26
Jharkhand	Giridh	40.5	65.6	18.3	14.6	78.5	50.6	28
Jharkhand	Bokaro	38.8	79.8	35.8	26.8	87	63.3	28
Jharkhand	Ranchi	43.8	75	37.8	39.1	85.5	73	
Jharkhand	Godda	46	83.8	17.1	6	75.2	42.5	
Jharkhand	Sahibgunj	49.7	77.6	24.7	11.6	60.7	45.9	
Jharkhand	Hazaribagh	47.1	67.5	27.7	18	86.3	62.6	
Jharkhand	Pakur	46.9	89.3	13.4	6.5	71.2	39.1	
Jharkhand State		47.8	77.8	24.4	18.9	79.7	59	44
JHK Urban		39.3	88.6	59	55.4	88.3	79	
JHK Rural		49.8	74	12.4	6.3	75.9	51.5	
Odisha	Jharsuguda	36.5	91.3	40.3	28	87.1	76.1	71
Odisha State		34.4	88.8	29.4	19.2	84.3	67.4	40
ORS Urban		26.2	95.3	61	60.8	93	80.7	
ORS Rural		35.8	87.5	23	10.7	81.9	64.5	
West Bengal	Birbhum	43.1	97.4	28	15.5	86.2	62.1	14
West Bengal		31.6	94.6	51	27.8	81.1	71	28
WB Urban		26.2	93.5	11	61.7	83.9	79.4	
WB Rural		33.6	95.1	45.5	11.3	79.7	66.9	
Madhya Pradesh	Singrauli	37.5	56.3	15.8	17.4	76.5	53.2	2.3
Madhya Pradesh	Umaria	46.6	68.6	18.6	12.5	73.8	57.3	67
Madhya Pradesh		42.8	84.7	33.7	29.6	81.8	59.4	65
MP Urban		36.5	96.8	66.6	74.8	88.7	77.5	
MP Rural		45	79.5	19.4	9.9	78.5	51.4	
Uttar Pradesh	Sonbhadra	46.4	87.5	23.7	20.3	82.4	56.6	
Uttar Pradesh		39.5	96.4	35	32.7	82.4	61	
UP Urban		33.7	92.6	68.4	78.5	85.4	74.6	
UP Rural		41.0	97.8	23.2	16.4	81.1	56.2	
Telangana	Khammam	22.2	84.5	50.3	70	82.7	60.2	
Telangana		28.4	77.9	50.5	67.3	83.4	65.5	

Source: (Census, 2010, 2011; NHFS, 2016f, 2016h, 2016d, 2017, 2016g, 2016k, 2016a, 2016c, 2016i, 2016b, 2016e, 2016j; Statista, 2021)

Among the 16 aspirational mining districts across seven mining revenue dependent states, some of the districts are socio-economically very backward compared to respective state average or even in some cases compared to rural areas of the respective state. For example, Godda (in Jharkhand) has some developmental parameters worse than Jharkhand state average (except in case of access to drinking water supply and % of under-weight children). Moreover, in terms of indicators like access to clean cooking fuel as well as literacy rate, performance of Godda is even worse than the rural areas of Jharkhand. In case of Sahibgunj and Pakur, development of the mining districts in terms of education (literacy rate) indicators are worse than rural areas (as well as state average) of Jharkhand. In terms of access to clean cooking fuel, both Sahibgunj and Pakur perform worse than state average. On the other hand, performance of Hazaribagh in terms access to drinking water is worse than state average as well as rural areas of Jharkhand while performance of Hazaribagh in terms of access to clean cooking fuel is worse than the state average. In Madhya Pradesh, some important socio-economic indicators (access to drinking water and sanitation as well as male literacy) of Singrauli are worse than

state average as well as rural areas of Madhya Pradesh. Performance of Sonbhadra in terms of access to drinking water and health (% of under-weight children) are worse than both state average as well as rural areas of Uttar Pradesh. Thus, inspite of having large mining resources and supporting the state through mining revenue, there are developmental challenges. It is true that there are very few aspirational mining districts like Birbhum in West Bengal, for which, the socio-economic performance (in terms of access to drinking water and male literacy rate) is not only better than the state average and rural areas, but also compared to urban areas. But the relatively better performing districts are comparatively less in number than other mining districts.

There are also evidences that the coal mining districts lack behind other non-coal mining districts of the country as well. Table 2 shows a summary of the socio-economic profiles of few mining districts of Andhra Pradesh, Karnataka and Gujarat.

It can be inferred from Table 2 that compared to the coal mining districts, overall, these mining districts in Andhra Pradesh, Karnataka and Gujarat are performing better when it comes to education, health and water and sanitation.

Table 2: Key indicators of socio-economic performance in other mining districts

State	Mining District	Child Nutrition (child below 5 years of age under-weight) (%)	Households with an Improved Drinking-water Source (%)	Households Using Improved Sanitation Facility (%)	Households Using Clean Fuel for Cooking (%)	Literacy among Males (%)	Literacy among Females (%)	Infant Mortality Rate (deaths per 1000 live births)
Andhra Pradesh	East Godavari	27.1	82.1	56.8	50.3	83.3	71.7	30.5
	Visakhapatnam	25.1	88.6	55.2	56.1	82.8	64	40
	West Godavari	33.1	84.3	61.2	62.3	65.9	68.1	29
	Guntur	29.1	74.8	63.2	79.8	76.6	60.4	30

State	Mining District	Child Nutrition (child below 5 years of age under-weight) (%)	Households with an Improved Drinking-water Source (%)	Households Using Improved Sanitation Facility (%)	Households Using Clean Fuel for Cooking (%)	Literacy among Males (%)	Literacy among Females (%)	Infant Mortality Rate (deaths per 1000 live births)
Karnataka	Bellary	53.3	94.4	40.7	46.7	78	53	7.8
	Tumkur	26	80.8	52.3	39.4	87.3	70.2	6.2
	Bagalkot	44.6	88.3	23	29.7	73.2	59.3	5.9
	Chitradurga	29.9	90.5	44.2	40.2	85.6	71.7	28
Gujarat	Bharuch	44.2	85.9	67.2	49.2	85	72.4	
	Kachch	39	81.5	61.5	38.5	86.5	56.7	
	Surat	36.1	93.4	77.4	83.4	92.5	81	17.6
	Bhavnagar	44.4	95.8	65.8	46.3	93.2	66.5	

Source: (IIPS, 2016a, 2016b)

This can be because of the high dependence of the coal mining districts on a singular mode of trade or commodity for revenue. Such states whose economy and revenue stream is highly dependent on a singular mode of trade or commodity are known as rentier economy, since royalties gained from the production and consumption of the product in large part funds the non-tax fiscal revenue bit for the state economy.

However, the rentier nature of a state economy undermines the overall power of the state, this happens because since external rents are the main source of wealth while other sectors including agriculture, manufacturing and industry remain underdeveloped and pose a threat to their long-term developmental prospects. Since the state is not overtly dependent on domestic production patterns for return on capital, it doesn't see the need to increase domestic production efforts at any level (Chatelus & Schemeil, 1984). This pattern of underdevelopment of manufacturing and industrial sector is brought to light by Chitkara & Nagpal in their 2017 research paper. The pair

examined the correlation and linkage between manufacturing and other infrastructure sub sectors, transport, communication and uninterrupted electricity supply amongst 20 Indian states, including coal economies like Chattisgarh, Jharkhand, Odisha and Madhya Pradesh. Their assessment reveal that the correlation of infrastructure and manufacturing development is strongest when all three sub-sectors viz. transport, communication and electricity are taken together as compared to their individual correlations with manufacturing development (Chitkara & Nagpal, 2017). In other words, regular supply of electricity, efficient communication system and good transport are all essential for manufacturing development.

While the role of the nexus of political economy and its influence on the state's overall efficient functioning can't be ignored, it does present a solid foundation of why some areas with similar characteristics like population spread, geography and access to resources progress significantly better than its counterparts. However, given the rent seeking behavior of the

financial economy of state's inflicted with the resource curse, we can hypothesize to a certain extent that these state's central focus on the coal mining industry and inability to diversify the industrial sector has played a significant role in its underdevelopment. Despite their own largescale mining capabilities states like Andhra Pradesh, Karnataka and Rajasthan feature in the top 10 of manufacturing and infrastructure index (Chitkara & Nagpal, 2017) as they don't follow the mono industrial developmental model like most of India's coal states.

Improving revenue and socio-economic development in the mining districts

Given the prevalence of weak sustainability within the policy discourse, to achieve strong sustainability based just transition there is a need to break-away from current practices in terms of economic approaches and ownership of resources since 'it is through coalitions and relations with state institutions that incumbency is maintained and radical transitions are inhibited' (Johnstone & Newell, 2018). If they are to function on the framework of strong sustainability then what is required is to focus on the development of 'transformative transition' which engages a different growth part and focuses on new ways of production and consumption (Goods, 2013). A rentier economy that suffers from the phenomenon of resource curse often leads to a stagnation in labor intensive industrial activities which invariably stunts the growth of overall economy in place. Papua New Guinea is clear representation of this theory, in 2009 the country's OK Tedi Copper mine generated 40% of public revenues and 80% of exports. However, OK Tedi only provided 2,000 jobs (Lin, 2011). By discouraging the development of labor-intensive industries resource curse hit regions devoid themselves

from generating more jobs in these sectors as they possess the capability to absorb rural surplus labor by allowing the poor, whose income relies predominantly on wage earnings, to be employed. Additionally, once the economy improves to more capital-intensive industries wages will likely increase since when an economy's capital accumulates and its comparative advantage shifts. An economy which is heavily dependent on the production and trade of a particular commodity will ordinarily have to rely on that commodity for a large part of its fiscal revenue. A fiscal revenue system of this kind is tough to manage, as it constraints the existing institutional structure, and is more likely to cripple the entire taxations system and future revenue stream possibilities. (Radetzki, 2016)

In practice, the determination and extraction of resource rents raises many difficulties. For instance, a reduction in global demand, or technical progress, which results in a price decline will normally lead to closure of the highest cost units and so diminish the size of rent throughout the industry. Thus, it becomes even more critical to diversify the industrial paradigms of a state away from the traditional mono industrial practice, in order to promote enhanced levels of economic activity, largescale employment integration and address the missing industrial gap that exists in the economy. Given then deeply entrenched transportive and supply chain capabilities of the mining regions in the country, the transitions can be in the form of establishment of industrial parks, promotion of rooftop and utility based solar energy centres and energy storage facilities.

Need for Diversification

With respect to the conceptual understanding of a rentier economy we can view the need for a diversification as a tool which uses the existing revenue generated by resource rents

and invests them into generating human capital through education and training, and social capital to strengthen the existing institutional structure in order to build an environment of transparency that is supported by the ethics of good governance practices in order to keep rent seeking at bay. Economic diversification not only reduces the risk of exasperating the phenomenon of resource curse, but also encourages efficiency and growth by channeling economic activity away from primary generating source, in this case the coal industry (Gylfason and Nganou, 2015). This level of efficiency allows for the transfer of employment from low paying, low skill intensive jobs like mining to more lucrative employment prospects in high skill intensive occupations such as manufacturing and services. This approach of transition towards a more technologically oriented economic base is what allows for states and countries alike to attract more investment capital and improve the overall fiscal revenue system and living standards of the entire population.

Industrial Parks

The establishment of Industrial parks and manufacturing facilities in a post just transition scenario can help diversify the local revenue stream and provide the much-needed economic stimulus to ramp up socio economic measures and further improve the employability. Further, given the critical importance of manufacturing within the nation's economy the industry has a positive multiplier effect when it comes to job creation, the National Manufacturing Policy 2011 stated that the manufacturing sector has a significant multiplier effect as every job in the sector creates two-three indirect jobs in related activities (IBEF, 2012).

The imperative aspect that will determine the triumph of industrial facilities in a post coal phase will depend on how coherently

the state will be able to leverage its existing capabilities. In 2020 Coal India announced that it is planning to add 21 additional railway sidings across four subsidiaries at an estimated investment of ₹3,370 crore (HBL, 2020), while in 2018 Indian railways completed laying the 51 km track in Odisha that connected all the major coal reserves of the state to the rest of the country. Similarly, the state of Jharkhand is looking to construct/improve approximately 150 bridges and 7 bypasses and add approximately 17,200 km and improve approximately 10,800 km of rural roads over the next 3 years (Government of Jharkhand, 2021).

During the course of this paper we have presented conclusive evidence on the aspect that the success of any industrial establishment is highly dependent on the connectivity that is offered in and around its facility. This transition will play an important role in the overall supply chain management and seamless transportation of goods across the nation, and efficient labour mobility both within and across the state, which will further notably mobilize the diversification of different industrial set ups and significantly improve overall labour wages.

Solar Parks

From the perspective of revenue generation, over the last few years several states in India like Uttarakhand, Himachal, Punjab Andhra Pradesh and Telengana have gradually moved towards a land leasing model in order to fast track the establishment of solar energy projects in their respective neighbourhoods, boost clean energy investments and enhanced employment levels (Sengupta, 2016). In coal bearing states like Madhya Pradesh and Odisha land rates are extremely high and lie in the region of 5-10 lakhs per acre and 7-12 lakh per acre respectively. From an economic and social perspective, getting annual land rentals is preferable over an upfront payment of

Industrial Parks in Odisha

Odisha has emerged as a major industrial hub in eastern India. The Industrial Policy Resolution of 2015 was developed with an objective to create an enabling environment to promote sustainable industrial growth. The state government also came out with Odisha Food Processing Policy in 2013 aiming to promote food processing industries. This has also aimed to add value by reducing farm wastes while increasing farmers' income and contributing to direct and indirect employment generation. A total of 108 industrial estates have come up in various mining and non-mining locations (Government of Odisha, 2018). Gross State Domestic Product between 2011–12 and 2017–18 increased at a Compound Annual Growth Rate (CAGR) of more than 10%. The state has emerged amongst the top 10 states accounting for the highest number of MSME enterprises (IBEF, 2020). Manufacturing is the leading sub-sector under industries, which grew at 10.7% in 2015–16, 33.2% in 2016–17, 8.6% in 2017–18, and 7.6% in 2018–19.

The parks have also been major source of revenue to the government. Although total revenue generation from these parks by the government is not available, the increase in share of tax revenue in recent years can be a reflection of the increased revenue from these states. Odisha's own non-tax revenue has declined from 7% of the GSDP in 2015 to 6.5% in 2019, however the share of tax revenue has marginally increased from almost 2.4% to nearly 3% of the GSDP during the same period. Some of the major industrial parks that has come up in recent years are listed here.

- Angul Aluminium Park at Angul over an area of 223 acre
- Seafood Park at Deras over an area of 152.78 acre
- Plastic Park at PCPIR at Refinery Complex of IOCL over an area of 120 acre
- Textile Park and Food Park over an area of 234 acre near Dhamnagar in Bhadrak district
- Development of Electronic Hardware Manufacturing Cluster at Info Valley, Bhubaneswar over an area of 203.37 acre
- Development of two IT/ITES SEZs, namely, SEZ at Chandaka (Bhubaneswar) over an area of 145.91 acre and Infocity-II IT SEZ at Gaudakashipur near Bhubaneswar (Info Valley) over an area of 262 acre.
- Developing an Inland Navigation System for movement of cargo from industries and mines to ports. MOU has been signed between Govt. Of Odisha and Inland Waterways Authority of India, Paradeep Port Trust and Dhamra Port.

Source: (Odisha, 2015)

compensation as it provides a regular source of income to the landowners, besides bestowing the option upon the owner to get back the land after the expiry of lease period (Kumar and

Thapar, 2017). This model is preferable for the state governments standpoint as well, since the flexibility to avail land without paying large sums of money for it creates a conducive

Karnataka Plans Industrial Park at Kolar Gold Fields

As of August 2020 the state of Karnataka is pursuing plans to set up an industrial park on 3,200 acres of unused land owned by Bharat Gold Mines (BGML) at Kolar Gold Fields, about 94 kilometres from Bengaluru. The location has been identified as ideal for solar manufacturers, automobile units, electronics, and pharmaceutical companies to invest as it is well connected by expressway and railway. Apart from being 94 km's away from Bengaluru airport, the place is also 260 km from Chennai port and 314 km from Krishnapatnam port, and hence, is strategically located, and thus is a primed establishment place for the setting up a large-scale industrial economy.

The project is in line with Karnataka's new and renewed Industrial Policy 2020-25 which has laid great focus on facilitating investments in advanced manufacturing capabilities. Dubbed as a pro industry policy, the development of such industrial parks is in line with the recent reforms undertaken by the state government, such as amendments to the Land Reforms Act, the Labour Act, and Karnataka Industries (Facilitation) (Amendment) Act.

Further, these plans are also strategically aligned with state's renewable energy vision. The Draft Karnataka Renewable Energy Policy 2021-2026 aims at developing 20GW of renewable energy projects. The state is largely focusing on developing renewable energy and hybrid parks, encouraging private sector participation in transmission network and boosting electric vehicle adoption. The development of such industrial parks is pivotal for the state as it aims to realize its sustainable development goals. (Times, 2020; Cyrill, 2021; Prasad, 2021).

business doing environment and positively impacts investor sentiment.

Establishing large scale solar parks on former coal mine establishments can be viewed as a righteous move ahead as the proposal seeks to make use existing infrastructure and capabilities such as land, labour and transportation connectivity to increase clean energy markup within the state's energy mix. Going beyond states, such solar parks can help country move towards decarbonization. Parts of premier coal states in India such as Odisha, Chhattisgarh and Madhya Pradesh are solar energy hotspots as some of the areas in these states have the potential to produce high to very high amounts of solar energy (Fernandes,

2016). This opens up a stream of possibilities and the manner in which the sheer capacity of lands in and around the coal mines can be revitalized for capacity building purposes. The Indian solar sector is expected to create over 300,000 jobs by 2022, to meet this target the number of manpower required by ground-mounted solar rooftop solar projects would need to increase significantly. (Today, 2020). Rooftop solar in India produces 24.72 jobs per year per MW, while ground mounted solar produces 3.45 jobs per year per MW (Kuldeep et al., 2017). Further, 120,990 direct and indirect employment jobs were created within the solar sector in 2017 (Tyagi, 2017).

Further, the development of solar parks in

Rewa Solar Parks

Situated in Madhya Pradesh the Rewa solar park, a 750MW solar project gained international recognition for bringing down the solar tariff to grid parity in February 2017. A total of USD100 million in loans and grant funding was raised for the Solar Parks project, of which USD18 million were disbursed for the Rewa solar project. The location of the Rewa Solar Park on low productivity land, in conjunction with the reduction in the need for coal mining and coal-fired power stations, creates a number of environmental benefits. These include decreased deforestation in coal mining areas, reduced water use and pollution, improved air quality, as well as the decline of 1.5 million tons of CO₂ emissions per annum. (CIF, 2021)

remote locations creates many socioeconomic opportunities that may otherwise have not existed. They also create benefits further afield such as cleaner and cheaper electricity that have the potential to support human development and economic growth. In the transition processes, these social and economic benefits could be proactively distributed in ways that contribute to more inclusive and equitable development. The focus on the communities in the near vicinity could be expanded to take into account systemic changes at local, regional, and national levels with a view to contributing more intentionally to a just transition.

Energy Storage Facilities

Energy storage systems are becoming an increasingly important power system

Bhadla Solar Park

Located in Rajasthan and spread across more than 14,000 acres, the Bhadla solar park is one of world's largest solar park with a capacity of 2,245 MW. The establishment of the solar park has brought in technological advancements with it as well, as due to the arid environment, the solar park has introduced technologies to reduce water use to a minimum. Besides this the project is also expected to reduce CO₂ emissions by approximately 4 million tons per annum. Most importantly however, the park has been able to reduce the demand for coal-fired power stations, coal mines, and emissions from coal transport.

The establishment of the project led the development of progressive CSR policies which helped provide 150 women vocational training on embroidery work and handicrafts and trained 75 women in basic accounting, finance management, and negotiation skills. Further, 415 women benefited from Micro Enterprise Development Training on Animal Husbandry. (CIF, 2021)

component due to the integration of variable renewable generation sources. This is expected to continue as the costs of solar and wind generation decrease further, and countries aim to achieve more stringent emission reduction targets on the path towards decarbonization (Pickard, 2015). Storage facilities play an essentially telling role in the overall acceptance of renewable energy at all levels. By storing energy from wind and solar farms, battery

facilities enable access to energy needs when such renewable energy farms are unable to produce them due to naturally occurring constraints. In order to warrant a renewable energy powered society and infrastructure in a post coal scenario, we need to establish energy storage facilities to empower their access and enable a seamless transition towards just transition.

Additionally, from a capital flow perspective, energy storage improves power management since it can generate power during times of low demand and hold it in reserve for when it is needed, thus reducing the need to generate enough power for peaks in demand. This practice of peak load shifting has the potential to improve overall electricity grid stability, reduce costs and largescale transmission losses, given that India wastes 15-20% of its renewable energy due to lack of storage (Raghavan, 2016). Further, by replicating the land lease model of solar utility establishments, large scale energy storage facilities can come to fruition in different areas across the country. Since, energy storage is critical for long term renewable energy growth, this move will prove potent for respective state governments as it will improve revenue flow, augment employment, and attract investment.

To reutilize the infrastructure of abandoned deep shaft mines, a new and intriguing proposition of gravity energy storage with suspended weights has been receiving wide-spread accolades for its technological diversification. The technology has relatively low-energy density, but has advantages including a power capacity decoupled from its energy capacity, no cycle-limit, and the potential to be combined with compressed air energy storage. It is currently being trialled in the United Kingdom, targeting abandoned coal mines (Morstyn, Chilcott and McCulloch, 2019).

The UK-based startup 'Gravitricity' has been

working on developing a gravity-based energy storage technology and received funding of £650,000 for developing a trial system. This system offers several advantages, including minimal surface land use and the possibility of combining it with compressed air energy storage (Morstyn, Chilcott and McCulloch, 2019). It has been estimated that a full scale project such as this would drop 24 weights totalling 12,000 tonne to a depth of 800 m to produce enough electricity to power 63,000 homes for more than an hour. It has been estimated that electricity released by a typical 10 MW lithium-ion battery project would cost \$367 (£283) per megawatt-hour over its lifetime compared to a cost of \$171 (£132)/MWh for electricity from a Gravitricity project (Ambrose, 2019).

Supporting Rural Development Through Innovative Enterprise Models

In coal mining districts, outside of mining, there is a high dependency on agriculture. Farming and agricultural communities, particularly vulnerable in coal mine regions, need sustainable solutions to meet not only their food security but also enhance their economic participation through agri-entrepreneurship.

Even though the negative externality associated with coal mining largely impacts the soil quality of agricultural fields in its vicinity, climate smart crop that are drought resistant and grow in areas with low rainfall and infertile soil (FAO, 2015), such as millets, can be sustainably promoted. Nearly 20% of the total potential employment in India (around 11 million jobs) comes from just one opportunity, i.e. the low income food markets. Developing rural enterprises around nutritious and accessible food products and along its supply chain can boost incomes and rural livelihoods. This in turn would create jobs and

add economic value to a region and community.

For the augmentation of a market economy that promotes the aspect of rural entrepreneurship, we have to look at financing tools/schemes alike that cater to both individuals and industries in order to create necessary job opportunities and infrastructure maintenance for the needs of the entire population. While micro approach will help us understand the nature of financial route we can take at a village or panchayat level, a macro conceptualization can strategically focus on scaling the financial interventions at a state-wide level for wide-scale implementation and acceptance.

At the micro level, micro credit financing has proven to be the successful tool to enable entrepreneurship, increase standard of living and livelihood maintenance. In their survey of South Rajasthan, Mathur et al. (2020) found statistically significant results between microfinance and its implementation tools with entrepreneurship as it directly resulted in immediate improvement of living standards and per capita income.

The Government of India's Deendayal Antyodaya Yojana- National Rural Livelihoods Mission (DAY-NRLM) is also an extensive mission to address rural poverty through sustainable community institutions of the poor. NRLM ensures that at least one member of each identified poor rural household is brought under the Self-Help Group (SHG) network. Linkage with sustainable livelihood opportunities through building skills and enabling access to formal source of finance, entitlements and services from both public and private sectors will be key aspects of such livelihood programmes (Ministry of Rural Development 2019).

The programme further provides financial benefits to the beneficiaries in the form of community investment fund, bank linkage,

and capital received under interest subvention. Additionally, non-financial benefits in the form of providing short duration learning programmes are also provided to make youths confident and self-employed. Furthermore, training on financial literacy is also imparted to the beneficiaries (Mishra 2018). The programme has supported rural start-ups in the non-farm and off-farm sectors, promoted agro-ecological farming amongst women's groups in particular, created value chain development interventions to enhance market linkages (Ministry of Rural Development 2019).¹

In India, currently there over a 100 regulated Micro Finance Institutions (MFIs) that have not only helped build entrepreneurial success but also assisted in attaining critical livelihood measures such as providing adequate housing services, and poverty alleviation (Vetrivel and Kumarmangalam, 2010).

However, to see through the success of financing option in rejuvenating rural entrepreneurship, other mechanisms also need to holistically compliment the financial framework. In the study done on understanding Rural Entrepreneurship through Micro Finance, Bank Lending and Subsidy in 15 panchayats of Mysore, Karnataka, Ramakrishna (2014) found that 20% of the enterprises engaged in service activities had shut down, while that number was 13% in the case of food processing enterprises and 32% in the case of manufacturing enterprises. The reason behind such mass closure was found to be enterprises inability to compete in the marketplace. Thus to protect such establishments in the open market conscious local efforts need to go towards marketing tie ups and forward linkages to sustain long-term grown and sustainability (Ramakrishna, 2014).

¹ Details available at <https://rural.nic.in/press-release/day-nrlm-reducing-poverty-through-livelihood-diversification>

Using Human Resources for Building Commons

The protection of common pool resources to help poor communities survive in colliery tracks is crucially important (Lahiri-Dutt, 2016). The MGNREGS² (Mahatma Gandhi National Rural Employment Guarantee Scheme) is one such employment intensive programme that, besides addressing poverty reduction, addresses restoration of ecosystems through works such as the renovation of the traditional water bodies, afforestation, tree plantation activities, soil and water conservation, horticulture, land development works amongst others. MGNREGS has a greater role in supporting climate-resilient development in the most vulnerable communities (Soanes et al., 2019).

In Odisha, funding from MGNREGS, besides others, was used to support the implementation of the Gram Panchayat Development Plan, a plan that was a result of participatory planning process across five hundred gram panchayats (village councils) in identified blocks of four districts of Bolangir, Bargarh, Nuapada, and Kalahandi. The plan was based on the identified hazards, risks and opportunities related to water security and livelihoods. Community members were trained on preventing soil degradation, improving conservation practices, nutrition sensitive interventions such as food gardens near anganwadis (rural child care centres) amongst others.

Interventions were successful in improving water availability at the community level through installation of check dams, ponds and percolation tanks and helped in reviving traditional practice such as allocating water ponds just for cattle. (Saxena and Chouhan, 2020).

² MGNREGS, provides at least 100 days of guaranteed wage employment per financial year to every rural household whose adult member volunteers to undertake unskilled manual work.

Studies have shown that the introduction of MGNREGA has not only led to an increase in the agricultural wages but also reduction in the male–female wage differentials (Reddy et al. 2014) and alleviation of women to a higher status as they become earning members.

Improved and Sustainable Infrastructure

Coal-producing states of India need an infrastructure redevelopment framework. Over the years the likes of Jharkhand, Chhattisgarh and Odisha have consistently featured in the bottom half of Infrastructure Development Index based on their poor infrastructure and industrial output (Chitkara and Nagpal, 2017).

Increasing Energy Access through Renewables

Expansion to renewable energy products, services, and infrastructure will drive development and help improve living conditions, particularly in rural communities where its use as a decentralized energy source has been shown to be a viable and efficient option (Mahapatra and Dasappa, 2012; Mustonen, 2010).

Even with complete rural household electrification under Saubhagya scheme, access to 24*7, quality and affordable electricity is inadequate. The country will face an increased demand for energy. A few success stories captured here are examples of the key role played by renewables in bringing about a bottom-up process of community engagement, social inclusion, and addressing poverty.

Renewables also has the potential to translate into higher labour demand across many sectors, thereby leading to the creation of new jobs and as the incomes generated are spent across the economy, they create further employment (induced jobs) in coal regions and this can be used for the socio-economic transition of the

Case Study - Integrated Domestic Energy System by TERI

Solar-powered driven 'Integrated Domestic Energy System (IDES)' designed by TERI, comprising a solar panel for charging battery to run LED lights, while providing mobile charging point coupled with a forced-draft improved biomass cook-stove that has the potential to provide clean and affordable energy access in remote locations while also creating local jobs and entrepreneurial opportunities for hundreds of the village dwellers in major coal mining districts in 2018. Over 50,000 rural houses in Bihar have now access to clean cooking and lighting through the IDES system.

The IDES were made available to women self-help group members through a unique financial model. Of the total cost, 60% was paid by the women in monthly instalments and 40% is contributed by CSR funds and grants from bilateral/multilateral donors (TERI 2018).

Case Study – Decentralized Energy Access for Public Health Centres in Chhattisgarh

In Chhattisgarh, most public health centres (PHCs) had no reliable source of power, partly because the state is heavily forested which makes grid extension difficult. To overcome this challenge, Chhattisgarh State Health Department collaborated with CREDA (Chhattisgarh State Renewable Energy Development Agency) on a programme to provide solar power at all PHCs.

A Solar PV system was designed and installed at each PHC following an energy audit. Energy-efficient appliances such as LED lighting, freezers, vaccine refrigerators, computers, centrifuges (for blood analysis), baby warmers, fans, and microscopes were also installed. The solar system is connected to the load with a change-over system, so that the load can be shifted to the grid (where and when available), ensuring 100% energy security.

The centres now provide 24-hour healthcare and are able to treat a greater number of patients. There has been a fourfold increase in the number of institutional deliveries and now deliveries can take place safely even during the night.

Digitalization of patient services and improved operational efficiency are two other co-benefits. New smart card services allow patients to register for free medical treatment. Reliable Internet services have enabled patients to order medicines online. (SEA, 2019)

Case Study: Two Stage Biomass Gasification

TERI's through an innovative technology transfer and intellectual property rights sharing of two-stage biomass gasification has been able to provide rural communities clean energy access and security. TERI had partnered with the state government and community-based organizations in selected districts in Odisha and Madhya Pradesh to provide reliable electricity to women self-help groups, increasing the income generated by them, and electrify rural households.

In Koraput district of Odisha, the irregular power situation in many areas has affected small agricultural processing activities. Poor sales and quality affected livelihood options and wastages. Installation of two-stage biomass gasifier had been able to provide regular and clean electricity access at very affordable prices. The gasifier has been able to support new livelihood in processing of cashew, pulses and rice for them to be sold directly to the market, which would have not been possible without a regular supply of electricity. Reported income has increased by as high as 500%. The increased production has supported many women and children at the Anganwadi centres thereby improving their standards of living and quality of life (Dhingra 2018).

mining areas. It has been estimated that up to 3.2 million people can be employed in the renewable energy sector in India by 2050 (IASS and TERI 2019). Research also indicates that risks tend to be lower with a move towards a low carbon economy (Poschen, 2015).

Significant potential exists for the expanded use of various renewable energy technologies to improve health and education outcomes. Application of decentralized solar powered mini-grid systems presents a unique opportunity for electrification of healthcare and educational facilities.

Land Reclamation through Mine Closure Building Social Infrastructure

In the classic remote mining town, closing the mine often means closing the town as well, as mines frequently constitute a larger proportion of the local economy. Most mining operations are served not only by physical infrastructure such as roads, water supplies, sanitation systems, electricity and telecommunications, but also often subsidized social infrastructure facilities such as better health providers, education, community centres, sports facility, skill levels, and employability of local people. The development of these infrastructures may even facilitate other forms of economic activity, such as tourism. In 2016, the Western Coalfields Limited, to raise awareness about the importance of coal mining, opened its coal mine for tourists. It also turned the site into an eco-park and allowed the tourists to visit the open cast mine (Ministry of Coal 2016). The maintenance of such projects is critical for the robust development of the local economy and its employment status.

A clear theme that emerged from the Mine Closure Workshop hosted by the World Bank Group (World Bank 2021) was the universally reported difficulty for local authorities to take on responsibility for social services and infrastructure when mines close or are privatized³. Hence, to provide sustainability,

3 Khanna, T., World Bank Group., & Kinzoku Kōgyō Jigyōdan. (2000). Mine closure and sustainable development: Results of a workshop organised by the World Bank Group, Mining Department and MMAJ, Metal Mining Agency of Japan. London: Mining Journal Books.)

these benefits must continue after closure and the planning phase should adequately focus on sustaining the benefits and further strengthening and developing the existing social infrastructure.

Efficient and timely repurposing of land and other infrastructure of the coal areas is often seen as a decisive factor in building and strengthening infrastructure and opening opportunities for renewed future regional prosperity. The City of Genk in Belgium provides a good example whereby old, coal-related infrastructure is now strategically used as an asset for modern social and economic development where the focus is on education, creative economy, recreation, and art.⁴ In Romania, the National Agency for Development and Implementation of the Programs for Reconstruction of the Mining Regions was established to oversee and implement the social and local development aspects of the coal sector reform programmes.⁵ Certain guidance on socio-economic aspects of mine closure policy also highlights the need for good quality and access to local public services, including education and training opportunities, appropriate levels of primary healthcare, and community facilities, availability and access to ICT infrastructure, especially for leisure.

In India, it is noted that due to mine closure, reductions in the population can lead to a subsequent reduction in government funding provided to education and health services. Schools may lose teaching staff and health services may be cut and this issue may be exacerbated if the mine has historically provided funding for these services.⁶ However,

4 Details available at <https://revolve.media/genks-transformation-honors-its-heritage/>

5 Details available at <http://www.scielo.org.za/pdf/jsaimm/v110n7/09.pdf>

6 Details available at http://www.ieindia.org/webui/ajax/Downloads/WebUI_PDF/Repository_Doc/AIS/AIS-2310-Vol-1.pdf

the ‘Guidelines for Preparation of Mine Closure Plan’ clearly states that the existing infrastructural facilities available, such as roads, aerial ropeways, railways, power lines, buildings and structures, water treatment plant, transport and water supply sources in those areas and their future utilization should be evaluated on a case-to-case basis. If retained, the measures to be taken for their physical stability and maintenance should be described.⁷ However, empirical evidence on comprehensive implementation of mine closure guidelines and its impact on social infrastructure remains a challenge.

Mining regions are characterized by various forms of social inequality. For instance, it has been noted that mining regions though gives stimulus to local economy and increase population income and business opportunity, it also creates income inequality which has the potential to trigger social tensions and inequality (E. Jul-Larsen, et al).⁸ Mining regions are also known to create gender imbalance due to prevalence of migrant of male workers, undermining social cohesion and spreading problems of psychological or behavioral nature (Dutt and Ahmed 2006).⁹ Hence, reducing social inequality is likely to be a particularly important success factor in post-mining transitions, especially in developing countries, where mining regions have often been characterized by high wealth concentration and very limited benefits in terms of human or social development (Meyersfeld 2017).¹⁰

7 Details available at <https://ibm.gov.in/index.php?c=pages&m=index&id=214>

8 E Jul-Larsen, B Kassibo, S Lange, I Samset. Socio-Economic Effects of Gold Mining in Mali: A Study of the Sadiola and Morila Mining Operations. CMI Report, 2006

9 Lahiri-Dutt, K., Ahmad, N., 2006. Engendering mining communities: examining the missing gender concerns in coal mining displacement and rehabilitation in India. *Gender, Technology and Development*, 2006 - Taylor & Francis

10 Meyersfeld, B. (2017). Empty Promises and the Myth of Mining: Does Mining Lead to Pro-Poor Development. *Business and Human Rights Journal*, 2(Issue 1). 31–54.

Nevertheless, for sustainable integrated development of social infrastructure and to meet the local needs, several studies have called for formation of partnerships, involving communities, governments and non-government organizations for resolution of community or collective dilemmas by minimizing free riding, facilitating consensus building, and helping to increase social capital, in the form of knowledge, policy global consensus and social infrastructure (Epps and Brett, 2000¹¹, Limpitlaw, 2004¹²). However, currently, the approved Mine Closure Plans for coal mines in India do not incorporate any

inputs from local communities or other major stakeholders since the approval of the Mine Closure Plan pre-dates the public consultation process required to obtain an Environmental Clearance as per the Environmental Impact Assessment Notification of 2006 (MOC, 2013).¹³ Nonetheless, the advantages of building these partnerships include providing resources, transfer of knowledge, community mobilization, securing public and political mandate, and building understanding between potentially adversarial groups.

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- 11 Epps, J. and A. Brett. 2000. "Engaging Stakeholders," in James M. Otto and John Cordes (Eds.) *Sustainable Development and the Future of Mineral Investment*, United Nations Environmental Programme (UNEP), Paris.
 - 12 Limpitlaw, D. 2004. "Mine Closure as a Framework for Sustainable Development," School of Mining Engineering, University of the Witwatersrand, Johannesburg, March.
 - 13 Ministry of Coal (2013). Mining Plan and Mine closure Plan. <http://environmentclearance.nic.in/writereaddata/online/EC/100120180QRJSUVNAnnexure-Additionaldocument->

3. UNDERSTANDING ENABLING DRIVERS TO SUPPORT JUST TRANSITION

In the event of a coal phase out, the biggest challenge that will hinge upon the central and different state governments of the country will be economic revitalization. Coal states are heavily dependent on the sector not only for employment, but also for financial reasons given their large-scale contribution to the non-tax revenue of a state; a phenomenon we delved deep into in our previous working paper. The overall challenge at hand is to lay the groundwork for the creation of a working economy that will lead to an expansive participation of people, whilst assisting in the overall formalization of the economy.

Investments in rural development and also creation of new sustainable jobs through promotion of rural agri-based enterprise are necessary in order to create attractive living conditions and to offer communities promising prospects in the coal phase out regions. Moreover, some of the subsidized social infrastructure facilities in the coal regions like better health and education, water and sanitization are of utmost importance and must be supported to continue in the event of a coal phaseout. Moving towards clean energy also provides tremendous potential to build social infrastructure, diversify economy, and promote livelihood activities. Most importantly moving towards Just Transition would need innovative financing routes, since it will be a challenge to rely only on public and private sector banks.

Reducing social inequality and strengthening human capital are likely to be important success factors in post-mining transitions. The existing workforce has to be skilled on alternative livelihood options along with emphasis on education of the next generation. Another important aspect for accelerating the transition while reducing social conflicts is promoting social dialogue, social protection, and economic diversification. The efforts and convergence of the approaches of government, private sector, and civil society organizations assume utmost significance in forging meaningful partnerships.

Augmenting Public and Private Sector Financing

One way the government can look to finance these infrastructure projects is through the off-budgeting borrowing mechanism. Undertaken by the Centre through the assistance of an implementing agency like a public institution, this kind of borrowing mechanism allows it to finance its expenditures while keeping the debt off the books. Also, since the liability of the loan is not formally on the Centre, the loan is not included in the national fiscal deficit. This helps keep the country's fiscal deficit within acceptable limits and allows for key financial investments to take place. Apart from the off budget borrowing route, recently the Government of India gave its nod for the

development of a new Development Fund Institution (DFI) which will look to finance big infrastructure projects by raising \$41 billion over the next few years (Gill, 2021). This DFI can also be looked as a pivotal player in expanding the developmental scenario in India's stress-ridden coal states, as it can look to provide a much-needed impetus for economic development there.

While a move towards 'Just Transition' would need specific financing routes, it also opens up an opportunity for redeveloping the infrastructure landscape from a 'green vision'. Although infrastructure funding in India largely relies on public and private sector banks, they alone cannot finance the capital (Table 3).

This is where the notion of securitization can help in providing additional financial outlets for capital regeneration. Securitization refers to the process of transforming a pool of liquid financial assets (for example mortgages or lease

receivables for a rooftop solar PV system) into tradable financial instruments [also known as Asset Backed Securities (ABS)]. The process assists lenders like banks, and leaseholders, like car financing companies, to sell pools of loans or lease, or other receivables, to institutional investors to generate new lending capacity. This allows lenders and leaseholders to overcome funding constraints and continue to provide loans/leases to its customers (Climate Bonds Initiative, 2019).

India over the last few years has seen a rise in the issuance of asset linked green bonds for raising capital. In 2017 Azure Power raised \$500 million from the sale of its green bond (Bhalla, 2017), while in 2021 another renewable energy company Renew Power raised \$575 million via green bonds (Das, 2021). Between 2015-17, the issuance of asset backed securities more than trebled and reached an impressive Rs 103 lakh crore. Further, to improve investment capabilities and overall global

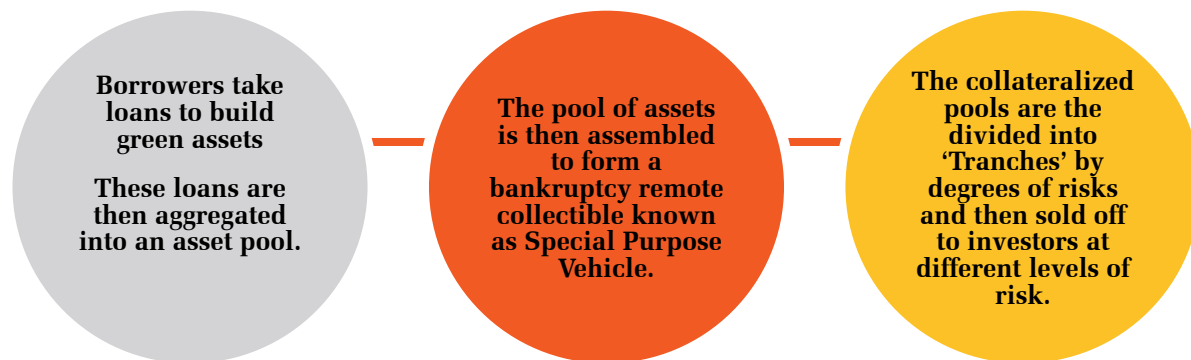


Table 3: Largest financial institutions that funded the initial renewable energy deployment - 2017

Public Sector Banks	Private Sector Banks	Government Backed NBFC's	Private NBFC's
State Bank of India 6%	IDFC 15%	PTC Financial services 6%	L&T Infracapital 12%
Bank of Baroda 5%	Yes Bank 10%	PFC 3%	India Infradebt 4%
Union Bank of India 4%	Indusind Bank 9%	IREDA 3%	
	ICICI 5%		

Source: (Climate Bonds Initiative, 2019)

investor sentiment, the Indian Government is keen to see the corporate sector expand its use of bonds financing. Proposals in the Union Budget of 2018-19 mandate large corporates to use bond financing to fund a quarter of borrowing needs. In response to this the regulatory investment grade as set by Pension Fund Regulatory & Development Authority has been reduced from AA to A. Stamp duty rates have been standardized across states (Climate Bonds Initiative, 2019).

Strengthening Human Capital

A transition to a green economy will have a dual impact on the employment opportunities by resulting into job loss in the high-emitting sectors, but also creating newer opportunities in cleaner energy sectors. However, there could be possible barriers for the workforce in making a smooth transition. These include unexpected loss of job and the resultant unpreparedness, different geographical areas of job opportunities (states where coal is mined in India are different from states which hold immense potential for large-scale renewables, particularly solar), lack of access to opportunities or information on skilling and re-training in the new sectors.

Under the overarching principles of Just Transition, these barriers will have to be addressed through a multi-stakeholder partnership. Bringing together governments, business, unions, educational and vocational institutions and civil society in identifying existing skill gaps, skill needs and investments, content and scope of training, curriculum design, course validation, disseminating information on labour market programmes, beneficiary identification will help minimize disruption.

During the transition of the Ruhr Coal industry, the Ruhr Coal Vocational Training Society (RKB), a 100% subsidiary of the Ruhr Coal AG,

was in-charge of managing the labour market transition. The institution was responsible for mapping the existing as well as the future skills demand and strategize the re-employment of the workforce in collaboration with the regional government, company management, and work councils (ILO 2018).¹⁴

The National Skill Development Corporation, built on a public private–partnership model, aims to promote skill development by catalysing the creation of large, quality and for-profit vocational institutions in the country. It financially supports enterprises, companies, and organizations that provide skill training. NSDC has partnership with around 100 private players to setup skill training institutes and a training centre in every district.

Enhancing Educational Outcomes

However, besides skilling the existing workforce in alternative livelihood options, it is equally important to emphasize on education and specifically of the next generation. There is a possibility that this generation will not have employment opportunities of the kinds their parents had. A number of studies have established that for improving livelihood prospects, education is of high significance, even if it is to acquire skills at the workplace. Low levels of education is closely linked with vulnerability and lack of occupational mobility. For a smooth transition, a resilient workforce is required. The key lies in education and in strengthening school education to build better capabilities.

14 Just transition towards environmentally sustainable economies and societies for all - ILO ACTRAV Policy Brief. Written by Béla Galgóczi, Senior Researcher at the European Trade Union Institute (ETUI).

Promoting Social Dialogue and Partnership

While it is important to establish dialogues with key stakeholders, continued consultation with all relevant stakeholders needs to take place in formulation and implementation of economic and social policies that will ensure a Just Transition for workers and communities.

The private sector in partnership with governments can play an important role in Just Transition through enhancing job opportunities by developing new emerging sectors that can mitigate negative impacts and reinforce positive developments. For instance, it can create local employment opportunities through accelerating investment in renewable energy, as it is an important source of growing demand as well as by joining private–public partnerships and initiatives to finance large-scale renewable energy projects. Clear national policies, road maps, and targets provide important signals to the private sector to accelerate the shift of investments. The private sector can also support government in retraining present coal sector employees and the communities that are directly and indirectly dependent on the coal mines for livelihood through skill development in green jobs. For instance, India’s Council for Green Jobs, founded in 2015, offers over 70 courses oriented toward environment sustainability by private institutions (ILO, 2018).¹⁵

As trusted champions, civil society organizations can play a key role in the Just Transition processes. Convergences of approaches are often successful when civil society organizations work in tandem with local governments and private sector at sub-national levels. They help in identifying challenges and responses to support a shift in narrative

15 International Labour Organization (ILO) (2018a). *Greening with Jobs. World Employment and social outlook 2018*. International Labour Office, Geneva. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_628654.pdf

and perception of the local communities in terms of environmental, health or livelihood concerns while helping to reduce opposition. Moreover, civil society can be actively engaged as an interface between the private sector/government/coal mines trade unions in creating alternate employment opportunities and positive impact on net employment at the local level. Studies have indicated that the main advocates for the phase-out of coal and transition to renewables have been civil society organizations, particularly the NGOs working on climate change, while renewable energy associations have been quite successful in lobbying for favourable policy conditions for the development of the renewable energy sector (Zinecker et. al 2018).¹⁶ Governments of Canada, Germany, Ghana, and Spain have set up dialogues that bring together unions, businesses, and civil society to foster dialogue and identify solutions for a just energy transition (Addo, Bazilian, & Oquah, 2017).

Creation of task force with government, private sector, and civil society may be assigned to engage with relevant stakeholders, notably local workers and coal- dependent communities that will be most affected. To aid better transition policies and increased social acceptance, the task force can collect information on impacts and identify opportunities and funding streams to support workers and communities through the transition. For convergence of various approaches, such a task force has already been launched in Canada (Government of Canada, 2018).¹⁷

16 Real People, Real Change – Strategies for just energy transitions 2018. Anna Zinecker, Philip Gass, Ivetta Gerasimchuk, Purva Jain, Tom Moerenhout, Yuliia Oharenko Anissa R. Suharsono and Christopher Beaton. International Institute for Sustainable Development. <https://www.iisd.org/system/files/publications/real-people-change-strategies-just-energy-transitions.pdf>.

17 Government of Canada. (2018b). Task force: Just transition for Canadian coal power workers and communities. Retrieved from <https://www.canada.ca/en/environment-climate-change/services/climate-change/task-force-justtransition.html>

An important area of policy that needs to be focused on by national governments is changing public financing flows and adopting policies to mobilize green investment from the private sector.

Phasing out fossil fuel subsidies, combined with the development of carbon pricing and targeted adoption of key best practice policies to enhance the share of variable renewable energy and accelerate investment – particularly in wind and solar – through market design, demand-side management, transmission and distribution system enhancements, grid interconnections and support for energy storage are crucial. Green recovery needs to be at the heart of economic stimulus packages developed by governments. This needs a focus to be placed on directing public funding and incentivizing private investments towards renewable energy and related technology and infrastructure development, such as storage and transmission grids, as well as electrification of end-use sectors and further measures to improve energy efficiency across end-use sectors.

Bringing Conducive Policies

Besides strengthening rural livelihoods, infrastructure development, capacity building and promoting social dialogue, policy plays important and enabling role in transition from coal. However, there are a few barriers and enabling factors which significantly influence transition. Suitable policy in place to address those barriers and promote the enabling factors can help the transition process.

In the context of India, there are few important socio-economic barriers against transition from coal (and hence just transition) are energy access for large population, dependence of Indian railway on cross subsidy from coal, inter-sectoral disparity, utilization of DMF funds etc.

Given various constraints, coal is the only short-term feasible solution in India to provide reliable power supply to a large population and control temporal load variability. Coal transportation is a major source of revenue for Indian Railways which is a primary infrastructural backbone of the Indian economy. This income helps Indian Railways to provide large employment and subsidize passenger fare for poor population. Since, renewable being localized, transition from coal will have severe impact on Indian economy and in turn employment and overall economy. On the other hand, among all renewables, solar has maximum potential in India. Eastern and central states which are coal rich states, have significant solar potential also. But, transition from coal will affect inter-sectoral imbalance within this regions. Just transition policies need to address these issues. On the other hand, DMF either remains unutilized or used to finance large infrastructural projects. This financial resource could play important role for a smooth just transition, if properly utilized.

However, there are some factors which can play enabling role to the transition process from coal. For example, due to emission intensity commitment of India under NDC, financial institutions are reluctant to finance new coal projects. Similarly, renewable generation and its storage technology getting cheaper over time is another such enabling factor. Policy promoting such enablers can also induce and indirectly facilitate the just transition process.

Every coal mine has limited reserves and hence fixed extraction period. Thus, unless guided by sudden regulatory/financial decision, each coal mine has its specific closing tenure. Thus, closing of the mine may be scheduled after 5 years or 10 years, but its transition plan (short term/medium term/long term) needs to start at the earliest for smooth and effective transition. There are lots of issues linked with

operation or closing of a coal mine including environmental, health, revenue earning for the state, employment and livelihood of the mine workers and local population in the surrounding area. Thus, the more timely and well-structured the transition policy is, the better and effective will be the transition process. After the closing of the mine, alternative employment opportunity of the dependent population is necessary.

There are various stakeholders with their diversified linkages with coal mine operation and its transition. Government departments including environment, labour, women welfare,

health, rural development are responsible for their relative roles and responsibilities. Thus, policy guideline for proper coordination among those departments is important. Revenue loss for state departments, land reclamation, alternative livelihood generation, training for reskilling of displaced employees are inter-linked and thus, just transition will be smooth once there is effective coordination among various departments. For such efficient coordination, policy needs to be formulated at the earliest, so that all the departments can function unitedly and play their relative role for a successful transition process.

4. CONCLUSION

The changing environment quality, growing climate change threats, declining cost of renewables, and ambition towards achieving mitigation targets suggest a faster transition away from coal in the coming years. The potential implications on social equity and distributional impacts particularly in mining-rich states is very high and, hence, solicits for a transition that is just and fair.

Just Transition needs to consider a broad range of social and economic sectors, geographic locations, diverse stakeholders and time horizons. The paper has attempted to highlight the developmental challenges in key mining locations and more so in a situation when mining activities may cease to exist in the future. It has identified a plethora of opportunities that mining states need to exploit to address social and developmental challenges.

Key Messages

- Coal is major source of revenue and employment for resource rich states like Jharkhand, Odisha, Chhattisgarh, West Bengal and Madhya Pradesh. Other than the economic revenue, coal mining often gives stimulus to the local economy through the creation of jobs and contribute to the development of local infrastructure. Despite these developments, some of these districts still lack behind in the socio-economic parameters. This underdevelopment of the coal mining districts can be because of the high dependence on a singular mode of trade or commodity for revenue.
- Coal rich states in India are weighed down by the phenomenon of resource curse, which leads to the monopolistic industrial reign of coal industry, pushing the state towards becoming a rentier economy. This process undermines the overall power of the state, this happens because since external rents are the main source of wealth other sectors such as agriculture, manufacturing and industry remain underdeveloped and pose a threat to their long-term developmental prospects.
- In order to transform the state away from its rentier economic nature, promotion and diversification of the state's industrial establishment away from the traditional mono industrial practice will help promote enhanced levels of economic activity, largescale employment integration and address the missing industrial gap that exists in the economy. This diversification of revenue sources can be undertaken in three ways by establishing:

- » Industrial Parks
- » Solar Parks
- » Energy Battery Storage
- In the event of a just transition the major challenge will be economic revitalization, laying the groundwork for the creation of a working economy. This can be done through:
 - » *Promotion of rural enterprise* Nearly 20 percent of the total potential employment in India (around 11 million jobs) comes from just one opportunity, i.e., the low -income food markets. Developing rural enterprises around nutritious and accessible food products and along its supply chain can boost incomes and rural livelihoods. This in turn would create jobs and add economic value to a region and community. Employment intensive programmes like MGNREGA will also have a major role in supporting climate-resilient development in the most vulnerable communities.
 - » For financing this at the micro level, micro credit financing has proven to be successful tool to enable entrepreneurship, increase standard of living and livelihood maintenance. The Governments Deendayal Antyodaya Yojana- National Rural Livelihoods Mission (DAY-NRLM) provides financial benefits to the beneficiaries in the form of community investment fund, bank linkage and capital received under interest subvention.
 - » Increasing energy access through renewable energy development for overall social upliftment will be a viable option and efficient option especially for the rural areas.
- » Infrastructure financing through off budget borrowing mechanism, securitisation and the new Development Fund Institution (DFI) which will look to finance big infrastructure projects by raising \$41 Billion over the next few years.
- » Strengthening human capital through a multi-stakeholder partnership, by bringing together governments, business, unions, educational and vocational institutions and civil society in identifying existing skill gaps, skill needs and investments, content and scope of training, curriculum design, course validation, disseminating information on labour market programmes, beneficiary identification will help minimise disruption.
- » Through consistent social dialogue building, and creation of task force with government, private sector and civil society may be assigned to engage with relevant stakeholders notably the local workers and coal dependent communities that will be most affected. To aid better transition policies and increased social acceptance the task force can collect information on impacts and identify opportunities and funding streams to support workers and communities through the transition.
- » Suitable policies addressing barriers, promoting the enabling factors and supporting the smooth transition should also be in place.

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