

India's Energy Transition:

Stranded coal power
assets, workers and
energy subsidies

ISSUE BRIEF



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India's Energy Transition: Stranded coal power assets, workers and energy subsidies

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List of Abbreviations

CIL	Coal India Limited
DISCOM	distribution company
FSA	fuel supply arrangement
FY	fiscal year
GHG	greenhouse gas
NCLT	National Company Law Tribunal
NPA	non-performing asset
PPA	power purchase agreement
RBI	Reserve Bank of India
UDAY	Ujwal Discom Assurance Yojana



1.0 Introduction

In the *India's Energy Transition 2018* update, the Global Subsidies Initiative of the International Institute for Sustainable Development and the Council on Energy, Environment and Water published updated estimates of the scale of energy subsidies in India for fiscal year (FY) 2017, including partial data on the scale of subsidies for FY 2018 (Soman et al., 2018).

This review called for a better analysis of coal subsidies—particularly given ongoing issues with coal power “asset stranding,” where around 21 per cent of India’s total installed coal capacity has been identified as “non-performing” or “stressed” throughout 2018 (Central Electricity Authority, 2018; Standing Committee on Energy, 2018).

This issue brief takes a detailed look at why such a large share of coal power is struggling today and the structural drivers—including subsidies—that may cause similar crises to rear their heads in future. In light of this, it sets out some broad proposals from international literature on the topic of “just transition,” which encourages governments to recognize stranded workers and communities as much as stranded private or public assets. It builds on an analysis of the relationship between subsidies and coal power assets published by the Global Subsidies Initiative and the Overseas Development Institute in mid-2018, *India's Stranded Assets: How Government Interventions Are Propping Up Coal Power*.¹

KEY FINDINGS

- The current asset-stranding crisis may or may not be a sign of a deeper shift in India’s energy sector, but our review suggests that numerous drivers are pointing in this direction in the medium term. This makes the crisis also an opportunity to discuss the appropriate role for government interventions to ensure a managed transition and the appropriate support when there is a risk of stranded assets.
- The cost of coal-based power production will be shaped by both current and future drivers of asset stranding. Current drivers include coal shortages and financial distress of energy distribution companies (DISCOMs), with future risks including water scarcity, air pollution regulations and cost-competitiveness of renewables. Future studies must include a review of key regions such as Chhattisgarh, Odisha and Jharkhand, where assets are already most stressed.
- It is important to identify and evaluate the role of current policy support mechanisms for coal, which are already artificially dampening market signals across the key drivers that affect coal power costs. These take the form of subsidies, public finance through loan preferential rates, or the delay or lack of enforcement of policies (such as air pollution regulations) that would otherwise increase costs to producers.
- As part of an ongoing dialogue about labour in the coal sector, policy-makers should consider the complementary policies that can ensure that the burden of asset stranding does not fall on workers and communities. This might include general employment schemes, targeted social protection measures and financing mechanisms. These should be developed through deep engagement with workers and communities.

¹ For more on this report, see: <https://www.odi.org/sites/odi.org.uk/files/resource-documents/12407.pdf>



2.0 What is Happening? India's stressed coal power in 2018

2.1 Definitions

According to the Reserve Bank of India (RBI) (2018), “an asset... becomes non performing when it ceases to generate income for the bank... where... interest and / or instalment of principal remain overdue for a period of more than 90 days in respect of a term loan.” The term “stressed” has also been used to refer to assets that are on the verge of becoming non-performing or are actively non-performing (Standing Committee on Energy, 2018). In various media reports, power plants in this position have often been labelled as “stranded” or “at risk of stranding.”

In this brief, we use “non-performing” and “stressed” to refer to assets whose owners have defaulted on debt repayment for a period of more than 90 days but who may yet be able to resolve these problems. “Stranded” is used to refer to assets whose owners have proved incapable of servicing their debt, such that bankruptcy proceedings must take place to partially or fully write off their value.

2.2 A Timeline of India's Stressed Coal Asset Crisis

As of November 2018, India had 190 GW of coal-fired power plants in operation with a further 103 GW in development (Central Electricity Authority, 2018; Coal Swarm, 2018).² The Standing Committee on Energy, under the Ministry of Power, reported in 2018 that 34 coal-fired power plants with a combined capacity of 40 GW were identified as “stressed”—around 21 per cent of total operational capacity as of the end of 2018. Some subsequent reports have estimated that the extent of affected capacity is even higher, as much as 75 GW (Trivedi & Singh, 2018), or 39.5 per cent of end of 2018 operational capacity. In addition to this, 571 GW of plants in development have been cancelled since 2010 (Coal Swarm, 2018).

² Development here refers to plants that are either announced, pre-permitted, permitted or under construction, as categorized in the Coal Swarm database. This also includes captive power plants.



A key trigger for this stressed assets crisis was the passage of the Insolvency and Bankruptcy Code, 2016 (Joint Committee on the Insolvency and Bankruptcy Code, 2016). This bill aimed to consolidate insolvency laws and reduce the time taken to resolve insolvency problems by setting a clear process and timeline to recover debt from a defaulting borrower. Before this, many banks had taken an ad hoc and inconsistent approach to tackling non-payment of debt across different projects and sectors, with a slow and cumbersome resolution process (Mehta & Rangan, 2017). This made it easy for banks to operate with insufficient attention to due diligence and for promoters (developers) to take on debt without adequately ensuring the viability of projects (Centre for Financial Accountability, 2018).

In June 2017 the RBI sent another strong message that the culture around addressing non-payment of debt had to change. Citing the new bill, it ordered banks to take the top 12 defaulters to the National Company Law Tribunal (NCLT), an entity responsible for bankruptcy resolution (Mehta & Rangan, 2017).

In February 2018 this was followed by an RBI circular that required banks to report defaults weekly on loans of INR 2,000 crore (USD 0.28 billion) or above and set a mandatory deadline of 180 days for a resolution plan to be implemented or for debtors to be taken to the NCLT (The Economic Times, 2018c).

These adjustments were not just focused on the power sector—the risk of India failing to identify and address bad debt was considered a major risk for the economy. In 2015 non-performing assets (NPAs) across all sectors made up 4.3 per cent of all loans (Khullar, 2016). By 2017, in part reflecting the RBI's new requirements for banks to identify and address bad debt, this had risen to a 9.3 per cent share (Paul, 2018).

The power sector was, however, one of the sectors with the greatest non-payment problems, resulting in a large volume of stressed power plants. As a result, private sector bodies like the Independent Power Producers Association of India and the Association of Power Producers petitioned for interim relief to various courts. They argued that the sector had been subject to “negative externalities” during the previous five years, such as non-availability of coal and lack of power purchase agreements (PPAs), and deserved special consideration (Insolvency and Bankruptcy Board of India, 2018). A number of commentators also raised the question of possible macroeconomic impacts from large-scale coal power plant stranding.

In response, the Ministry of Power released a report on the stressed assets (Standing Committee on Energy, 2018). This report explored the causes of stressed assets and made high-level recommendations—but carried no executive power to directly resolve the crisis (Jai & Jha, 2018).

In September 2018—on the final day by which new RBI procedures required insolvency plans to have been implemented—the Supreme Court directed all lower courts to transfer related pleas to its jurisdiction and declared a stay, granting an extension for affected companies until the matter could be adjudicated (NewsClick, 2018; Ghosh, 2018). The Supreme Court also requested a high-level panel led by the Cabinet Secretary to advise on a pragmatic solution (Singh, 2018d). The RBI, however, has opted out of joining the panel on the basis that it stands by its position (Singh, 2018b). As of the time of writing, this legal dispute remains unresolved.

These developments are illustrated in Figure 1.

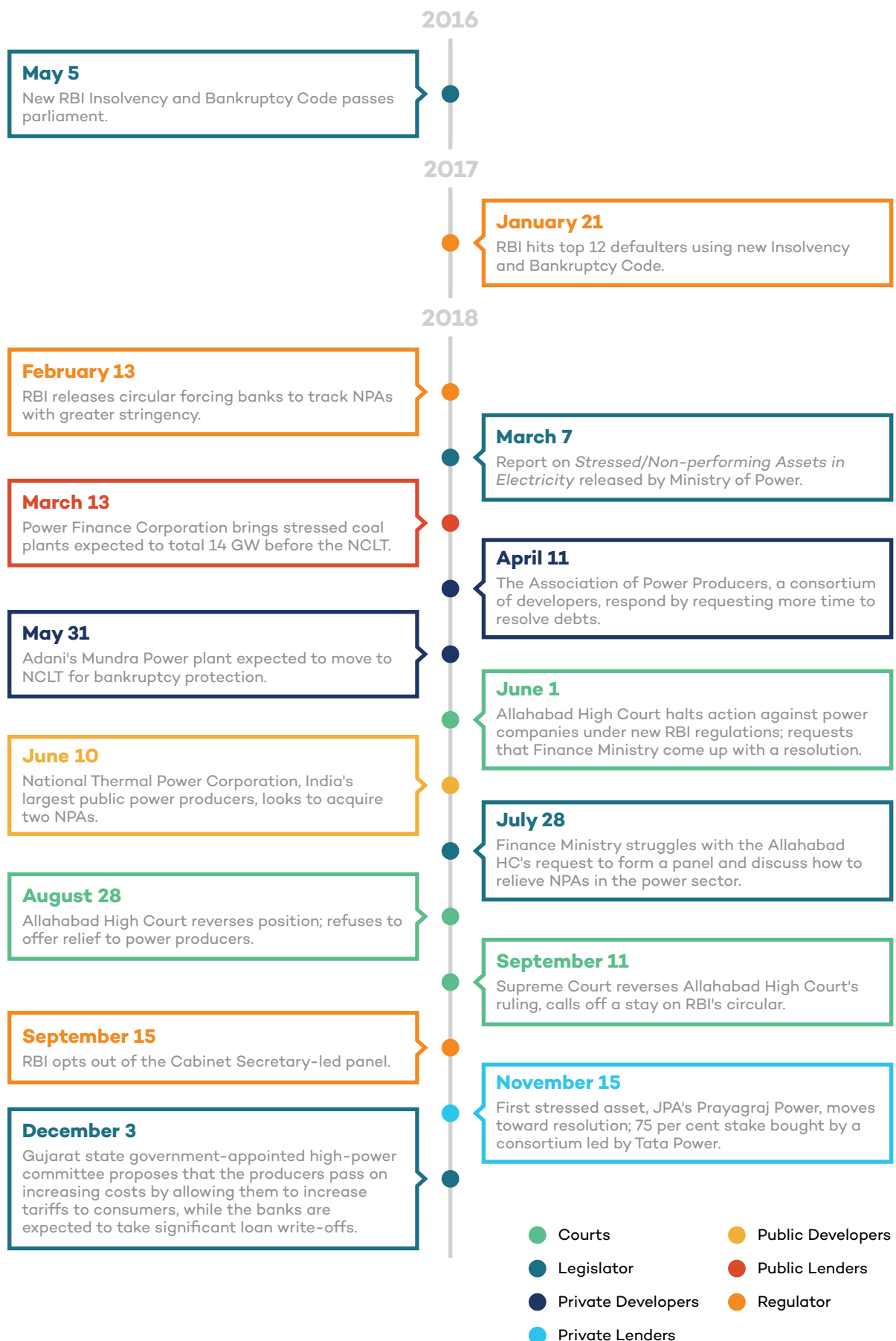




Figure 1 (left). Timeline of decisions relating to coal power asset stranding

Note: This timeline corresponds only to events since May 2016 and only the power production parts of the coal supply chain that are relevant to stressed power plants. Last updated: December 15, 2018

Source 1: Joint Committee on the Insolvency and Bankruptcy Code, 2016; Source 2: Mehta & Rangan, 2017; Source 3: The Economic Times, 2018c; Source 4: Standing Committee on Energy, 2018; Source 5: The Economic Times, 2018b; Source 6: Sengupta, 2018b; Source 7: Mohammad, 2018; Source 8: Ramkumar, 2018; Source 9: Srivastava, 2018; Source 10: Jai & Jha, 2018; Source 11: The Economic Times, 2018a; Source 12: Singh, 2018d; Source 13: Singh, 2018b; Source 14: Singh, 2018c; Source 15: Singh, 2018a.

BOX 1. WHAT IS BEING DONE TO RESOLVE STRESSED ASSETS?

As the asset-stranding crisis has evolved, some deals have been brokered to resolve the stressed assets out of the NCLT.

The first one approaching resolution is the Prayagraj Power Generation company, which is to be acquired by an alliance of the ICICI Bank and Tata Power, both from the private sector, through a competitive bidding process (Singh, 2018c). The recovery rate for lenders was not reported, but Nair (2019) claims that deals for three unspecified plants had resulted in a recovery rate between 35 and 54 per cent.

Another possible outcome could be speculated from the case of three coal power plants using imported coal in Gujarat with a combined capacity of 9.8 GW. A high-powered committee has ruled to allow the increase of tariffs from the PPAs (Singh, 2018a). This means the cost of supporting the struggling plants will be carried over to consumers, while the lenders involved will also take INR 18,000 crore (USD 2.5 billion) in loan write-downs, socializing the promotor losses onto the public banks as well (Press Trust of India, 2018).

In early January 2019, it was reported that seven troubled power projects were close to resolving loans (Ghosh, 2019). Three would be sold under the Samadhan scheme that divides debt into sustainable and unsustainable portions (Ghosh, 2019). Another would involve a “haircut” for the original lender of around 50 per cent, followed by resale (Ghosh, 2019). This means the bank would agree to write off 50 per cent of the value of its original loan. Finally, some commentators have speculated that state-owned enterprises may take over ownership of many assets, which may or may not take place on a fully commercial basis.

2.3 What Are the Macroeconomic Impacts of Coal Power Asset Stranding?

Bankers and power plant developers from the public and private sectors are the actors first affected by asset stranding. Bankers, especially from the private sector, typically set aside provisional funds in the event that an asset receives a “haircut” during the resolution of stranded assets. These funds are effectively capital that is not being invested in the economy. A large accumulation of such capital contributes to an overall slowdown in Indian infrastructure investments (Kumar, 2018). Meanwhile, developers with stranded assets (who at the current time are predominately private sector developers) are going through insolvency proceedings. These proceedings could result in either a bankruptcy among insufficiently diversified groups or an industrial aggregation, with big players purchasing smaller ones. This can have an impact on the country’s GDP and can trigger job losses.

Macroeconomic impacts also depend on how governments address this situation. One approach is to hold capital markets accountable for poor decision making: a quicker pathway to bankruptcy can send signals to better evaluate risks, minimizing the risk of large amounts of bad debt in the banking system and contributing to more stability and higher GDP in the long term. This is in contrast to simply switching promoters, which would not address underlying structure problems (Buckley & Shah, 2018). In the current situation, some argue that this approach should not apply because circumstances are temporary and arose due to several systemic failures. In turn, the RBI has argued that viable assets should have had sufficient time to come up with a resolution plan under the new regime (Insolvency and Bankruptcy Board of India, 2018; Spencer, Pachouri, Renjith, & Vohra, 2018).

In the event of favourable interventions by the government or public financial institutions—either through direct bailouts, offloading debt onto a “bad bank” or some other form of support—the bill is ultimately footed by the taxpayer (Krishnan, 2018). Such interventions have an opportunity cost: the funds or services allotted by the government could instead be diverted to alternate power producers or general public services. To put this cost into perspective, the total outstanding debt of the 34 stressed assets is INR 1,74,468 crore (USD 26 billion), which is more than the combined estimated budgetary expenditure on health, education and social protection for FY 2019 (Saldanha, Salve, & Vivek, 2018; Standing Committee on Energy, 2018).

In this scenario, the question extends beyond the short-term economic impact to question whether continued public support for coal power is in the long-term best interest of the public. It also begs the question of whether the government should be focusing on keeping bad investments afloat in order to protect jobs, when it could simply allow markets to determine which investments are good or bad and dedicate public funds to assisting workers and communities directly during this kind of economic volatility.

2.4 Geographic and Ownership Distribution of Stress and Stranding

Chhattisgarh, Odisha and Jharkhand have been most affected by the recent identification of “stressed” assets, with 58 per cent, 55 per cent and 27 per cent of their state capacity categorized as stressed, respectively, as illustrated in Figure 2 (Standing Committee on Energy, 2018; Vasudha Foundation, 2018). Further, these three states combined represent 22 per cent of all operational coal power plants in India, despite being states with low electricity consumption. While reviewing Figure 2, it must be considered that the location of the plants does not necessarily match the state where it is supplying power.

The vast majority of stressed plants are also privately owned: 88 per cent of stressed capacity, as illustrated in Figure 3 (SourceWatch, 2018; Standing Committee on Energy, 2018). The remaining capacity (12 per cent) is operated by central government institutions (e.g., PTC India, NTPC Limited or Damodar Valley Corporation), in some cases wholly and in others in partnership with privately or state-owned institutions (e.g., Bihar State Power Holding Company Limited) (see Figure 2). In Chhattisgarh, Odisha and Jharkhand, all affected coal power plants are privately owned except one: Athena Energy Ventures Private Limited’s 12,000 MW plant in Chhattisgarh, which has a joint private–central ownership with Athena Projects Private Limited, Infrastructure Development Finance Company Limited and PTC India Limited (SourceWatch, 2018).

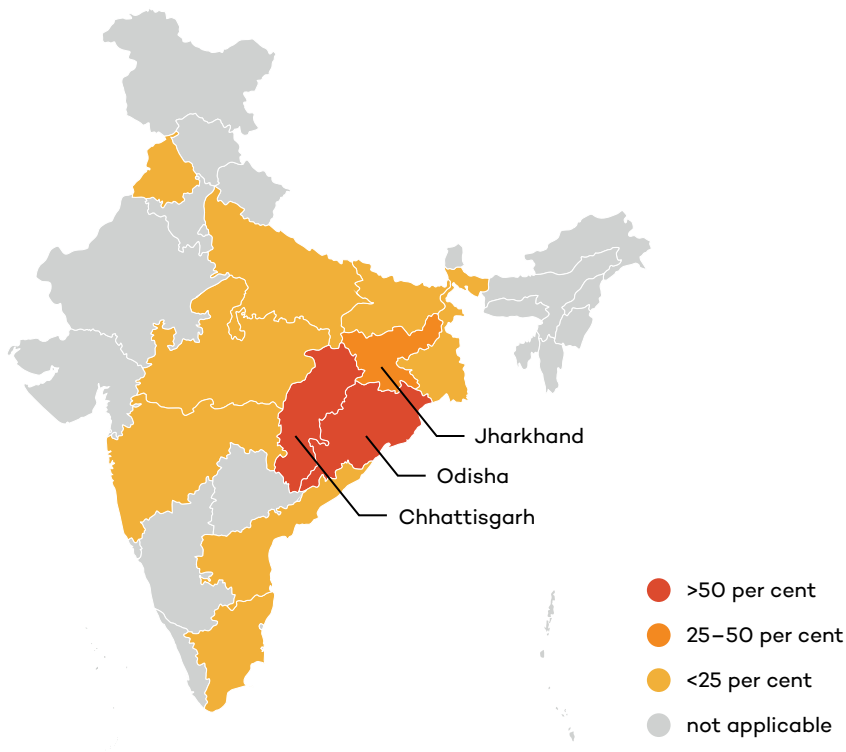


Figure 2. NPAs as a proportion (percentage) of total state coal power capacity, 2018

Source: NPA data in India from Standing Committee on Energy, 2018; state-level capacity data from Vasudha Foundation, 2018. Data considers operational state capacity data until 2015 while NPA data is updated to 2017.

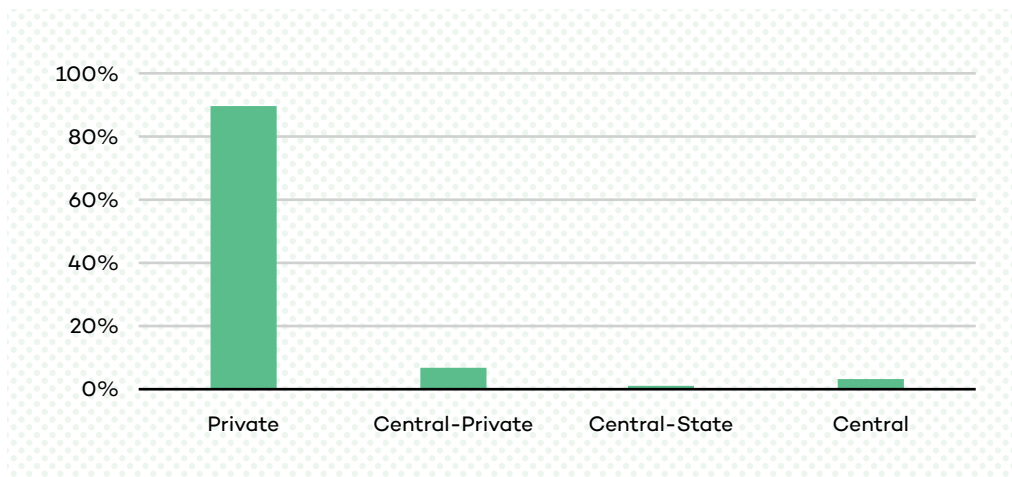


Figure 3. Stressed assets (percentage) by ownership type, 2018

Source: Standing Committee on Energy, 2018; ownership data from SourceWatch, 2018.



3.0 Why is Coal Power Stressed? Drivers of stranding today—and in the future

The stressed coal power crisis was not created by a change in law by RBI—this just made the scale of the problem fully transparent and introduced mandatory, time-bound insolvency procedures for the first time. Rather, a number of drivers contributed to the current situation. And a growing body of literature suggests that the financial pressure on coal power producers in India is likely to increase over time, as additional drivers come into play.

In the sub-sections below, we discuss the current context in India in light of five major drivers of asset stranding, as identified in a broad review of literature in *India's Stranded Assets: How Government Interventions Are Propping Up Coal Power* (Worrall et al., 2018). These drivers are: DISCOMs' ability to pay for supply, coal shortages, the cost-competitiveness of renewable energy, air pollution regulation and water scarcity (see Figure 4). These are not the only drivers of coal power asset stranding, but they are expected to be among the most important over the next decade.

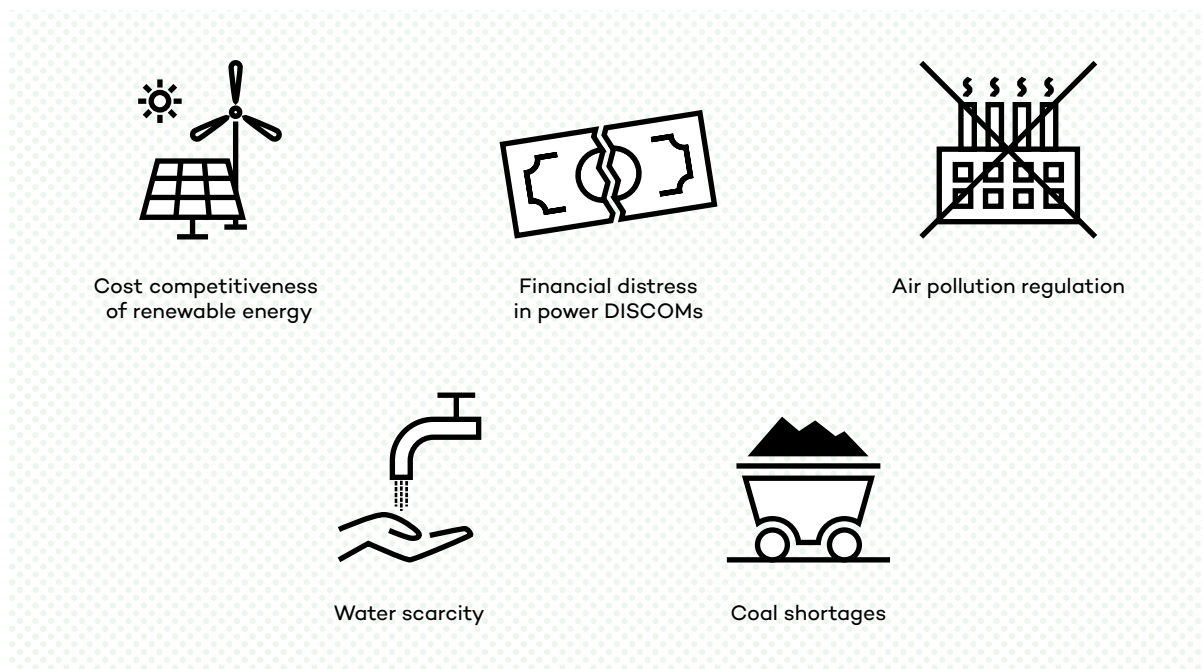


Figure 4. Major drivers of coal power asset stranding in India

Source: Worrall, Whitley, Garg, Krishnaswamy, & Beaton, 2018.

We do not discuss in depth the idea of a “business cycle mismatch” over the last decade, which has often been identified as a key cause of the current crisis (Spencer, Pachouri, Renjith, & Vohra, 2018). This idea reasons that a boom in private investments in the mid-2000s, combined with lower-than-expected electricity demand, has led to a market failure; given the cyclic nature of the market, demand will rise again, at which point these coal power plants can provide supply. We consider this to be an example of short-term volatility and not a structural driver of underlying change. It is also hard to have any certainty about how market trends will develop or how current stressed assets will be resolved.

It is important to note that one cross-cutting theme recurs across many of these drivers: the role played by government support in shielding coal power from bearing all its costs. As of FY 2018, it is estimated that the coal sector in India benefits from INR 13,850 crore (USD 2.15 billion) in subsidies (Soman et al., 2018). This has changed little since FY 2014, despite major progress with the reform of fossil fuel subsidies in other areas. The government has also traditionally supported coal with public finance and by delaying policies that would see the sector pay for its social costs like impacts on air quality and health (Worrall et al., 2018). Government policy can decrease the apparent costs of investments and operations, masking capital subsidies and financial stress, and prolonging the lifetime of assets that would be otherwise be struggling—with taxpayers ultimately paying the bill for these bailouts (Worrall et al., 2018).

3.1 DISCOMs’ Ability to Pay for Supply

DISCOMs, which are largely state owned, are an integral part of the electricity value chain, purchasing electricity from power producers and selling it to consumers. Many power plants have PPAs, where DISCOMs have committed to purchasing a steady demand of electricity at an agreed price. On the other hand, some power plants, particularly privately owned plants, may not have a PPA. They are reliant on sufficient demand from DISCOMs or other large-scale consumers who purchase electricity in the short-term market. They are exposed to the risk of lower average tariff rates—for example, average

power exchange prices have fallen from INR 7.5 (USD 0.116) per kWh in FY 2009 to INR 3.3 (USD 0.05) per kWh in FY 2018 (Financial Express, 2018).

However, due to financial distress, DISCOMs have been unable to pay their dues to generation companies, nor have they attempted to renegotiate PPAs with lower tariffs, thus reducing their cash flow and compromising their ability to service debts (Chatterjee, 2018). This has been felt particularly strongly by independent power producers, which account for 57.7 per cent of the outstanding DISCOM dues (Ministry of Power & PFC Consulting Ltd, 2019). Among the 34 plants identified as stressed in 2018, 52.3 per cent of the capacity have PPAs (Standing Committee on Energy, 2018).

In order to improve the financial health of DISCOMs, and in turn the electricity value chain, the Ministry of Power launched the Ujwal Discom Assurance Yojana (UDAY) scheme in November 2015. This mandated the state governments to take up DISCOM debt in a graded manner, starting with 75 per cent of the debts (Ministry of Power, 2015). Improvements will only begin to yield benefits in the medium term, as the influx of funds through UDAY was primarily associated with investments to help narrow the gap between costs and revenue, rather than directly injecting funds for operational expenses. For example, Jharkhand and Chhattisgarh have state DISCOMs that signed up to UDAY with grants of INR 6,925 crore (USD 0.97 billion) (Government of National Capital Territory of Delhi, 2016b) and INR 1,305 crore (USD 0.18 billion) (Government of National Capital Territory of Delhi, 2016a), respectively—yet they are still two of the states with the highest degree of stressed assets.

Another challenge for DISCOMs has been problems in signing PPAs with public sector generators with high capital costs. This is due to generous terms for projects led by NTPC, India's largest state-owned utility, where electricity tariffs were not determined by competitive bidding. The Association of Power Producers argues that this has negatively affected private sector plants by unduly signing large public sector undertakings like NTPC up to PPAs, while more competitive private sector plants are at risk due to a lack of assured markets (Financial Express, 2018).

Based on past experiences, challenges with the reliability of demand from DISCOMs are likely to continue in future years. There is a long history of restructuring efforts such as UDAY that succeed in providing assistance in the short term but fail to ultimately resolve structural problems amid a challenging context of rapidly growing energy demand and highly dynamic changes in the costs of generation technologies. The large scale of stressed assets today suggest that this risk has not been adequately accounted for during investment decisions, despite its long-standing nature.

3.2 Coal Shortages

The purpose of a fuel supply arrangement (FSA) is to secure long-term coal supply for power plants. They are common among both publicly and privately owned capacity. Many currently stressed plants have blamed their insolvency on a lack of FSAs, or a failure to honour coal supply obligations under FSAs. In some cases, this is linked to a lack of a PPA, as Coal India Limited (CIL) is only obliged to draw up an FSA with a plant operator that has an existing PPA. In other cases, it is due to the practices of CIL, following the strong push to encourage private sector investment after the Electricity Act 2003 (Standing Committee on Energy, 2018). At that time, nationalized banks provided priority sector lending to private companies, in some cases before pre-conditions for cost-covering operations were met, including coal supply. For the same reason, there were also over-promises of coal supply. CIL wrote many “letters of understanding” for coal project developers, a document that indicates an intention to provide an FSA and that is required to raise project finance (Chitnis et al., 2018). The number of “letters of understanding” exceeded CIL's planned coal production, creating problems with the subsequent provision of FSAs (Chitnis et al., 2018).

Without an FSA, some plants buy coal in the open market, but this is expensive and does not meet their total fuel requirements. In addition, Indian Railways gives priority of dispatch to coal plants with an FSA, so even if coal is available on the open market, timely delivery is not assured. Such plants have not been able to produce enough power and generate enough income to service their debts.

The relationship between coal supply and stressed assets is context-dependent. Some states—notably, Chhattisgarh and Odisha, and to a lesser extent Jharkhand—have a high share of stressed assets and a high share of plants without FSAs. This is in spite of them being located physically close to mines in the state. In other states, a modest degree of stressed assets appear to exist, regardless of the share of FSAs that are in place (see Figure 5). Nonetheless, this is a problem that affects the majority of currently stressed assets. The Standing Committee on Energy (2018) reported that only around one quarter of currently stressed assets had an assured supply of coal.

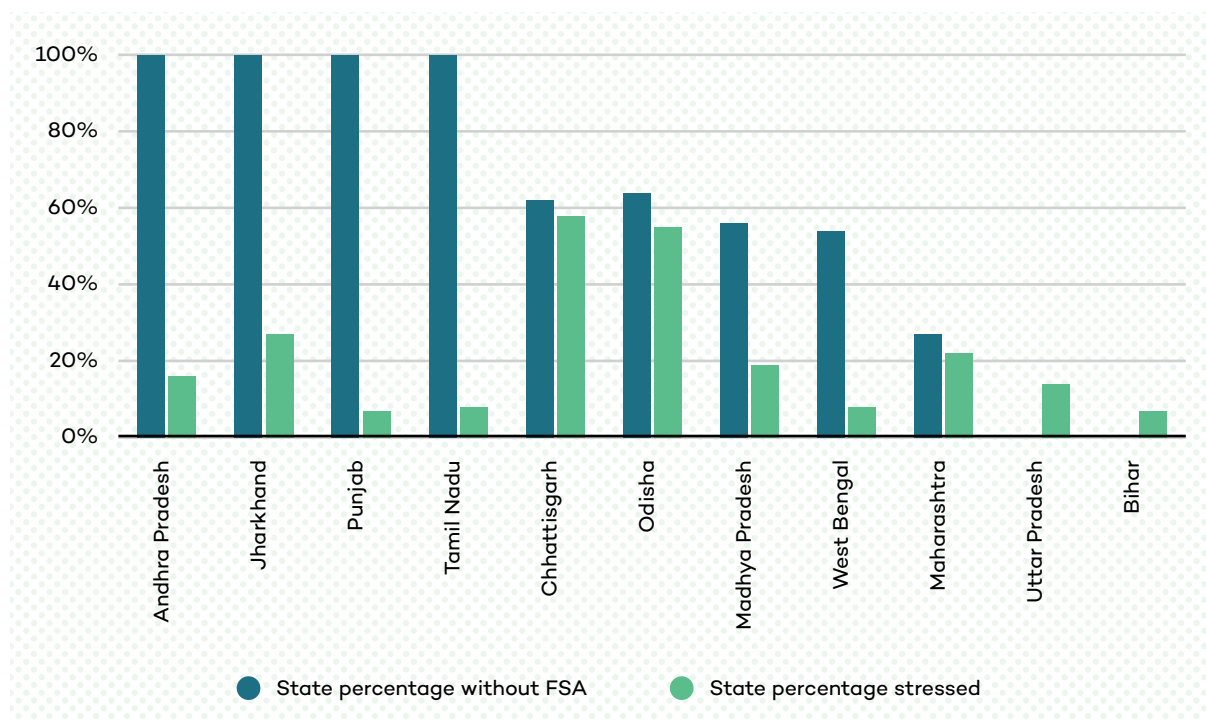


Figure 5. Comparison of lack of FSAs and percentage of stressed assets

Source: NPA share data from Standing Committee on Energy, 2018; Vasudha Foundation, 2018; FSA data from Standing Committee on Energy, 2018.

In some cases, the problem has been that FSAs have not in fact guaranteed security of supply. The Association of Power Producers, for example, has claimed that the government’s Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India (SHAKTI) has resulted in many advance payments from producers but long delays in supply, creating cash flow problems (Mishra, 2018). It has also reported that state-owned CIL has preferred to sell coal through e-auctions rather than meeting its obligations under FSAs (Sengupta, 2018c). In the case of coal being imported, prices are subject to fluctuation outside the control of both the developer and the government, as was the case when Indonesia announced plans to tax coal exports (Prasad, 2012).

Coal shortages are a good example of how government support policies can cause unintended complications. News sources report that premiums in e-auctions for coal have been as high as 81 per cent



and an average of 27 per cent (Sengupta, 2018b), implying that coal power companies have been guaranteed coal at prices significantly below current market prices. While FSAs are intended to create long-term price certainty, and hence risk mitigation for coal power plant investments, they also create a situation where this price can be significantly divergent from actual market prices, creating a strong disincentive to honour supply arrangements. As long as there remains a significant deviation between the price of coal agreed under FSAs and the spot market price of coal, this is likely to continue driving asset stress in the future.

3.3 Air Pollution and Emissions Regulation

Concern about air pollution linked to coal power is growing. In 2015 it was estimated that combustion from coal contributed to about 169,300 deaths, or 15.5 per cent of all deaths, from air pollution in India, reducing life expectancy by an average of 4.3 years (Conservation Action Trust & Urban Emissions, 2015). The Health Effects Institute (2018) finds that coal is one of the largest sources of fine particulate matter (PM_{2.5}) in India today, and it will be the single largest source by 2050, responsible for 1.3 million deaths per year. On top of direct cost to human health, these problems burden India's economy and can lead to more diffuse social and economic impacts, like "brain drain" away from places of critical economic and political importance, such as the Delhi National Capital Region (Koundal, 2018). Coal power is also a major producer of greenhouse gas (GHG) emissions, toxic chemicals (arsenic, mercury, radioactive fly ash) and other externalities, including biodiversity loss, damage to roads, accidents including deaths in coal mines, noise and water stress, all of which are ultimately borne by the public or the government (Ministry of New and Renewable Energy, 2013; Nkambule & Blignaut, 2017). An increase in GHG emissions is directly correlated to global warming, where India will see an estimated 1.3 per cent drop in real GDP for every 1°C increase in temperature (International Monetary Fund, 2017).

Air pollution regulation is the main way by which governments can require coal power to invest in technologies that will reduce particulate emissions or raise revenue that can help address negative consequences and drive market forces toward cleaner energy sources. Coal power plants are already subject to some forms of regulation that increase their costs, but the requirements are low, with Indian coal power plants performing much below the global environmental benchmarks (Centre for Science and Environment, 2015). Hence, there are strong reasons to expect more stringent regulations in the future.

A number of efforts are currently ongoing to address local air pollution, but they have not yet had a significant impact on coal asset stranding, largely due to inconsistent enforcement and even delays in policy implementation (Shrivastava, 2018). Coal washing is an existing policy that is intended to ensure that coal releases fewer particulate emissions, but it is not well enforced. In FY 2018, the non-enforcement of coal washing laws resulted in avoided costs of INR 982 crore (USD 152 million) for thermal power plants (Soman et al., 2018). Further, new regulation laid out by the Central Pollution Control Board (2018) will require coal power plants to invest in a range of new technologies that reduce air pollution, such as flue gas desulfurization. The estimated total capital cost of retrofits is around INR 75,000 crore (USD 11.6 billion), if all notified plants comply (Ghosh & Ganesan, 2018).

A deadline of December 2017 was originally set for compliance; this was not met, and the government agreed to postpone the policy, rather than subjecting plants to non-compliance charges, setting a new deadline of December 2022. The Supreme Court admonished this decision and brought forward the



timeline for some plants that are close to densely populated, critically polluted areas (Soman et al., 2018). Complying with the regulation over the next several years will place further cost pressure on power plant asset owners. Further, in January 2019 the National Clean Air Programme was launched. This initiative is indicative of the growing momentum behind improving air quality monitoring, raising awareness of air pollution and introducing further city-level and national-level mitigation interventions (Chatterji, 2019; Press Information Bureau, 2019).

The burden of such regulations is likely to fall uniformly across the coal sector, affecting both private and state-owned power plants, although there may be divergence in the effectiveness of state-level enforcement of national norms. Another factor is the extent to which air pollution is a high state-level priority. Figure 6 illustrates the extent to which particulate matter pollution is distributed across India. The states with high levels of pollution may be more likely to introduce accompanying, more stringent regulations. Outside of government regulations, developers are also exposed to community movements and protests that can affect the operational and financial viability of the power plants.

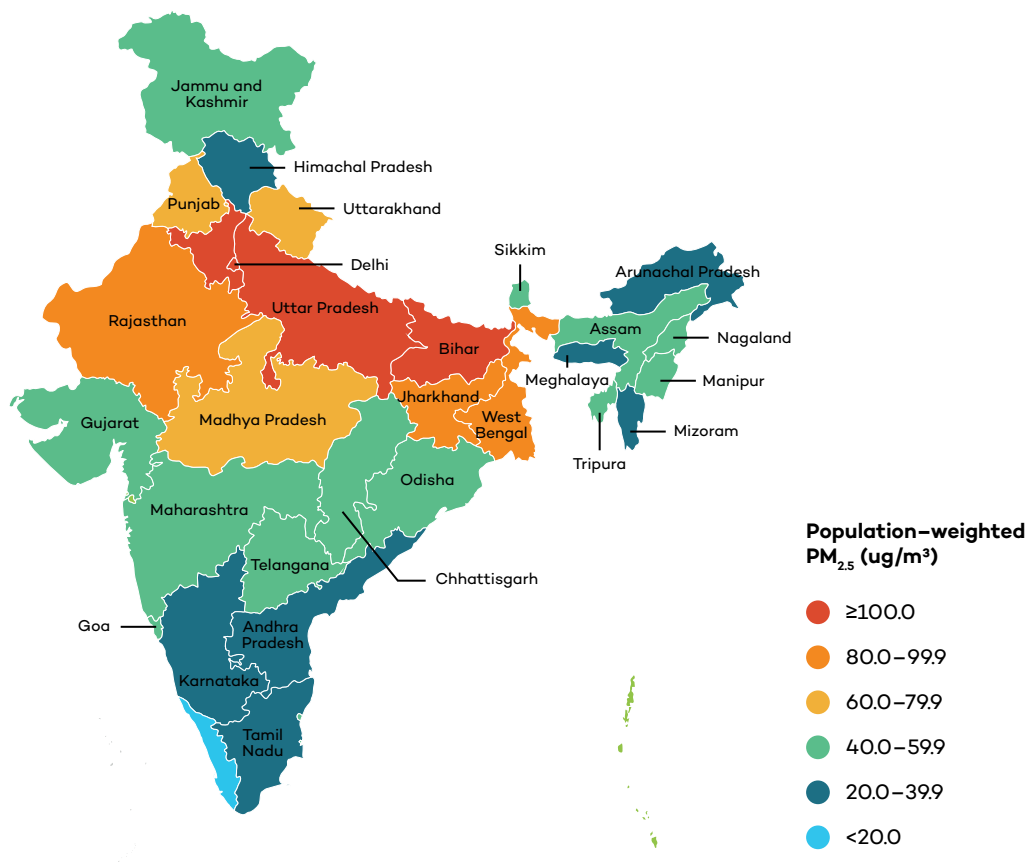


Figure 6. PM_{2.5} concentration levels across India

Source: Balakrishnan et al., 2018.

The main regulation to address GHG emissions linked to coal is a cess that was introduced in 2010. It has been described it as a “carbon tax” in India’s climate change commitments and has been raised three times through its lifetime to date, currently levying INR 400 (USD 5.7) per tonne of coal (Soman et al., 2018). In terms of carbon pricing, this amounts to an effective carbon dioxide price of USD 4 per tonne (Soman et al., 2018). This is much lower than most estimates of the price required to properly account for the costs of climate change. For comparison, Sweden taxes carbon at USD 139 per tonne of carbon dioxide equivalent (World Bank & Ecofys, 2018), while South Korea announced plans to increase its coal tax to USD 41 per tonne in April 2019 (Reuters, 2019).

As the impacts of climate change intensify and policy in India becomes more stringent, the rate charged by the cess can be expected to increase. Considering the constraints of “carbon budgets”—the total available amount of carbon that can be sustained globally—many countries over the past several years have been announcing even stronger regulatory measures, including coal phase-outs. There is no sign that this is currently being considered by policy-makers in India, but this trend should be priced into risk by public and private lenders. Prospects for coal power assets could rapidly change in light of growing climate change impacts.

3.4 Water Scarcity

Thermal power plants are water intensive in nature, largely linked to cooling systems. In recognition of this, the government-mandated cap on water consumption was set at 3 m³ per MWh³ (Ministry of Environment, 2017). A study by Luo, Krishnan and Sen (2018) calculated that 39 per cent of the installed thermal capacity in India is in high water-stress regions, and, with water resources limited, any further coal power plant expansion will only add to the magnitude of this growing problem.

The location of the current stressed assets coincides with regions of water scarcity. Luo et al. (2018) analyzes the revenues generated in high water-stress areas by two companies that possess assets classified as non-performing. They find that none of GMR Group’s revenues are in high water-stress areas (operating two NPAs in Chhattisgarh and Odisha), but 99 per cent of Essar Energy’s revenues are in high water-stress areas (operating one NPA in Jharkhand).

Table 1 indicates the stress level of six major water basins in Chhattisgarh, Odisha and Jharkhand, the three states with the highest share of stressed assets, based on data collected by the Vasudha Foundation (2018). In 2010, two basins (Brahmani & Baitarn and Mahanadi) were categorized as “no water stress,” while the remaining four basins were stressed and had per capita annual water supply lower than 1,700 m³. By 2050, all six basins are expected to be stressed with two—east-flowing rivers between the Godavari and Krishna basins and east-flowing rivers between the Mahanadi and Godavari basins—reaching “absolute scarcity.” This suggests that water availability may become an increasingly important factor that affects coal power operating costs in future.

³ This equates to 5,040 kL of water used in a day by a 100 MW plant running at a plant load factor of 70 per cent.



Table 1. Water scarcity basins supplying the states of Chhattisgarh, Jharkhand and Odisha, 2010–2050

Basin	States	Water Stress		
		2010	2025	2050
Brahmani and Baitarni basins	Odisha	No stress	No stress	Stress
East-flowing rivers between the Godavari and Krishna basins	Chhattisgarh, Odisha, Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Karnataka, Puducherry	Scarcity	Scarcity	Absolute scarcity
East-flowing rivers between Mahanadi and Godavari basins	Chhattisgarh, Odisha, Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Karnataka, Puducherry	Scarcity	Scarcity	Absolute scarcity
Godavari Basin	Chhattisgarh, Odisha, Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Karnataka, Puducherry	Stress	Stress	Stress
Mahanadi basin	Chhattisgarh, Odisha	No stress	Stress	Stress
Subarnarekha basin	Jharkhand, Odisha, West Bengal	Scarcity	Scarcity	Scarcity

Note: no stress (>1,700 m³), stress (1,000–1,700 m³), scarcity (500–1,000 m³), or absolute scarcity (<500 m³).
Source: Vasudha Foundation, 2018

3.5 Cost-Competitiveness of Renewable Energy

India’s current policies and interventions supporting coal power (and coal mining) have been predicated on the fact that it has been the lowest-cost domestic form of energy and therefore important for promoting economic growth and energy security. This context has been shifting rapidly since the start of 2017 with the advent of competitive, contested reverse auctions for both wind and solar power: recent onshore wind and solar PV auctions have resulted in tariff bids that are comfortably cost-competitive with coal power plants (Worrall et al., 2018). Further, leveraging the natural domestic wind and solar resources of India will improve India’s energy security, reducing reliance on imported fossil fuels. A sustained increase in the share of renewable energy in India will still depend on important technological and infrastructural developments around balancing variable supply, but the recent pace of change suggests that this should be viewed as an important risk factor for coal power, as existing or new capacity may be under-bid by alternative technologies.

Today, six states—Karnataka, Tamil Nadu, Maharashtra, Gujarat, Rajasthan and Andhra Pradesh—account for 77 per cent of total Indian renewable energy capacity (Central Electricity Authority, 2018), while the three states with the highest degree of stressed assets—Chhattisgarh, Odisha and Jharkhand—have only 1.1 per cent of their capacity made up of renewables. The relative share of renewables in state electricity capacity is illustrated in Figure 7. This distribution suggests that the cost-competitiveness of renewable energy is not a major driver of the current stressed asset crisis. It is likely, however, that it could become more pressing in the future. For example, the State of Andhra Pradesh accounts for 10 per cent of installed renewable energy capacity while also having 5 per cent of its coal assets under “stress” (Standing Committee on Energy, 2018). A sustained drop in the price for renewable electricity will increase the risk of renegotiated PPAs for existing plants and the challenges in obtaining new PPAs. It could also affect the revaluation of stressed assets if borrowers enter bankruptcy. This situation could be enhanced by a policy environment that supports greater integration of renewables in the grid, as seen by the transmission charge waiver for renewables (Saluja, 2018).

Investment in profitable renewable projects could be an important hedging strategy for asset owners and investors to offset stranded-asset-related financial losses, while also contributing to the energy transition. In Chhattisgarh, Odisha and Jharkhand, only half of the companies (nine) with stressed capacity are also investing in, or considering future investment in, renewable energy (broadly defined, i.e., hydropower, solar, wind and biomass), as stated on their corporate websites. Among the remaining companies, there is little evidence of diversification of power assets outside of natural gas power plants, coal mining and steel manufacturing (with captive power). This is in contrast to leading national corporations from both the public and private sectors that have expanded their portfolios to include renewables. One example is the public coal mining Neyveli Lignite Corporation of Tamil Nadu, which has commissioned 440 MW of solar power and 51 MW of wind power. In 2017, they were awarded 449 MW of the initial 1,500 MW solar power bid, making them one of the leading developers in the state (Chandrasekaran, 2017). Diversification into other high-carbon areas is a riskier strategy in the context of India's energy transition, as it is associated not just with higher emissions but also greater local pollution and water consumption.

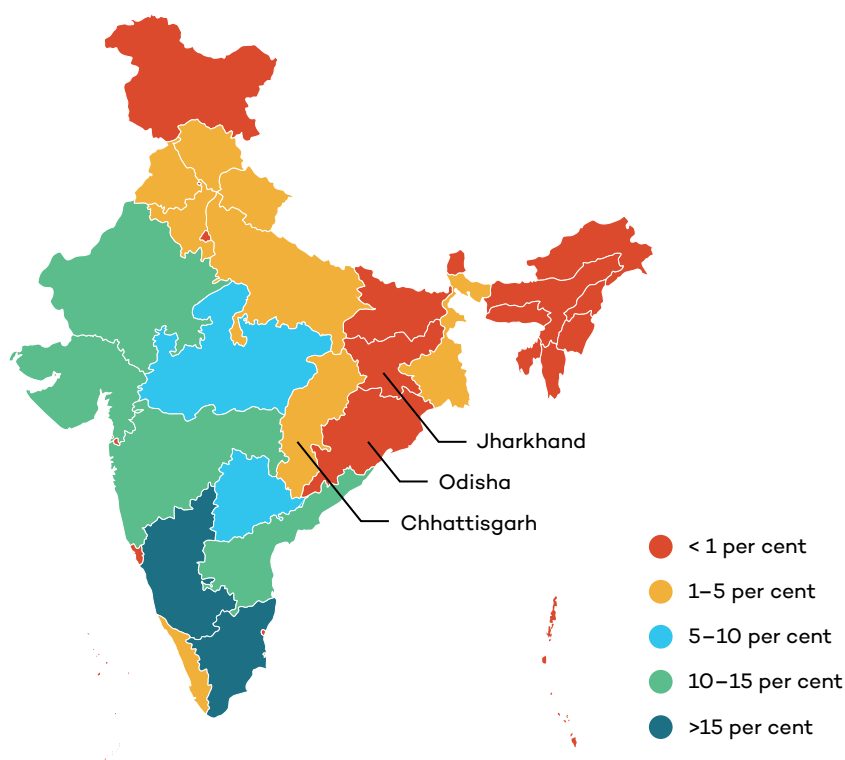


Figure 7. State deployment (percentage) of total national renewable energy installed capacity

Note: includes only utility-scale capacity, updated on December 31, 2018.

Source: Central Electricity Authority, 2018.



4.0 Managing the Energy Transition: Supporting workers and communities

The extent of asset stranding for coal power in India is determined by a range of drivers, and it is reasonable to suppose that this pressure may intensify over time. Today, most debates around government intervention are focused on how to assist assets, investors and lenders—but this is only one half of the equation. Interventions can also focus on assisting affected workers and communities. While this may seem far from the reality of current practice for many policy-makers in India, it is important to think early and seriously about this question in light of growing renewable energy cost-competitiveness and various policy processes for the increased internalization of coal externalities. Such discussions are ongoing in a number of countries around the world, often described as a call for a “just transition”: “a bridge from where we are today to a future where all jobs are green and decent, poverty is eradicated, and communities are thriving and resilient” (International Labour Organisation, 2016).

Adapting the International Institute for Sustainable Development framework established in *Real People, Real Change: Strategies for Just Energy Transitions* (Zinecker et al., 2018), the sub-sections below illustrate some of the complex social justice issues that might emerge if coal asset stranding continues or intensifies by reviewing the energy sector context and its implications for a transition, and examining complementary policies to ensure social justice and key actors for national dialogue.

4.1 Context

Coal accounts for 45 per cent of India’s total primary energy supply and is India’s largest domestic fuel source. As a result, the coal supply chain employs many people. Limited data availability and quality make detailed analysis challenging, with no formal employment statistics available on the entire coal value chain. Nonetheless, the estimates that are available suggest that a significant decline

in coal power would likely have important labour impacts. Lahiri-Dutt (2016) estimates that there are 1.2 million workers in India's coal mining industry, including CIL, private producers and informal workers. This does not include workers in coal power production and transport. Power production is not labour intensive, but coal accounts for approximately 30 per cent of India's rail network revenue, and the rail sector formally employs 1.3 million individuals (Indian Railways, 2018). There is also likely to be a large shadow informal workforce, as informal labour is thought to make up 81 per cent of India's wider industrial workforce (Indian Railways, 2018; International Labour Organisation, 2018). Much of this is likely to be clustered in specific states that possess the majority of India's coal reserves: Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh and Andhra Pradesh (Ministry of Coal, 2014). While these are large absolute numbers of workers, it is important to consider them within the context of India's overall labour force: estimated at around 527 million people in 2018 (World Bank, n.d.).

India's coal mining workforce has been declining per unit of output, as mechanization of the sector has been promoted by CIL, driven by the need for economic efficiency and safety concerns (Ghosh, 2015). This can be tracked by showing labour productivity estimates, which have increased by 6.6 per cent between 2000 and 2014 (Spencer et al., 2018). In turn, this has faced strong pushback from unions. There has also been increasing scrutiny of the low quality of employment in the coal sector. It exposes workers to numerous risks, particularly if they are working informally. The Ministry of Labour and Employment observed: "coal mining is recognized as one of the most hazardous peacetime occupations...mainly because of highly unpredictable and varying nature of working conditions" (Ministry of Labour and Employment, 2011).

At the same time, the renewable energy sector is bringing in significant new capital investment and hence also creating many new job opportunities. Jobs in solar power grew by 36 per cent between 2016 and 2017 to 164,000. The International Renewable Energy Agency (2018) estimates that there were 432,000 direct renewable energy jobs in India in 2017, not including large-scale hydro, many distributed renewable energy technologies and appliances or informal labour. This is already on par with CIL's workforce and is highly likely to grow, with the renewable capacity target having increased from 175 GW to 227 GW by 2022 and the Renewable Purchase Obligation requiring major energy consumers to increase their compulsory share of renewables from 17 per cent to 22 per cent by 2022 (Ministry of Power, 2018).

4.2 Implications for a Transition

If a significant volume of India's coal power capacity becomes stranded, this could affect labour linked directly or indirectly to the coal value chain. The large absolute numbers of workers in India's coal sector workforce would require this to be managed in a socially just way, particularly in the most affected regions. Given the ongoing decline of employment in the coal sector, driven by mechanization and shifting relative costs of capital and labour, this should be a natural extension of existing strategic thinking on how to manage labour loss among sector workers.

Although there may be some natural rebalancing with new employment linked to renewable energy, there is no reason to suppose that job losses and creation will necessarily cluster in the same geographic areas. The majority of India's coal is in the central states of Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh and Andhra Pradesh, while most new renewable capacity is planned for South, West and North Indian states with better wind resources and solar radiation (Geological Survey of India, 2018; NITI Aayog, 2015). Within the context of a fast-growing, emerging economy, there may be lower-hanging fruit among other fast-growing economic sectors that are better clustered geographically



with coal sector jobs. This leaves an important role for government planning to help ensure job growth in the most affected areas. Government planning may also be needed to account for the quality and longevity of new jobs that are created (Bridle et al., forthcoming).

4.3 Complementary Policies

Complementary policies are government interventions intended to promote a socially just outcome for communities and workers during a major period of change (Zinecker et al., 2018). These can vary in scope, from bespoke policies that are targeted at specific affected actors (e.g., coal miners) to national systems that provide for vulnerable groups as part of a wider social safety mechanism.

Today, India's unemployed population is estimated at 31 million, and many macroeconomic policies are focused primarily on job creation (Breitkreuz et al., 2017; Sushma, 2018). The main national scheme that provides a safety net for workers is the Mahatma Gandhi National Rural Employment Guarantee Act, which guarantees citizens 100 days' of work per year (Breitkreuz et al., 2017). Meanwhile, the government has "widened the scope of continuous engagement of consultations among the stakeholders for inclusive labour policy formulation at regional and state levels," including a series of conferences between government and senior figures in the labour movement (Ministry of Labour and Employment, 2018).

Despite these general policies, there are few schemes that could target assistance to regions where coal workers are at risk of redundancy. Coal mine rehabilitation can recover land damaged through open cut mining, using the same workforce and skillset that created the problem in the same location. However, end-of-mine-life brings to an end state royalties, and hence the funding of rehabilitation after end-of-mine-life can be problematic without proactive financial planning. Other countries that have drawn back from coal have provided policies such as voluntary retirement schemes (generally available to public sector workers with 10 years of service or over the age of 40), retraining of workers, and cash transfers and tax breaks for immediately affected groups (Zinecker et al., 2018). While such policies may be costly, they often compare favourably with the cost of subsidizing continued operations or bailing out assets and investors. Such schemes can also be funded through any policy measure that has sought to internalize coal-related externalities, such as the cess on coal intended to account for the cost of GHG emissions (Robins, Brunsting, & Wood, 2018).

4.4 Dialogue with Stakeholders

The design of such policies should derive from a meaningful dialogue between affected actors (Pant, 2017). Given the impacts on the economy and the energy sector, as well as state dominance in the coal value chain, national and state governments will have to play a central role in facilitating any transition dialogue. The process would then need to include trade unions (e.g., INTUC, AITUC), state-owned enterprises, DISCOMs and various departments of government (e.g., the ministries of New and Renewable Energy, Transport and Highways, and Labour and Employment). The wider communities that depend on coal should also be included, as they too can become "stranded communities" (Robins et al., 2018). Such dialogue would be most important in major coal-producing states, including Maharashtra, Chhattisgarh and Jharkhand. As the official government think tank responsible for planning, the National Institution for Transforming India (NITI Aayog) can also play a role in facilitating the process. Finally, the voice of fast-growing labour-intensive sectors in affected regions must be recognized in the dialogue, to give a voice to how best to create opportunities for workers.



5.0 Conclusions

The current stressed asset crisis may or may not be a sign of a deeper transition in India's energy sector—but our review suggests that numerous drivers are pointing in this direction in the medium term. This makes the crisis also an opportunity to discuss the appropriate role for government interventions when assets strand, separating out a focus on protecting assets from a focus on protecting people.

While this issue is still emerging, the government has a pivotal role to play in creating a conducive policy environment for stakeholders to discuss and manage social and financial risks and in providing a long-term policy-oriented planning framework. On this basis, we make the following key recommendations for policy-makers:

- **Assess scenarios for future cost-effectiveness of coal power based on key drivers of current and future stranding.** While literature exists on various factors that may put pressure on the cost-competitiveness of coal, deeper analytical work is required to estimate the range of impacts across different scenarios. This should review future risks associated with water scarcity, air pollution and renewable energy cost-competitiveness. This assessment may want to focus on states where stressed assets are already most problematic: Chhattisgarh, Odisha and Jharkhand.
- **Identify and evaluate the role of policy support mechanisms for coal.** Across all major drivers that affect coal, there is also an important role being played by policy, where generous lending practices and interventions that reduce the cost of investment and operations have driven poor investment decisions and masked the extent to which plants are under stress. In some cases, policy tools may also be having a counter-productive influence.
- **In the context of existing dialogue about coal workers, explore the complementary policies that can ensure that stranded assets do not lead to stranded workers and communities.** This should include a consideration of general employment schemes and safety nets, as well as targeted assistance-financing mechanisms. It should also involve deep engagement with representatives of coal workers and communities, as well as the sectors that might be best placed for employment transfers if the right conditions are in place. This engagement may want to focus on states with the largest coal reserves: Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh and Andhra Pradesh.



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