

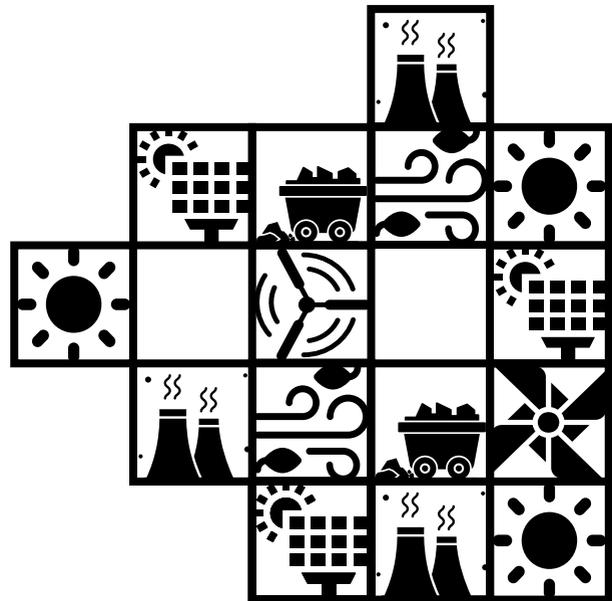
September 2023

CEEP's Contribution to

The Role of **Coal** in a Sustainable Energy Mix for India



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The Role of Coal in a Sustainable Energy Mix for India

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1 Governance Principles for a Just Energy Transition

Simran Grover, Naini Swami, and V. Suresh

Energy Transition and Justice

Energy transition is not just about technological change in energy production but crucially includes and entrenches a transition in consumer behaviour, institutions, and their power, infrastructure, and cultural discourses (Williams & Doyon, 2019). The global fuel (oil and gas) crisis triggered by the Ukraine–Russia conflict has highlighted, once again, the complications of international geopolitics and its entanglements with global and regional energy security. In the present context, energy production from extractive sources and entrenchment of investments in energy assets are pressing concerns for citizens and institutions of sovereign nations.

Coal mining’s deleterious environmental impact is well documented. Recent research presents compelling evidence against open-cast mining activities from multiple districts across India (Ranjan, 2019). Land clearing and mining operations remove natural vegetation and fertile topsoil, leave permanent scars on the landscape, impoverish soil quality, and drastically change ecosystems’ biotic and abiotic components (Mishra & Das, 2017). A 2016 report highlights that coal mining activities in India have caused the displacement of 87,000 people since 1973, including 14,000 Adivasis (Amnesty International, 2016).

Does a clean energy transition offer an alternative development paradigm which is environmentally non-extractive and socially inclusive?

The emerging evidence suggests otherwise. Renewable energy projects are reported as sites of conflict between local communities and project developers (Aggarwal, 2021). In Rajasthan, the Supreme Court’s order, to install bird diverters on the high-voltage lines and to move them underground in identified critical regions (*M.K. Ranjitsinh v Union of India*, 2019) when the avian population was endangered because of contact with high-voltage lines of the upcoming renewable energy power plants, is yet to be implemented.

Further, a central issue at the heart of energy transition is its impact on livelihoods. The coal economy employs only 4.7 million people directly across the globe but supports a much larger number of indirect jobs and livelihoods, cutting deeply across sectoral value chains of many industries (World Bank, 2021). Clean energy transition navigates complexities at the intersection of corporate interests, state priorities, and lives and livelihoods of people; enshrining social and environmental justice in the energy transition is a matter of human decency and dignity. Chapter 20 delves deeper into the concept of Just Transition and what it means for all stakeholders.

For India, clean energy transition provides an opportunity to shape new paradigms of development and growth, where the need for a “Just Transition” takes centre stage. Given the unique social, cultural, historical, and economic context of India, the consensus

on the vision of “Just Transition” and principles that may be adopted to achieve the same require a broader political recognition and acceptance.

In the following sections, we deliberate on some such governance principles for a just energy transition by exploring the critical domains of labour and environmental governance.

Labour Governance and Just Transition

The Just Transition of the workforce is inextricably linked to the creation of decent work and quality jobs in accordance with nationally defined priorities (United Nations, 2015). The decent work agenda is a long-standing goal of the International Labour Organization (ILO) as well. Broadly, it refers to “access to full and productive employment with rights at work, social protection, and the promotion of social dialogue” (ILO).

The ILO Declaration on Social Justice for a Fair Globalization recommends member states to lay down mechanisms for measuring decent work indicators (ILO, 2008). In pursuance of the same, an expert body of the ILO adopted a framework for Decent Work Indicators covering ten substantive elements relating to the four strategic pillars of ILO’s Decent Work Agenda: (i) employment creation, (ii) social protection, (iii) rights at work, and (iv) social dialogue. The ten substantive elements of decent work agenda are employment opportunities; adequate earnings and productive work; decent working time; combining work, family, and personal life; work that should be abolished; stability and security of work; equal opportunity and treatment in employment; safe work environment; social security; and social dialogue and employers’ and workers’ representation (ILO). The legal indicators for decent work cover maternity protection (including weeks of leave, replacement rate, and coverage), paternity and parental leaves, maximum hours of work and paid annual leave, and minimum wage setting procedure and level (ILO, 2013).

The salience of the decent work agenda is reiterated in the guidelines for a Just Transition towards environmentally sustainable economies and societies (ILO, 2015), whose key recommendations are:

- Integration of social dialogue, including adequate, informed, and ongoing consultation into the institutional framework at all levels.
- Recognition, promotion, and realization of fundamental principles and rights at work.
- Recognition of the strong gender dimensions of environmental challenges and opportunities and the creation of specific policies to address the same.
- Coherence in economic, environmental, social, education/training, and labour policies.
- Creation of a Just Transition framework for creating decent jobs, anticipating employment impacts, adequate and sustainable social protection for job losses and displacement, skill development, and social dialogue, including the effective realization of the right to organize and bargain collectively (ILO, 2015).

Understanding the Indian Workforce

The workforce in India is broadly classified into three categories: self-employed, regular wage/salaried, and casual workers. An analysis of the PLFS Annual Report 2019–2020 shows that amongst the three categories, the majority of India’s workforce comprises self-employed people (53.5%), followed by casual workers forming 26.3%, and only 18.2% who are regular wage or salaried workers (NITI Aayog, 2022). The labour laws

segment the workforce into informal and formal workers and the labour market into organized and unorganized sectors.

Together, the informal workers and unorganized sectors form the country's informal economy, where workers are excluded from the benefits of formal contracts, paid leave, and social security benefits. There is persistent conceptual ambiguity in classifying informal and formal workers and organized and unorganized sectors. The disparities arising from the absence of legal protection for informal workers are considered a fundamental governance flaw (Shyam Sundar, 2019).

Evidence suggests that the coverage of social security schemes amongst economically and socially vulnerable sections has remained poor. While regular workers are largely covered by the provident fund regime, the growing segment of casual and contract workers, even in the organised sector, appear to be discriminated against. The entire self-employed workforce is inherently excluded. Although the statutory provisions of the provident fund are supposed to be applicable universally amongst industries specified in Schedule I, the evidence clearly points to a dismal state of affairs (Sakthivel & Joddar, 2006).

Seasonal and circular labour migrants form a growing segment of the informally employed. Poor and low-caste workers form a disproportionate proportion of such workers comprising the lowest rung of labour at organised sector work sites. They are segmented and fragmented by the recruitment process and along the lines of caste, sex, ethnicity, language, and region. This segmentation and fragmentation create the basis for capital to acquire low-cost, highly flexible labour, who work long hours and take up the most dangerous work. Gender-based labour segmentation builds on the culturally determined social reproduction responsibilities of female workers and other socio-cultural factors (Srivastava, 2019).

As far as the coverage of social security schemes is concerned, 85% of workers from non-farm sector belonging to the category of SCs and OBCs do not have social security benefits. For the other categories, it stands at 75%. Amongst the unorganised segment of workforce, there is hardly any coverage of social security schemes. For instance, coverage of the Workmen's Compensation Act which provides for security and medical treatment in the context of occupational and workplace accidents and mishaps is not available for the bulk of workers in the informal and casual labour segment. Estimates for the organised segment suggest that 85–90% of the workforce belonging to the category of STs and others are covered under social security schemes, but coverage for SCs and OBCs is lower, being less than 80% for OBCs (Sakthivel & Joddar, 2006).

India and the ILO Conventions

India is a founding member of ILO and has contributed significantly to setting ILO standards, which have substantively influenced its labour governance. India has ratified 47 conventions covering 15 subjects. Fundamental ILO Conventions ratified or ignored by India are listed in Table 7A.1. However, of the 47 Conventions and 1 Protocol ratified by India, 38 are in force, 5 Conventions have been denounced,¹ and 5 instruments have been abrogated². From the ILO conventions relevant for Just Transition, India has ratified 10 of the 25 instruments. Social security, social policy, occupational safety and health, and labour relations remain neglected subjects in the existing architecture of binding ILO standards accepted by India (ILO, 2015). Table 7A.2 provides a detail of the Just Transition conventions accepted by India.

An important fundamental convention not ratified by India relates to collective bargaining despite the Constitution of India guaranteeing, under Art. 19(1)(c), the right to freedom of association as a fundamental right subject to reasonable restrictions (The Constitution of India, 1950). Further, labour laws in India provide statutory recognition to trade unions to raise issues and negotiate with employers. However, India's domestic standards on collective bargaining are weaker than those specified by ILO. The amendments to labour legislation have adversely impacted collective bargaining rights. This includes steps such as increasing the minimum requirements for recognition of unions from seven to at least a hundred workers or 10% of the workforce, whichever is lower (Hussain & Wani, 2011). The increased minimum requirements of workers for union registration are very high compared to the international standards that specify a minimum of 20 workers for the recognition of trade unions.

Further, while labour laws provide enabling provisions for negotiation between employers and workers, the same is not mandatory. After independence, collective bargaining developed in a centralized way in India, with the state playing mediator between employers' and workers' associations. However, with the advent of economic reforms, and the influence of globalization, the system of collective bargaining was decentralized. As a result, highly segregated mechanisms of collective bargaining emerged along the fault lines of regions and industrial sectors (Bhattacharjee, 2001). Workers' participation in trade unions has significantly declined, and collective bargaining practices continue to emaciate (ILO, 2018).

Exploring Governance Principles at the Intersection of Labour Governance and Just Transition

3.6 million people are estimated to be directly or indirectly employed in the coal mining and power sector across 159 districts in India. While informal workers produce a fraction of coal in India, the informal sector creates many more jobs than total employment in the formal coal mining industry (Pai, 2021). On the other hand, the thermal power generation sector employs mostly formal workers. However, the majority of the labour is employed through sub-contracting, diminishing their power for collective bargaining as they are unionized. Further, there are many associated industries and services (ash handling, brick, and cement) which employ a large number of informal workers. From the 1990s, post liberalisation and economic reforms, the formal sector has substantively shifted towards engaging contractual workers. The contractual workforce largely consists of unskilled and semi-skilled workers, working in extremely hazardous conditions for minimum wages.

The clean energy transition imposes a major challenge for jobs, livelihoods, and local economy. The sites of coal mining and thermal power generation are not necessarily suited to be replaced by renewable energy assets, and they often demand significant investments to remedy decades of environmental degradation.

The renewable energy generation sector also offers a strikingly different job landscape. Renewable energy assets built on commercial technology such as wind and solar employ very few people for operations and maintenance. Further, the majority of the jobs created (guards and labour for cleaning solar modules and clearing vegetation) are menial in nature and employ unskilled workers. The industry creates temporary jobs during the construction and pre-commissioning phase, which does not provide the long-term reliability of coal and power sector jobs.

While it may be argued that the renewable energy sector offers a far better and safer work environment, it does not guarantee better jobs. Given the temporary and contractual nature of the work, the workforce is at the mercy of the industry to decide their wages without any mechanisms for collective bargaining and legal safeguards.

As carbon-intensive industries are gradually dismantled, possibly over the period of the next 30–40 years, the clean energy transition provides a rare opportunity to envisage the fundamental economic and development paradigms. As we strive to transform our extractive and exploitative relation with natural ecosystems and the environment, do we also strive to stop the exploitation of human beings for cheap labour and financial gains of the few at the cost of many?

The rule of law does not allow public policy to limit rights and justice to workers of a particular industry. Delivering equitable growth and inclusive development shall require a transformative approach towards labour governance. Just Transition shall posit the rights of workers and equitable development against corporate interests and economic growth at the cost of the masses. These are non-binary and complex trade-offs which require much deliberation. The decision-making and action for transforming labour governance in the back-drop of energy transition shall be shaped by the broad governance principles we practice while framing our legislation (and legal framework), designing our institutions, and deciding on paths of action.

Environment Governance and Just Transition

Environment legislation in the country gained momentum with the landmark United Nations Conference on the Environment (1972) in Stockholm. The Stockholm conference led to the setting up of the National Committee on Environmental Planning and Coordination. This committee played a key role in the framing of the Wildlife Protection Act, 1972; the Water (Prevention and Control of Pollution) Act, 1974; and the Air (Prevention and Control of Pollution) Act, 1981.³

However, the most important development in the Indian landscape of environment law was a result of the unfortunate Bhopal Gas Tragedy in December 1984. After the incident, the Indian government came up with the Environment Protection Act, 1986 which was presented as an instrument to combat environmental pollution in all aspects. The Act gave wide regulatory and punitive powers to the central and state authorities.⁴

The institutional development to regulate and implement environmental law gathered pace with the introduction of the aforementioned legislations. In 1980, the Tiwari Committee was constituted for suggesting ways of improving the legal framework for protecting the environment, recommended the constitution at the central government level, of the Department of Environment, later renamed the Ministry of Environment and Forest (MoEF) in 1984. The Water Act, 1974 established the Central and State Pollution Control Boards, and their scope was expanded by the Air Act, 1981. Further, in 1995 the National Environment Tribunal Act was enacted to establish an environment tribunal to adjudicate environmental disputes and decide the liability of the polluter. The National Green Tribunal Act of 2010 repealed this law and established the National Green Tribunal (NGT) with broader and overarching powers of adjudication.

The Panchayat Extension to Scheduled Areas (PESA) Act, 1996, gave greater autonomy to tribal communities living in Scheduled Areas (Schedule V, Constitution of India) by extending the powers of local self-government (Panchayats) to include control over natural resources and traditional institutions. The Act recognised the Panchayats in

the Scheduled Areas as an institution of self-governance and accorded the Gram Sabha (village assembly) powers to promote community ownership, control of minor forest produce, protection of community resources and rights, and recognition of traditional leadership and institutions.

In a major development, the Forest Rights Act 2006 recognized the rights of forest-dwelling communities and intended to reverse the historical injustice they have faced. The Act provides for the recognition and vesting of individual and community forest rights. It also requires that forest-dwelling communities be consulted before any decision is taken that affects their rights or forests. The Act establishes a process for granting rights to forest land, including the right to reside in, protect, and conserve the forests and their biodiversity; the right to use and access forest produce; and the right to protect the traditional and cultural heritage of the forest-dwelling communities.

India has a rich history of environmental movements, dating back to “Bishnoi Movement” in the 1700s that sought to protect the faith of the community and the sacred trees of their village. In the post-independent era, various movements like the Chipko (Uttarakhand, 1973), Save Silent Valley (Kerala, 1978), Jungle Bachao Andolan (Bihar, 1982), Narmada Bachao Andolan (1985), and others have sought to assert the rights of people and preserve natural ecosystems. Hence, it is important to explore the environmental governance in India at the intersection of policy, jurisprudence, and public (and environment) interests.

Environment Rule of Law and Environment Protection Act

The rule of law refers to the idea that all individuals and institutions, including governments, are accountable to laws that are publicly promulgated, equally enforced, and independently adjudicated and which are consistent with international human rights norms and standards.

In 2013, the United Nations Environment Programme (“UNEP”) adopted Decision 27/9, on Advancing Justice, Governance and Law for Environmental Sustainability, which introduced the term “Environmental Rule of Law” to integrate critical environmental needs with the essential elements of the rule of Law (Jain, Ahlawat, Sinha, & Jain, 2022).

Environmental rule of law has been recognized as a crucial element in achieving sustainable development, as it provides the legal framework and mechanisms for the protection of the environment and the promotion of sustainable practices. It also helps to ensure that the rights of individuals and communities are respected and protected in relation to the environment. This includes the right to a healthy environment, the right to access information and justice in environmental matters, and the rights of indigenous peoples and local communities to participate in decision-making processes related to the environment.

The Environment (Protection) Act (1986) provides (EP Act) for the protection and improvement of the environment and the prevention of hazards to human beings, plants, and animals. Section 3 of the EP Act empowers the central government to take all necessary measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing controlling and abating environmental pollution. In unequivocal terms, this section lays out that this power is to be used for protecting and improving the quality of the environment. The power under this section is of protectionist nature, but it is to be used for protecting the environment and

not for relaxing environmental safeguards for any other reason (Jain, Ahlawat, Sinha, & Jain, 2022).

We explore the environmental governance in India in the context of the mandate of the EP Act 1986 and the Environment Rule of Law, including the principle of nonregression,⁵ through some amendments introduced under the EP Act.

- **Environmental Impact Assessment Rules**

In the draft EIA Rules 2022, MoEF&CC displayed policy intent to introduce business-friendly amendments at the cost of public interests and environmental safeguards. While the draft notification was not adopted (possibly because of public resistance), the ministry later introduced specific amendments which are contrary to the “principle of non-regression.”

MoEF&CC vide notification dated 14 July 2022 exempted thermal Power Plants up to 15 MW based on biomass or non-hazardous municipal Solid Waste using auxiliary fuel such as coal, lignite, or petroleum products up to 15% from the requirement of environmental clearance. It further exempted highway projects of strategic and defence importance up to 100 km from the line of control or border subject to compliance with the Standard Operating Procedure notified in this regard from time to time. Ports and harbours exclusively engaged in fish-handling capacity were also exempted from environmental clearance. Vide notification dated 12 April 2022, the MoEF&CC extended the validity of environmental clearance for mining from thirty (30) years to fifty (50) years, aligning it with Mines and Minerals (Development and Regulation) Amendment Act, 2015.

- **Diluting the Role of Gram Sabha and Forest Dwellers**

Gram Sabha is accorded special authority under the Forest Rights Act (FRA) 2006 to execute its mandate. This includes acknowledgement of individual forest rights and the conservation of the forest environment (Forest Conservation Rules, 2022 – An overview of changes that snatch rights of Gram Sabhas, 2022). The Forest Conservation Rules, 2016 had embedded the need for Gram Sabha consent as a procedural requirement for prior approval for forest diversion by the environment ministry. The 2022 Rules have expunged this mandate. The central government can approve the project without any prior approval from *Gram Sabha*. The process of ensuring recognition of rights and final forest diversion is the responsibility of the state government (Nandi, 2022). Over the past few years, attempts have been made to dilute the legal provisions concerning the diversion of forestland, wherein executive orders and circulars of the MoEF&CC have directly sought exemption from obtaining *Gram Sabha*'s consent (Trivedi, 2022).

The various amendments (proposed/notified) by the MoEF&CC outlines the intent of the Government. The development paradigm increasingly undermines the critical need for environmental protection and acknowledging the rights of communities for sustainable growth. They pave the way for further exploitation and extraction of biological resources through direct intent and dilution of environmental safeguards.

In its December 2022 report, Vidhi Center for Legal Policy presented an analysis of 123 regulatory instruments issued by MoEF&CC, consisting of orders, office memorandums, circulars, letters, and notifications. It highlighted the number of changes introduced which circumvented the process of law, often against the spirit of the EP Act, and

weakened the “environment rule of law” in the country by removing or relaxing norms in the interest of economic growth (Jain, Ahlawat, Sinha, & Jain, 2022).

Exploring Governance Principles at the Intersection of Environment and Just Transition

Energy transition, similar to climate change, is “a double inequality” (Barrett, 2013), as the shift in the livelihoods landscape imposes risks on local communities and associated workforce, while the rewards of transition are cornered by investors and major corporates in the energy sector. The energy transition shall reshape the energy infrastructure, requiring the decommissioning or repurposing of existing assets, and building new infrastructure. In both scenarios, the presence of vulnerable communities in the proximity of the infrastructure is, typically, disproportionately high. Transition away from coal and treatment of carbon-intensive assets present environmental (and other) risks because of poor remediation practices and the absence of a comprehensive governance framework to mandate the same.

The social and environmental impact of large-scale deployment of renewable energy assets is now well documented. For instance, large-scale utility solar PV generation assets are rapidly changing the land use patterns across the states leading energy transition. In Western Rajasthan, conflicts are being increasingly reported as the rights of communities to *Orans* (sacred groves) and their preservation are being undermined. The region is home to highly vulnerable pastoral communities. Increasing exploitation of the region for renewable energy deployment is impacting their traditional routes and limiting their access to fodder as common lands are encroached.

The massive transmission infrastructure for evacuation of solar power in the Thar Region of Rajasthan threatens the endangered Great Indian Bustard (GIB) and other avian species. In the case of *M.K. Ranjitsinh v Union of India* (2021), the Supreme Court ordered the installation of bird diverters on the high-voltage lines and to move them underground, mandatorily in regions identified by the Wildlife Institute of India and subject to feasibility in others (supreme court, 2019). In response, the Ministry of New and Renewable Energy (MNRE) has filed an application seeking modification of the order on technical grounds (Thomas, 2022). Yet, the ministry identifies 75 GW of renewable energy potential in Rajasthan, of which 45 GW potential lies in the GIB zone (Central Electricity Authority, 2022).

An analysis of the emerging trends in energy transition suggests that the development paradigm and environmental governance principles share the same tenets that shaped the carbon-intensive economy and exploitation of natural resources. In the quest of development and climate action, public policy has to address many pertinent questions. Tradeoffs are perhaps inherent to the clean energy transition, the process of decision-making and setting up of priorities shall be shaped by the broader governance principles and development goals.

Deliberating Governance Principles for Energy Transition

The resilience of nations is manifest in their ability to anticipate and prepare for shocks, which, in turn, depends on the technical capacities of organizations and institutions at the front lines of crisis response, the overall functioning of country systems, and the governance structures that “set the rules of the game.”

(UNDP, 2011).

Conversations on the increasing threat of climate change highlight the rising complexity of governance issues at global and national levels. In this context, enhancing state resilience has become a key policy priority. Good governance is recognized as a foundational determinant of resilience among the various facets influencing state resilience (Brown, 2022).

There is a lack of consensus on the definition of good governance as a conceptual framework, despite its many proponents with varied interpretations. International institutions such as the World Bank and multilateral development banks focus on economic institutions, public sector management, transparency and accountability, regulatory reform, and public sector skills and leadership as relevant aspects of good governance. In contrast, organisations like the United Nations, European Commission, and the Organisation for Economic Co-operation and Development adopt a more expansive approach by including aspects like democratic governance, human rights, and political governance that are amiss in the approach of the international finance institutions (Gisselquist R. M., 2012).

Governance may be defined as a system of (1) policies, (2) values, and (3) institutions which (a) mediates decision-making, (b) creates a mechanism for articulating demands and differences, and (c) operates on core ethical/values-based system. The fundamental governing principles for the energy transition can be derived from various sources, including individuals, institutions, and conventions. For India, the Constitution provides perhaps the most comprehensive and nuanced framework for Just Energy Transition as it intricately enshrines the elements of social, economic, environmental, and political justice in a timeless manner. The UN members states recognise eight core values and principles of democratic governance: (a) participation; (b) equity, non-discrimination and inclusiveness; (c) gender equality; (d) consensus oriented (e) rules-based; (f) transparency; and (g) accountability and (h) responsiveness. These principles are congruent with key human rights principles set out in various UN declarations and conventions. They can be summarized in three core principles: (a) participation and inclusion, (b) accountability and the rule of law, and (c) equality and non-discrimination. The application of these three core principles for governing energy transition to deliver social and environmental justice is discussed next.

Participation and Inclusion

Participation and inclusion include empowerment through representation in government and other (e.g., administrative and local) mechanisms facilitating free, active, and meaningful participation in decision-making processes. Participatory political regimes deliver more equitable distributional outcomes and produce “superior institutions” better suited to local conditions (UNDP, 2011).

The energy transition discourse in India has been shaped by top-down policy, driven by national commitments for climate action. It has focussed heavily on addressing technical and financial barriers, mobilising public resources for subsidies (such as Production Linked Incentive schemes, exemption of wheeling charges, net metering, etc.) across the renewable energy value chain. However, the substantive impact on livelihoods (especially, the informal economy) as a result of the transition away from coal, has rarely attracted the attention of policy makers.

Accountability and the Rule of Law

The rule of law is a fundamental principle of governance that holds that all individuals and institutions are subject to the law and that the law should be applied equally and

fairly to all. In a democratic country, it is essential for protecting the rights and freedoms of the citizens. Accountability ensures that individuals and institutions are transparent and accountable to the people they serve. It is a critical component of good governance and is essential for building trust and confidence in institutions and organizations. Together, these are essential for effective participation and managing conflicts (UNDP, 2011).

The concept of the Rule of Law finds full expression in the Indian Constitution. The Preamble re-emphasises the high ideals of equality, justice, liberty, and fraternity (Baxi, 2007). Article 14 establishes “Equality before Law” as a fundamental right. Right to (dignified) work, a fundamental human right (UDHR, 1948), is inalienable from “Right to Life” under Article 21 (*Olga Tellis & Ors. vs Bombay Municipal Corporation & Ors.*, 1985). Further, various articles under Part IV of the Indian Constitution, Directive Principles of State Policy, enshrine the guiding principle for the State to deliver social, economic, and environmental justice. Directive Principles lay out guiding principles for labour governance that include the Right to Work (Article 41. The Constitution of India, 1950) and the dignity of workers (Articles 42, 43. The Constitution of India, 1950). Article 43A further directs the state to empower workers by securing means of participation of workers in the management of establishments and institutions in all sectors. The principle of conservation and preservation of the environment was also enshrined in Article 48A through the Constitution (Forty-second) Amendment Act 1976.

The Indian constitution establishes “accountability” as a fundamental principle through several mechanisms. This includes separation of powers (of the government) amongst the legislative, executive, and judicial branches; checks and balances between the three branches of the government; establishment of independent institutions;⁶ and a guaranteed Right to Information.

Thus, the fundamental principles for establishing and safeguarding the rights of workers, communities, and the environment are well enshrined in the Constitution of India. It succinctly established the Rule of Law and the Environment Rule of Law to guide India’s policy discourse towards Just Energy Transition.

Non-discrimination and Equality

The principles of equality and non-discrimination are part of the foundations of the rule of law (United Nations). In the context of Governance, the principle of equality seeks to address structural inequalities (be they social, political, or historical) by extending the development gains to the most excluded individuals and groups (UNHCHR, 2008). Institutions that ensure non-discrimination and equality can mitigate any detrimental impact on the most vulnerable through different means including ring-fencing of social expenditure and the prevention of the erosion of normative standards in times of crisis (UNDP, 2011).

The Constitution of India guarantees equality before the law and prohibits discrimination on the grounds of religion, race, caste, sex, or place of birth. Article 14 of the Constitution states that “the State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India.” Article 15 prohibits discrimination on the grounds of religion, race, caste, sex, or place of birth. The Constitution also provides for affirmative action for the benefit of disadvantaged groups such as Scheduled Castes and Scheduled Tribes. In addition, the Constitution also establishes

various commissions and committees to address issues related to equality and social justice, such as the National Commission for Scheduled Castes, the National Commission for Scheduled Tribes, and the National Commission for Women.

In the context of the clean energy transition, the principle of affirmative action may be extended for disadvantaged groups resulting from employment and livelihood vulnerabilities. Delivering justice in the course of the clean energy transition required a transformative change in our economic and development paradigm in a manner that seeks the restoration of human rights for all, sanctifies dignity of all workers, and promotes the preservation of the environment.

Emergence of a New Governance Paradigm: A Critique

In May 2022, the Union Minister of Power and New & Renewable Energy, Mr R.K. Singh, asked the Chief Ministers of all States and Lieutenant Governors of Union Territories (UT) to set up State Level Steering Committees for Energy Transition. The Steering Committees will work under the chairmanship of the Chief Secretaries of the respective States/Union Territories along with relevant departments. The Minister reiterated that States/UTs have a vital role in meeting state-specific goals on sustainable development in the most energy-efficient way.

A report of the Inter-ministerial Committee on Just Transition from Coal, published by NITI Aayog, highlights the need for a Just Transition policy addressing five key issues of livelihoods, community health, physical and social infrastructure, repurposing of resources, and public finance. The Committee advocated for a threeter task force to enable a Just Transition. Tier I, with representation from Central Govt. ministries and Civil society, shall ensure a Just Transition in the process of coal mine closure and set guidelines and good practices in the process by guaranteeing convergence and alignment with existing national policies and programmes. Tier II is constituted for each coal-bearing state, to safeguard the state's concerns, oversee plans for each asset closure in that state, and develop the regional development framework to enable the closure of coal mines with Just Transition principles. Tier III is constituted by Tier II for each asset being closed, at least four years prior to closure, with representatives from the affected local communities, project staff, and corresponding district administration and agencies. It shall develop and implement the redevelopment and repurposing plan for each asset that is being closed, based on public consultations.

In a very progressive move, the Government of Jharkhand recently set-up the "Sustainable Just Transition Task Force" with members including the Department of Planning, Mines and Geology, Environment Forests and Climate Change, Rural Development, Urban Development, Tribal and Minority Welfare, Labour and Employment, Training and Skill Development, Energy, Tourism, and State Coordinator State Level Bankers Committee. The Task Force has identified multiple objectives in the domain of impact assessment, sensitization of district officials, the role of communities in climate change mitigation, promotion of entrepreneurship, formulation of district action plans, and others.

The aforementioned emerging trends of policy action for Just Transition seem to acknowledge the intersectionality of energy transition across different sectors and line ministries. Further, the three-tier framework acknowledges the need for decentralised planning and representation.

While it is a good start, steering committees and task force don't have the administrative authority or permanence needed to navigate the complexities of energy transition. Navigating the challenges and complexities of energy transition shall require a comprehensive legal and institutional framework that encompasses various sectors and development initiatives. While there may be merit in exploring new institutions to be stewards of the energy transition, the role of existing institutions that execute development agenda across different tiers and sectors can't be ignored.

Values and Principles for a Just Energy Transition

Rule-based and Science-based Governance: Managing energy transition requires complex decision-making for long-term outcomes; primarily energy security, affordability, and sustainability. Uncertainties are integral to this process, often resulting in high social and economic costs when the margin of errors is high. Infrastructure demand, market economics, consumer behaviour, supply chains, and capital adequacy are some of the many uncertainties.

Given the complex and nuanced science behind energy transition, it is pertinent that transition governance embraces a science-based outlook. A rule-based system of policy and regulations can evolve to enable transition management for multiple outcomes. For instance, logical development goals shall evolve and informed tradeoffs can be made based on broader transition values and principles. This shall also promote systemic transparency and accountability.

Intersectional and Decentralised Governance: At the fundamental level, energy transition shall redefine how energy is produced and how it is consumed. From an economic perspective, it shall encompass all major sectors such as power, mobility, industry, agriculture, consumer products and services, etc. Some of the development challenges shall include energy reliability and affordability (hence, energy justice), livelihoods, and rights of directly impacted workers and communities. Hence, transition management shall demand conscious policy interventions across key sectors and development initiatives.

As India commits to an energy transition pathway, its challenges shall intersect with its social, economic, and cultural diversity. Addressing such spatial complexities require contextual understanding, and hence, the need for a decentralised governance regime for effective and efficient transition management. Decentralisation also improves transparency and accountability through participatory decision-making and accessible institutions.

Inclusion and Participation: Indian society is entrenched with structural inequalities based on caste, class, and gender. Structural inequality can limit the benefits of distributive justice. For instance, despite affirmative action of reservation, the most disadvantaged groups are unable to access its benefits in India as reservation quotas are rarely realised across many key institutions. Hence, the aspect of "procedural justice" becomes pertinent in evolving Just Transition governance. Decentralisation, on its own, doesn't guarantee the same.

Inclusion of impacted disadvantaged workers and groups in decision-making and transition management may be an effective mechanism for achieving procedural justice in transition governance. This shall also imply, as far as feasible, power is devolved to the bottom tier of governance to facilitate meaningful participation by disadvantaged groups.

Conclusion

Governing energy transition to make it just and equitable is complex and challenging. The discourse needs to begin by acknowledging the structural inequality and disparity entrenched in our social and economic systems. This shall require building conscious sensitivity towards historical oppression and engaging in dialogue to transform the current reality towards a more just and equitable social and economic system. A hard-coded governance regime cannot be prescribed here, but the core principles discussed here can facilitate an evolutionary governance paradigm which shall continuously seek to transform the current reality.

Notes

- 1 No. 2 Unemployment Convention, 1919, No. 5 Minimum Age (Industry) Convention, 1919, No. 22 Seamen's Articles of Agreement Convention, 1926, No. 108, Seafarers Identity Documents Convention, 1958, and No. 147 Merchant Shipping (Minimum Standards) Convention, 1976.
- 2 No. 4 Night Work (Women) Convention, 1919, No. 14 Minimum Age (Trimmers and Stokers) Convention, 1921, No. 16 Medical Examination of Young Persons (Sea) Convention, 1921, No. 21 Inspection of Emigrants Convention, and No. 22 Seamen's Articles of Agreement Convention, 1926.
- 3 <https://www.cambridge.org/core/journals/environmental-conservation/article/abs/indian-national-committee-on-environmental-planning-and-coordination/B0C955DDFFDB40104553B6FE15D73205>
- 4 <https://ijsw.tiss.edu/greenstone/collect/ijsw/index/assoc/HASH01ff/74b6e1e2.dir/doc.pdf>
- 5 The principle of non-regression prohibits any recession of environmental law or existing levels of environmental protection and comprises its protective norms in the category of non-revocable and intangible legal rules, in the common interest of humanity (UNEP, n.d.).
- 6 The Election Commission, the Comptroller and Auditor General, and the Central Vigilance Commission.

References

- Aggarwal, M. (2021, July 14). Land conflicts on the horizon as India pursues a clean energy future. India. Retrieved from Mongabay: <https://india.mongabay.com/2021/07/land-conflicts-on-the-horizon-as-india-pursues-a-clean-energy-future/>
- Amnesty International. (2016). *India: "When Land is Lost, Do We Eat Coal?" Coal Mining and Violations of Adivasi Rights*. Bangalore: Amnesty International.
- Barrett, S. (2013). Local level climate justice? Adaptation finance and vulnerability reduction. *Global Environmental Change*, 23(6), 1819–1829.
- Baxi, U. (2007). The rule of law in India. *International Journal on Human Rights*, 6, 7–26.
- Bhattacharjee, D. (2001). Globalising economy, localising labour. *Economic and Political Weekly*, 35, 3758–3764.
- Bhattacharjee, D. (2001). The evolution of Indian industrial relations: A comparative perspective. *Industrial Relations Journal*, 32, 244–263.
- Brown, F. Z. (2022, May 23). *Governance for Resilience: How Can States Prepare for the Next Crisis?*. Retrieved from carnegieendowment.org: <https://carnegieendowment.org/2022/05/23/governance-for-resilience-how-can-states-prepare-for-next-crisis-pub-87175>
- Central Electricity Authority. (2022). *Transmission System for Integration of Over 500 GW RE Capacity by 2030*. Central Electricity Authority.
- Forest Conservation Rules, 2022 – An Overview of Changes that Snatch Rights of Gram Sabhas. (2022). Retrieved from Citizens for Justice and Peace: <https://cjp.org.in/forest-conservation-rules-2022-an-overview-of-changes-that-snatch-rights-of-gram-sabhas/>

- Gisselquist, R. M. (2012). *Good Governance as a concept, why this matters for Development Policy*. Helsinki: UNU - WIDER.
- Hussain, Z., & Wani, M. A. (2011). Application and enforcement of international labour standards in India: A critique. *Journal of the Indian Law Institute*, 53, 577–593.
- ILO. (2008). *ILO Declaration on Social Justice for a Fair Globalization*. Retrieved October 18, 2022, from www.ilo.org: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/genericdocument/wcms_371208.pdf
- ILO. (2013). *Decent Work Indicators*. Geneva: ILO.
- ILO. (2015). *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*. Geneva: ILO.
- ILO. (2018a). *India Wage Report*. ILO.
- ILO. (n.d.). *Decent Work*. Retrieved from ilo.org: <https://www.ilo.org/global/topics/decent-work/lang--en/index.htm>
- ILO. (n.d.). *Decent Work Indicators*. Retrieved November 29, 2022, from ilo.org: https://www.ilo.org/integration/themes/mdw/WCMS_189392/lang--en/index.htm
- ILO. (n.d.). *Measuring Decent Work*. Retrieved October 22, 2022, from <https://www.ilo.org/integration/themes/mdw/lang--en/index.htm>
- Jain, T., Ahlawat, H., Sinha, D., & Jain, U. (2022). *(De)Regulating the Environment?* New Delhi: Vidhi Centre for Legal Policy.
- M.K. Ranjitsinh v Union of India (Supreme Court 2019).
- Mishra, N., & Das, N. (2017). Coal mining and local environment: A study in Talcher coalfield of India. *Air, Soil and Water Research*, 1, 10–12.
- Nandi, J. (2022, July 13). Clause for gram sabha consent missing in Forest Conservation Rules 2022: Critics. India.
- NITI Aayog. (2022). *Changes in Labour Force and Employment in Rural and Urban India: 2017–18 to 2020–21*. New Delhi: NITI Aayog.
- Olga Tellis & Ors. vs Bombay Municipal Corporation & Ors. (Supreme Court of India 1985).
- Pai, S. (2021). *Fossil Fuel Phase Outs to Meet Global Climate Targets: Investigating the Spatial and Temporal Dimensions of Just Transitions*. Vancouver Canada: University of British Columbia.
- Ranjan, R. (2019). Assessing the impact of mining on deforestation in India. *Resources Policy*, 60, 22–35.
- Sakthivel, S., & Joddar, P. (2006). Unorganised sector workforce in India; trends, patterns and social security coverage. *Economic and Political Weekly*, 41, 2107–2114.
- Shyam Sundar, K. R. (2019). Introduction: Towards an understanding of informality and Precarity and of some institutional developments and challenges in labour markets and industrial relations in a globalizing India. In K. R. Shyam Sundar, *Globalization, Labour Market Institutions, Processes and Policies in India: Essays in Honour of Lalit K. Deshpande* (pp. 1–45). Jamshedpur: Palgrave Macmillan.
- Srivastava, R. (2019). Emerging dynamics of labour market inequality in India: Migration, informality, segmentation and social discrimination. *The Indian Journal of Labour Economics*, 62, 147–171.
- Supreme Court. (2021). *M.K. Ranjitsinh v. Union of India*. Retrieved from indiankanoon.org: <https://indiankanoon.org/doc/165550376/>
- Thomas, A. (2022, February 2). SC notice on Centre’s plea to modify order that protected Great Indian Bustard. India. Retrieved from Hindustan Times: <https://www.hindustantimes.com/india-news/sc-notice-on-centre-s-plea-to-modify-order-that-protected-great-indian-bustard-101643751285986.html>

- Trivedi, D. (2022). *Where Would the Proposed Forest Conservation Rules Leave Forest Dwellers?* Retrieved from Frontline: <https://frontline.thehindu.com/environment/snatch-and-grab-proposed-forest-conservation-rules-2022-dilute-rights-of-forest-dwellers/article65661818.ece>
- UDHR. (1948). *United Nations General Assembly. The Universal Declaration of Human Rights (UDHR)*. New York: United Nations General Assembly.
- UNDP. (2011). *Towards Human Resilience: Sustaining MDG Progress in the Age of Economic Uncertainty*. New York: UNDP.
- UNHCHR. (2008). *Claiming the Millenium Development Goals: A Human Rights Approach*. United Nations Office of the High Commissioner for Human Rights (UNOHCHR).
- United Nations. (n.d.). *United Nations and the Rule of Law*. Retrieved from Equality and Non-discrimination: <https://www.un.org/ruleoflaw/thematic-areas/human-rights/equality-and-non-discrimination/>
- Williams, S., & Doyon, A. (2019). Justice in energy transitions. *Environmental Innovation and Societal Transitions*, 31, 144–153.
- World Bank. (2021). *Global Perspective on Coal Jobs and Managing Labor Transition out of Coal*. Washington: The World Bank.

Appendix 7A

Fundamental ILO and Just Transition Conventions and India’s Policy Stance

Table 7A.1 Fundamental ILO conventions ratified and ignored by India

<i>Fundamental conventions ratified by India</i>	<i>Fundamental conventions not ratified by India</i>
No. 29 Forced Labour Convention, 1930	No. 87 Freedom of Association and Protection of the Right to Organize Convention, 1948
No. 100 Equal Remuneration Convention, 1951	No. 98 Right to Organise and Collective Bargaining Convention, 1949
No. 105 Abolition of Forced Labour Convention, 1957	No. 155 Occupational Safety and Health Convention, 1981
No. 111 Discrimination (Employment and Occupation) Convention, 1958 No. 138 Minimum Age Convention, 1973 No. 182 Worst Forms of Child Labour Convention, 1999	Protocol of 2014 to the Forced Labour Convention, 1930

Table 7A.2 Just Transition conventions ratified and ignored by India

<i>Just Transition conventions ratified by India</i>	<i>Just Transition conventions not ratified by India</i>
No. 29 Forced Labour Convention, 1930	No. 87 Freedom of Association and Protection of the Right to Organize Convention, 1948
No. 81 Labour Inspection Convention, 1947	No. 98 Freedom of Association and Protection of the Right to Organize Convention, 1949
No. 87 Freedom of Association and Protection of the Right to Organize Convention	No. 102 Social Security (Minimum Standards) Convention, 1952
No. 87 Freedom of Association and Protection of the Right to Organize Convention	No. 117 Social Policy (Basic Aims and Standards) Convention, 1962
No. 100 Equal Remuneration Convention, 1951	No. 129 Labour Inspection (Agriculture) Convention, 1969
No. 105 Abolition of Forced Labour Convention, 1957	No. 140 Paid Educational Leave Convention, 1974
No. 111 Discrimination (Employment and Occupation) Convention, 1958	No. 144 Tripartite Consultation (International Labour Standards) Convention, 1976
No. 122 Employment Policy Convention, 1964	No. 148 Working Environment (Air Pollution, Noise and Vibration) Convention, 1977
No. 142 Human Resources Development, 1975	No. 150 Labour Administration Convention, 1978 No. 151 Labour Relations (Public Service) Convention, 1978 No. 154 Collective Bargaining Convention, 1981 No. 155 Occupational Safety and Health Convention, 1981 No. 161 Occupational Health Services Convention, 1985 No. 170 Chemicals Convention, 1990 No. 187 Promotional Framework for Occupational Safety and Health Convention, 2006 No. 189 Job Creation in Small and Medium-Sized Enterprises Recommendation No. 193 Promotion of Cooperatives Recommendation, 2002 No. 195 Human Resources Development Recommendation, 2004 No. 202 Social Protection Floors Recommendation, 2012
No. 174 Prevention of Major Industrial Accidents Convention, 1993	

2 Industrial Policy 2.0 Policy Space and Decarbonisation

Mritiunjoy Mohanty, Saon Ray, and Naini Swani

With the passage in the US Congress in 2022 of \$280 billion US Chips and Science Act (to recoup technology leadership in the manufacture of IC chips) and the \$370 billion in subsidies for clean energy in the Inflation Reduction Act (to try and emerge as a leader in green technology), industrial policy, as a Financial Times editorial notes, is back in fashion in the USA (*The US Chips Act Becomes a Christmas Tree*, The FT Editorial Board, *Financial Times*, 5 March 2023). In response, the EU has come up with a proposal, currently at the draft state, to match the clean energy subsidies built into the US Congress's Inflation Reduction Act 2022, sparking a huge internal debate around the use of subsidies to attain clean energy goals (*EU Liberals Battle Big State Role in Plans for Green Economy*, Alice Hancock, Sam Fleming, Javier Espinoza, Andy Bounds, *Financial Times*, 13 March 2023).

Revival of Industrial Policy

Way before these landmark US legislations, however, industrial policy has seen a revival in both policy-making and academic circles. As Stiglitz et al. (2013), Haggard (2015), and Wade (2015) among others note, in policy-making circles, the revival of industrial policy was sparked by the 2008 financial crisis and the Great Recession that followed in its aftermath, as economies sought greater policy space. Perhaps what is equally noteworthy, today industrial policy is as likely to be practiced by developed as developing countries.

Empirically validating the increased use of industrial policy after the Great Recession, Juhász et al. (2022), using text-based analysis and methodological advances in empirical economics, establish “a clear upward trend for instances of industrial policy over our study period, expanding from 462 in 2009 to more than 1000 in 2018” (p22). Equally important, given that normally industrial policy is discussed in the context of developing countries creating policy space to enable catch-up (see, for example, List (1856), Gerschenkron (1962), Amsden (1989), Reinert (2007), Wade (2015) Mathews (2016) and Juhász et al. (2022)), they also establish that today it is developed countries that are as likely if not more to use industrial policy to achieve policy-making goals.

According to their analysis, the following countries are the top 20 users of industrial policy in the period 2008–2019, ranked by intensity of use; i.e., Germany is the most intensive user of industrial policy over this period: 1. Germany, 2. Japan, 3. Brazil, 4. USA, 5. Canada, 6. Russia, 7. India, 8. Switzerland, 9. Saudi Arabia, 10. Australia, 11. China, 12. UK, 13. Italy, 14. Spain, 15. South Korea, 16. France, 17. South Africa, 18. Belarus, 19. Turkey, and 20. Poland, (see Figures 9.5a and 9.5b, p31, in Juhász et al.

(2022)). It is noteworthy that 11 out of the top 20 users are rich countries (according to the World Bank's 2010 current USD GDP per capita classification). Indeed, only five (Russia, India, China, S. Africa, and Belarus) are classified as lower-middle- or upper-middle-income countries. Therefore, as Juhász et al. (2022) conclude in this regard, "This pattern suggests one potential correlate of what type of countries engage in IP: *income*" (p23, emphasis added; IP is an acronym for industrial policy in the Juhász et al. paper).

Industrial Policy: A Reassessment

The revival of industrial policy within the economics discipline noted above is all the more remarkable given that despite its long and often successful history of use (see for example Johnson (1982), Zysman (1985), Amsden (1989), Wade (1990), Chang (2002), Reinert (2007), Haggard (2015), Mathews (2016) and Cherif and Hasanov (2019)), it has also remained controversial, particularly among mainstream economists – see for example Anne Krueger's celebrated contributions on the inefficiencies related to rent-seeking behaviour (1974) and on government failure (1990). Hsieh and Klenow (2009) is a more recent empirical re-statement of the Krueger rent-seeking related inefficiency hypothesis. In addition, using cross-country growth regression models, it has been argued that successful instances of industrial policy referred to above, such as the Asian "miracle economies" (South Korea, Taiwan, etc.) are statistical outliers with little policy-relevant informational content (see for example Easterly (1995)). As Cherif and Hasanov (2019) note, "Perhaps the consensus view among many economists is that industrial policy usually fails, so any resurrection of these ideas is taken with great skepticism" (p9).

Be that as it may, revival there has been in academic research as well, both reassessing past instances of the use of industrial policy and advocating its relevance in the current context. Within economics, new tools (for example, text-based analysis and machine learning) and methodological advances in empirical economics have led to a more granular understanding of the mechanics of industrial policy and thereby a reassessment of its outcomes. In addition, incorporating non-linear growth processes into the analysis has given it more theoretical and empirical heft.

As is well known, linear regressions suffer, among other infirmities, from endogeneity issues, making drawing causal inferences problematic (see for example Zhu (2022)). Little wonder Rodrik (2012) has argued that it is difficult to draw policy conclusions from linear-regression-based growth analysis. In this context, i.e., growth being characterised as a linear process, Cherif and Hasanov (2019) have argued that long-run growth is characterised by non-linear processes (particularly in the case of gross relative growth rates which are more relevant for catch-up) and that the Power Law¹ may be a better approximation of underlying tendencies (p16, p17). Using these, and given the fat-tail characteristics of power law distributions, they establish that this "would mean that the Asian miracles should not be dismissed and instead they would constitute an important source of information" (p17).

At the end of their cross-country analysis, Cherif and Hasanov (2019) conclude the following:

We have come a full circle on income convergence toward the frontier and growth at the frontier. Producing sophisticated products provides productivity gains, spillovers, and other positive externalities needed to catch-up. At the same time, producing sophisticated products requires high R&D spending and innovation to keep up with

the frontier. High spending on R&D by large domestic firms in high tech areas early on suggests a path to achieving high and sustained growth. (p50)

Cherif and Hasanov (2019: p50) go on to argue that Asia's miracle economies such as Taiwan and South Korea followed this path and that industrial policy was central to that growth strategy.

Finally, the new sectors in which economies have been successful in becoming internationally competitive using industrial policy are those in which they have relatively high revealed comparative advantage rather than those dictated by comparative advantage (either of the Ricardian or Heckscher–Ohlin type) (see Cherif and Hasanov (2019: pp36–39), Juhász et al. (2022: p26)). Similarly, Felipe (2015) argues that the key to achieving higher income and growth lies in finding niches in industrial products with high-income elasticities and modern services. Coming from a different tradition within economics, but with a focus squarely on non-linear processes, the nature of competition and technology-driven dynamic capabilities of firms, Andreoni and Roberts (2022) have argued that in dealing with network effects that characterise platform technologies in a manner that optimises growth and efficiency, it is of vital importance to devise a regulatory framework that brings together industrial policy and competition policy. Also see Mathew (2016) on the salience of non-linear growth processes (Kaldorian cumulative causation) and industrial policy.

The performance of South Korea's Heavy and Chemical Industry (HCI) drive in 1970s, which at one point had become the poster boy of industrial policy-driven inefficiency, has been reassessed as well. Lane (2021) uses spillover effects to establish that targeted sectors performed significantly better than those that were not. Similarly, Kim et al. (2021) and Choi and Levchenko (2022) also analyse the industrial policy effects of South Korea's HCI drive. Both papers note that growth effects persisted well after industrial policy subsidies were removed. Kim et al. (2021) also note that non-targeted industries gained from a lowering of input costs as a result of production efficiencies of the targeted industries. Kim et al., however, also note that whereas targeted industries saw labour productivity and plant-level TFP rise, they did not raise aggregate regional TFP, suggesting some misallocation of resources. They argue that had this misallocation been avoided, gains would have been significantly higher.

Criscuolo et al. (2019) look at the employment effects of the EU-funded investment subsidy programme administered by the UK Govt. called Regional Selective Assistance. They conclude that

there is an economically large and statistically significant program effect: a 10 percentage point increase in an area's rate of maximum investment subsidy causes about a 10 percent increase in manufacturing employment and a 4 percent decrease in aggregate unemployment. These effects are *underestimated if endogeneity is ignored* ... we show that these positive effects are not purely due to substitution of jobs toward eligible areas and away from neighboring (ineligible) areas. (p49) (emphasis added)

Finally, and important from our standpoint, Aghion et al. (2015), using a large Chinese data set of medium and large-sized firms between 1998 and 2007, study the effects of industrial policy and establish the following: “when sectoral policies are targeted toward competitive sectors or allocated in such a way as to *preserve or increase competition*,

then these policies *increase productivity growth*” (p2; emphasis added). In other words, “there can be complementarity between competition and suitably designed industrial policies in inducing innovation and productivity growth” (p1).

Therefore, on the basis of the recent reassessment of industrial policy, as a result of new techniques in data analysis and methodological advances in empirical economics, it would be reasonable to conclude that appropriately designed industrial policy has significant and lasting positive output and employment effects, reiterating an older literature which has argued for both its necessity and its effectiveness. In line with this earlier literature, the newer one has also established that industrial policy makes possible catchup and remaining at the technology frontier, creating technologically dynamic and competitive firms and industries. Equally importantly, as Aghion et al. (2021) have argued, industrial policy, by helping create sophisticated export industries and innovative firms that are both domestically and internationally competitive, contributes towards the creation of reasonably fair and inclusive markets, i.e., markets with low-income inequality and high and sustained growth.

While recognising that industrial policy has the potential to enable all this, it is also worth emphasising that today catch-up for developing economies is made much more complicated because developed countries are as likely to use it (industrial policy) systematically and extensively, as we have noted earlier, which is to say that industrial policy today is as likely to be a cause of growth divergence between developed and developing countries. This has serious implications for the diffusion of technological change induced by the need to cope with global warming, given that this knowledge, barring a few exceptions, is more likely to be generated in advanced economies given their extensive use of industrial policy.

Making Industrial Policy Rents Contingent and State Capacities

One of the reasons mainstream economics views industrial policy with “skepticism” is the supposed inefficiencies related to rent-seeking behaviour (see Krueger (1974)) and the related literature on government failure (see Krueger (1990)). Clearly in instances of successful use of industrial policy noted above this behaviour was controlled or tamed. However, given that these were dismissed as outliers, the dominant understanding was that industrial policy outcomes are normally marred by inefficiencies related to rent-seeking (see for example Hsieh and Klenow (2009)).² In contradistinction, as we have already noted, Cherif and Hasanov (2019) have established that the growth experience of Asian “miracle” economies has useful policy-relevant informational content.

More than inefficiency losses due to rent-seeking which in the static case tend to be small (see endnote 3), the more important issue is that *whereas market-created rents*³ (or *quasi-rents*) *are incentives for accumulation and are ex post, state-created rents are ex ante*. As Mohanty (2000) has argued,

[w]hen the state creates rents, they are not only supposed to be an incentive for accumulation but are also supposed to help achieve some policy objectives the state may have in mind (say in subsidising technological learning the state hopes to be able to foster industries which will help maximise the long run rate of growth). *It is this dual objective of state-created rents which is the source of potential problems. Rents are in this case, as it were, received ex ante to the fulfillment of the state’s objective in allocating the rent.* That is the accrual state-created rents are not contingent upon

the state's objective(s) being fulfilled and hence may be frittered away (say, a firm may refuse to grow out of infancy) ... leaves the state with an enforcement problem ... notice that making a *state-created rent contingent is a matter of policy design or institutional structure and not an a priori theoretical flaw in the argument.* (p11-12; emphasis added)

The inability to make state-created rents contingent can have dynamic consequences, which as we have already noted tend to be large (see endnote 3; as well as, for example, Mohanty (2000)).

The more relevant question therefore is that if a government chooses to implement industrial policy and thereby *necessarily creates rents*, does it have the *institutional mechanism to make those rents contingent on its objectives being fulfilled?* And the growth experience of France, Japan, South Korea, Taiwan, Brazil, and China tells us that indeed they do. Oftentimes these states have used leverage over the financial system to make state-created rents contingent (see for example Zysman (1985), Amsden (1989), Wade (1990), Chang (1994), Mohanty (2000), Andreoni and Tregenna (2022)). In addition to leverage over the financial system what development experience also tells is that domestic and international competition may be important ways of making state-created rents contingent (see for example, Amsden (1989), Wade (1990), Aghion et al. (2015), Cherif and Hasanov (2019), Aghion et al. (2021), and Andreoni and Roberts (2022)).

Be that as it may, addressing the issue as to why industrial policy succeeds in some countries and fails in others opened up debate around the role of the state and state capacities to promote development (see for example Evans et al. (1985), Evans (1995), Khan and Jomo (2000), Kohli (2004), Rodrik (2007), Rodrik (2014), Haggard (2015), Andreoni and Chang (2019), Andreoni and Tregenna (2020), and Andreoni and Roberts (2022)). Therefore, our understanding of the architecture of successful industrial policy as well as its institutional and political economy underpinnings is much better today than it was a couple of decades ago. Of course, the fact that we know this does not imply that these conditions and institutional architecture will necessarily obtain. These ultimately will be determined by the specific institutional political economy of the country in question. At least, however, our knowledge of necessary conditions is much better. And each country choosing to use industrial policy can then cut its cloth according to its coat.

The Entrepreneurial State

A lot of the discussion above has happened in the context of market failure, i.e., when markets misallocate resources as a result of the presence of negative or positive externalities.⁴ Mazzucato (2013), using the USA's technological evolution and trajectory, introduces an entirely new dimension to our understanding of the institutional underpinnings of successful growth strategies by defining the notion of an "entrepreneurial state." An entrepreneurial state is one which invests in basic and allied sciences research and research infrastructure, thereby leading to a lowering of "Knightian uncertainty,"⁵ particularly in the context of technological change. This reduction in Knightian uncertainty in turn aids the risk-taking appetite of the private sector and induces it to invest in new technologies and technological innovation in goods, services, and processes flowing from publicly financed basic science research. Finally, she describes technological change as being "path dependent and cumulative with a 'fat-tailed distribution' (Mazzucato (2016))". Therefore, she argues that "rather than having an equally likely probability of occurring at

any time, innovation occurs in waves and clusters, a feature emphasised in the work of Schumpeter” (Mazzucato (2016)).

Perhaps equally importantly, going beyond market failure, Mazzucato demonstrates the state’s role in *creating and shaping new markets and sectors*. In Mazzucato’s framework, public institutions and the private sector form systems of innovation where the innovation process includes feedback loops between market and technology, applications and science, and policy and investment. Mazzucato highlights that the innovation required for growth is collective, uncertain, and tacit. Given the inherently unpredictable nature of innovation, the state, in its entrepreneurial role of lowering Knightian uncertainty, through long-term public investments in research capabilities and institutions, goes beyond the redressal of market failure and shapes the market’s direction and the economy’s dynamic technological trajectory (Mazzucato (2013) (2016)). Therefore, as she notes in Mazzucato (2016), “The winning IT revolution was ‘picked’ in the US in just the same way that the green revolution is being chosen by some countries today.”

For developing a green economy, Mazzucato highlights the need for organizations that not only fix market failures but proactively create and shape markets. She states that the question of which direction the market should take requires extensive democratic debate. Acknowledgement of the critical and widespread role of the state should also stir the reimagination of indicators and tools of policy evaluation beyond static cost/benefit analysis. Institutional design for the green economy should promote risk-taking capacities in public organizations to respond to contemporary challenges. Importantly, the institutional design should also incorporate the equitable distribution of rewards for organizations across a value chain (Mazzucato (2016) (2021)). Finally, outside of the important task of lowering Knightian uncertainty, and bringing us back to the issue of leverage over financial systems noted earlier, Mazzucato also stresses the *historical and continuing* role of state investment banks in catalysing technological change. As she notes in Mazzucato (2016) in financing renewable energy projects “The four most active banks are (in order) the China Development Bank, the German KfW, the European Investment Bank (EIB) and the Brazilian BNDES.” And, as she has argued elsewhere,

Governments play a critical role in catalysing and coordinating both public and private investment around common goals, not least transitioning to a green economy. Industrial strategies must not be about subsidizing specific sectors but about catalysing transformation across all sectors in order to meet social goals: climate action requires sectors as diverse as digital, nutrition, transport and construction to innovate and collaborate.

(Mazzucato (2021: p93) emphasis added)

Towards a Green Economy Framework for Decarbonisation and a View on India’s Industrial Policy

Sound green growth policies require policies that fully internalize environmental costs. Hallegatte et al. (2012) provide the arguments for the trade-off between environmental protection and economic production. The production function (Y) is given by the equation

$$Y = \Psi(P_E) f(A(P_E), K(P_E), L(P_E), E(P_E))$$

where Ψ is the efficiency of the production function and lies between 0 and 1. A is the available technology, K is capital, L is labour, and E is environment. P_E is the effort towards the environment.

The trade-off arises due to at least three reasons:

- (a) It can reduce productivity (A) by causing producers to use more expensive or less productive technologies. In the case of India, Ganesan et al. (2014) discuss the higher costs of solar, which has to be seen in comparison to the global avoided climate change.
- (b) Result in the early retirement of physical capital (K) if capital is based on polluting technologies. This can take two forms: (i) either a decrease in capital or (ii) an increase in capital depreciation. Apart from direct costs, there is an increase in investment needed to replace retired capital. Maamoun et al. (2022) estimate the cost-saving potential of early retirement of coal plants to be \$21 billion in the Indian context.
- (c) increase the price of some goods and services and alter relative prices. This could have two outcomes: (i) change the structure of the demand or (ii) lead to a reduction in efficiency (Ψ).

Environmental policies can increase conventionally measured economic output if (Hallegatte et al., 2012):

- (a) There is an increase in the effective quantity of production inputs i.e., K , L , and E .
 - (i) L can increase through improved health and (ii) K can increase through well-managed natural risks e.g., lower K losses from natural disasters.
- (b) There are productivity gains by correcting market failures affecting the environment and enhancing the efficiency of resource use (Ψ).
- (c) There is a shift in the production frontier by accelerating the diffusion of innovations, leading to an increase in A .

In India, post-independence growth was state led and coordinated through five-year plans. However, in 1991, the Indian economy was liberalised after three decades of largely state-driven industrialisation (Singh, 2008). Post-economic liberalisation, trade, and industrial policy have focused on the reduction of import tariffs, increase in foreign direct investment, and enhancing Indian firms' participation in global supply chains. The critical changes in industrial policy during economic reforms included the delicensing of industrial activities and the expansion of private enterprises into sectors previously reserved for the state (see for example Aggarwal (2019), Chaudhuri (2021), Mani (2021) and Swathysree (2021)). Since 1991 economic reforms, coherent industrial planning in India has withered, with the growing influence of sectoral trade policies, as opposed to consolidated, cross-sectoral national planning (Mehrotra, 2020). For a critique of India's industrial policy from an institutional perspective and arguing that a lack of institutional coordination constrains its effectiveness see Swathysree (2021).

As highlighted by Mazzucato, green industrial policy is recognised as different from conventional industrial policy and requires different policy instruments and a more robust engagement of the state in markets (Swain, 2014). In India, concerns about energy access, energy security, and impetus provided by international climate negotiations have been the key drivers of national efforts towards decarbonisation. India's steps

towards greening its economy appear most starkly in actions taken to promote renewable energy across different industrial sectors, including power generation, transport, agriculture, buildings, etc. Renewable energy promotion is undertaken through enabling provisions in the overarching policies governing the electricity sector in India, including the National Electricity Policy (2005), National Tariff Policy (2006), Integrated Energy Policy (2006), Indian Electricity Grid Code (2010), and the National Missions envisaged under the National Action Plan for Climate Change (NAPCC), see GOI (2008). Within this overarching policy framework, India has furthered renewable enhancement through various specific measures, including financial incentives, preferential tax treatment, R&D, demand stimulation, and manufacturing-linked incentives (Ganesan et al., 2014).

While India is taking essential strides towards renewable energy, researchers have expressed concerns about the gaps in the institutional arrangement needed for economy-wide decarbonisation. It is argued that the institutions focusing on decarbonisation in India have historically privileged developmental aims over emissions reduction, with an express shift towards convergence in the two goals being recognised for the first time in the NAPCC, see GOI (2008). The institutional arrangement arising from this approach entails nodal climate bodies across different sectors, with weak inter-ministerial and sectoral coordination (Pillai and Dubash, 2021). Dubash et al. argue that the success of renewable energy initiatives in India is owed significantly to bureaucratic champions who leveraged the promise renewables held for energy security. However, they did not create robust mechanisms for personnel capacity building or grants for subject experts to effectively deliver on the intent of decarbonisation. As a result, post the exit of the bureaucratic or ministerial champions, the climate institutions of the country saw a decline with a shift back to a sectoral focus. Presently, measures under various missions are undertaken through sectoral ministries, with insufficient interministerial coordination. However, the prevailing institutional structure lacks equitable distribution of costs and benefits (see Pillai and Dubash (2021)). Therefore, as we move towards effective decarbonisation a reconfiguration of industrial policy is required with clear institutional underpinnings and focus such that goals of both development (including technological change) and emission reduction are met in a clear, time-bound manner.

Notes

- 1 “Power law distributions exhibit fat tails such that extreme events (multiples of standard deviations) are much more likely than with normal distributions” (Cherif and Hasanov(2019: p19)). See also the Wikipedia entry on Power law at https://en.wikipedia.org/wiki/Power_law. See West (2017) for an exploration of the ubiquity of Power Law in physical and economic processes and the related increase in complexity.
- 2 That is not to say inefficient rent-seeking has not been critiqued. See Fisher (1985) for the onerous assumptions under which it would hold. See Brooks and Heijdra (1989) who argue that it is not clear that the entire rent would be get dissipated away. Tullock (1989) establishes that waste from rent-seeking behavior is very small. Within a general equilibrium framework Varian (1983) has argued that rent-seeking costs are overstated. See also Leininger and Yang (1994) and Mohanty (2000). From outside the neoclassical paradigm see Samuels (1971), Samuels and Mercurio (1984) and Barzel (1985). As Brooks and Heijdra (1989) and Brooks, Heijdra and Lowenberg (1990) point out, rent-seeking costs are much more significant within a dynamic framework. It is that aspect of the problem that is addressed by Cherif and Hasanov (2019) and Andreoni and Roberts (2022), among others.
- 3 On market-created rents see for example Buchanan (1980) and Khan and Jomo (2000).

- 4 In the case of negative externalities because all costs are not internalised, firms tend to over-invest, from the standpoint of the overall economy. In the case of positive externalities because profits streams are not internalised firms tend to under-invest.
- 5 Named after economist Frank Knight (1885–1972) who was the first to distinguish between uncertainty and risk, Wikipedia defines it as follows: “Knightian uncertainty is a lack of any quantifiable knowledge about some possible occurrence, as opposed to the presence of quantifiable risk.” https://en.wikipedia.org/wiki/Knightian_uncertainty

References

- Aggarwal, R. (2019). ‘Industrial Policies in India: Did they Work?’, Centre for Sustainable Employment Working Paper #24, Azim Premji University, Bangalore. <https://cse.azimpremjiuniversity.edu.in/publications/industrial-policies-in-india-did-they-work/>.
- Aghion, P., J. Cai, M. Dewatripont, L. Du, A. Harrison and P. Legros. (2015). ‘Industrial Policy and Competition’, *American Economic Journal: Macroeconomics*, 7(4), 1–32.
- Aghion, P., R. Cherif and F. Hasanov. (2021). ‘Fair and Inclusive Markets: Why Dynamism Matters’, IMF Working Papers, WP/21/29.
- Amsden, A.H. (1989). *Asia’s Next Giant: South Korea and Late Industrialization*, Oxford University Press, New York.
- Andreoni, A. and H.J. Chang. (2019). ‘The Political Economy of Industrial Policy: Structural Interdependencies, Policy Alignment and Conflict Management’, *Structural Change and Economic Dynamics*, 48, 136–150.
- Andreoni, A. and F. Tregenna. (2020). ‘Escaping the Middle-income Technology Trap: A Comparative Analysis of Industrial Policies in China, Brazil and South Africa’, *Structural Change and Economic Dynamics*, 54, 324–340.
- Andreoni, A. and S. Roberts. (2022). ‘Governing Digital Platform Power for Industrial Development: Towards an Entrepreneurial-Regulatory State’, *Cambridge Journal of Economics*, 46, 1431–1454.
- Barzel, Y. (1985). ‘Transaction Costs: Are they Just Costs?’, *Journal of Institutional and Theoretical Economics*, 141, March, 4–16.
- Brooks, M.A. and B.J. Heijdra. (1989). ‘An Exploration of Rent-Seeking’, *Economic Record*, 65, 32–50.
- Brooks, M.A., B.J. Heijdra and A.D. Lowenberg. (1990). ‘Productive Versus Unproductive Labour: Lessons from History’, *Journal of Institutional and Theoretical Economics*, 146, 419–438.
- Buchanan, J.M. (1980). ‘Rent Seeking and Profit Seeking’, in J.M. Buchanan, R.D. Tollison and G. Tullock (eds.) *Toward a Theory of the Rent-Seeking Society*, Texas A&M University, College Station, Texas, 3–15.
- Chang, Ha-Joon. (1994). *The Political Economy of Industrial Policy*, St. Martin’s Press, London.
- Chang, Ha-Joon. (2002). *Kicking Away the Ladder: Development Strategy in Historical Perspective*, Anthem Press, London.
- Chaudhuri, S. (2021). India’s Import Dependence on China in Pharmaceuticals: Status, Issues and Policy Options, RIS Discussion Paper Series, RIS-DP#268, Research and Information Systems for Developing Countries (RIS), New Delhi
- Cherif, R. and F. Hasanov. (2019). ‘The Return of the Policy That Shall Not Be Named: Principles of Industrial Policy’, IMF Working Papers, WP/19/74, March.
- Choi, J. and A. Levchenko. (2022). ‘The Long-Term Effects of Industrial Policy’, NBER Working Paper, #29263, National Bureau of Economic Research, Washington D.C.
- Crisuolo, C., R. Martin, H. Overman and J. Van Reenen. (2019). ‘Some Causal Effects of an Industrial Policy’, *American Economic Review*, 109(1), 48–85.
- Easterly, W. (1995). ‘Explaining Miracles: Growth Regressions Meet the Gang of Four’, in *Growth Theories in Light of the East Asian Experience*, NBER-EASE Volume 4, National Bureau of Economic Research, 267–299.

- Evans, P.B. (1995). *Embedded Autonomy: States and Industrial Transformation*, Princeton University Press, Princeton, NJ.
- Evans, P.B., D. Rueschemeyer and T. Skocpol (eds). (1985). *Bringing the State Back In*, Cambridge University Press, Cambridge.
- Felipe, J. (2015). 'Modern Industrial Policy', in J. Felipe (ed.) *Development and Modern Industrial Policy in Practice Issues and Country Experiences*, Asian Development Bank and Edward Elgar.
- Fisher, F.M. (1985). 'The Social Costs of Monopoly Power and Regulation: Posner Reconsidered', *Journal of Political Economy*, 93, April, 410–416.
- Ganesan, K., P. Choudhury, R. Palakshappa, R. Jain and S. Raje. (2014). 'Assessing Green Industrial Policy, The India Experience', The International Institute for Sustainable Development Research Report. <https://www.iisd.org/publications/report/assessing-green-industrial-policy-india-experience>.
- Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective: A Book of Essays*, Belknap Press/Harvard, Cambridge, MA.
- GOI (Govt of India) (2008) *National Action Plan for Climate Change (NAPCC)*, New Delhi
- Haggard, S. (2015). 'The Developmental State is Dead: Long Live the Developmental State!' in James Mahoney and Kathleen Thelen (eds.) *Advances in Comparative-Historical Analysis, Strategies for Social Inquiry*, Cambridge University Press, Cambridge, 39–66.
- Halleagatte, S., G. Heal, M. Fay and D. Treguer. (2012). 'From Growth to Green Growth - A Framework', NBER Working Paper No. 17841.
- Hsieh, Chang-Tai and P. Klenow. (2009). 'Misallocation and Manufacturing TFP in China and India', *Quarterly Journal of Economics*, 124(4), 1403–1448.
- Johnson, C. (1982). *MITI and the Japanese Miracle: The Growth of Industrial Policy: 1925–1975*, Stanford University Press, Stanford, CA.
- Juhász, R., Nathan Lane, Emily Oehlsen and Verónica Pérez. (2022). 'The Who, What, When, and How of Industrial Policy: A Text-Based Approach', SSRN Working Paper.
- Khan, M. and K.S Jomo (eds.) (2000). *Rents, Rent-Seeking and Economic Development: Theory and Evidence in Asia*, Cambridge University Press, Cambridge.
- Kim, M. M., Lee and Y. Shin. (2021). 'The Plant-Level View of an Industrial Policy: The Korean Heavy Industry Drive of 1973', NBER Working Paper #29252, National Bureau of Economic Research, Washington DC.
- Kohli, A. (2004). *State-Directed Development: Political Power and Industrialization in the Global Periphery*, Cambridge University Press, Cambridge.
- Krueger, A.O. (1974). 'The Political Economy of the Rent Seeking Society', *American Economic Review*, 64, 291–303.
- Krueger, A.O. (1990). 'Government Failures in Development', *Journal of Economic Perspectives*, 4(3), 9–23.
- Lane, N. (2021). 'Manufacturing Revolutions: Industrial Policy and Industrialization in South Korea', CSAE Working Paper, Centre for Study of African Economies, WPS/2021-09-02, Dept. of Economics, University of Oxford.
- Leininger, W. and C.-L. Yang. (1994). 'Dynamic Rent-Seeking Games', *Games and Economic Behaviour*, 7, 406–427.
- List, F. (1856). *The National System of Political Economy*, J. B. Lippincott & Company, Philadelphia.
- Maamoun, N., P. Chitkara, J. Yang, G. Shrimali, J. Busby, S. Shidore, J. Yana and J. Urpelainen. (2022). 'Identifying Coal Plants for Early Retirement in India: A Multidimensional Analysis of Technical, Economic, and Environmental Factors', *Applied Energy*, 312, 118644.
- Mani, S. (2021). 'The Role of Industrial Policy in Market-Friendly Economies: Case of COVID19 Vaccine R&D and its Manufacturing in India And The USA', India's Economy and Society Series-21, Centre for Development Studies, Thiruvananthapuram
- Mathews, J.A. (2016). 'Latecomer Industrialization', in Erik Reinert, Jayati Ghosh and Rainer Kattel (eds.) *Handbook of Alternative Theories of Development*, Edward Elgar, Cheltenham, UK and Northampton, MA, USA.

- Mazzucato, M. (2013). *The Entrepreneurial State*, Anthem Press, London.
- Mazzucato, M. (2016). 'Innovation, the State and Patient Capital', in M. Jacobs and M. Mazzucato (eds.) *Rethinking Capitalism: Economics and Policy for Sustainable and Inclusive Growth*, Wiley-Blackwell, London.
- Mazzucato, M. (2021). 'Financing the Green New Deal', *Nature*, Published online: 9 December 2021, <https://doi.org/10.1038/s41893-021-00828>. <https://www.nature.com/articles/s41893-021-00828-x.pdf>.
- Mehrotra, S. (2020). "'Make in India': The Components of a Manufacturing Strategy for India", *Indian Journal of Labour Economics*, 63(1), 161–176.
- Mohanty, M. (2000). 'Rent Seeking, Financial Systems and Economic Development', IIM Calcutta Working Paper, WPS-393/2000.
- Pillai, A.V. and N.K. Dubash. (2021). 'The Limits of Opportunism: The Uneven Emergence of Climate Institutions in India', *Environmental Politics*, 30(1), 93–117.
- Reinert, E.S. (2007). *How Rich Countries Got Rich . . . and Why Poor Countries Stay Poor*, Public Affairs, New York.
- Rodrik, D. (2007). 'The Real Exchange Rate and Economic Growth: Theory and Evidence', John F. Kennedy School of Government, Harvard University.
- Rodrik, D. (2012). 'Why We Learn Nothing from Regressing Economic Growth on Policies', *Seoul Journal of Economics*, 25(2), 137–151.
- Rodrik, D. (2014). 'Green Industrial Policy', *Oxford Review of Economic Policy*, 30(3), 469–491.
- Samuels, W.J. (1971). 'Interrelations Between Legal and Economic Processes', *Journal of Law and Economics*, 14, 435–450.
- Samuels, W.J. and N. Mercurio. (1984). 'A Critique of Rent-Seeking Theory', in D.C. Colander (ed.) *Neoclassical Political Economy: The Analysis of Rent-Seeking and DUP Activities*, Ballinger, Cambridge, MA, 55–70.
- Singh, Ajit. (2008). 'The Past, Present and Future of Industrial Policy in India: Adapting to the Changing Domestic and Industrial Environment', Centre for Business Research, Cambridge University, Working Paper. <https://www.cbr.cam.ac.uk/wp-content/uploads/2020/08/wp376.pdf>.
- Stiglitz, J.E., J.Y. Lin and C. Monga. (2013). 'Introduction: The Rejuvenation of Industrial Policy', in Joseph E Stiglitz, Justin Yifu Lin and Celestin Monga (eds.) *The Industrial Policy Revolution: The Role of Government Beyond Ideology*, Palgrave Macmillan, New York and Hampshire, UK, 1–18.
- Swain, A.K. (2014). 'India's Green Industrial Policy', *Economic and Political Weekly*, 49(9), 19–21.
- Swathysree, S.S. (2021). Evolution of India's Capital Goods Industry from the perspective of the role of the State, Unpublished PhD dissertation, Indian Institute of Management Calcutta
- Tullock, G. (1989). *The Economics of Special Privilege and Rent Seeking*, Kluwer, Boston.
- Varian, H. (1983). 'Models of Rent Seeking', Monash University, Centre for Policy Studies, Discussion Paper No. 40.
- Wade, R.H. (1990). *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*, 2nd ed., Princeton University Press, Princeton, NJ.
- Wade, R.H. (2015). 'The Role of Industrial Policy in Developing Countries', in *Rethinking Development Strategies after the Financial Crisis*, UNCTAD.
- West, G. (2017). *Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies*, New York: Penguin Press.
- Wikipedia, 'Power Law', https://en.wikipedia.org/wiki/Power_law.
- Wikipedia, 'Knightian Uncertainty', https://en.wikipedia.org/wiki/Knightian_uncertainty.
- Zhu, A. (2022). 'Causal Inference with Linear Regression: Endogeneity', in *Towards Data Science*, <https://towardsdatascience.com/causal-inference-with-linear-regression-endogeneity-9d9492663bac>.
- Zysman, J. (1985). *Governments, Markets and Growth: Financial Systems and the Politics of Industrial Change*, New Delhi: Prentice-Hall.

Appendix 9A

In-Situ Power Generation in Urban Spaces for End Users*Arunava Ghoshal*

Five megacities alone (Delhi, Mumbai, Kolkata, Chennai, and Bengaluru) consume around 18.8 Gigawatt of power daily (which is 47% of India's rooftop solar target). Without being overambitious, for a start, around 1% of the area of the metro cities can be utilised under the On-Grid Solar Power system and equipped with net metering every year till 2026. At this rate, 4–5% of each megacity would be under solar panels thus generating the lion's share of their electricity requirement.

A panel that needs only around 100 square feet of shadow-free space can generate about 120 kilowatt-hour per month. In India, a typical home uses 260 kilowatt-hour per month. However, since this varies greatly across cities, a working estimate based on this author's consumption of 180 kilowatt-hour of energy per month during peak summer months (April-September) of 2021 and 2022 has been considered. This would require around 150 square feet of shadow-free space. This indicates that, on an average, small four-storied apartments are capable of generating enough power for household consumption.

Also, an on-grid network/infrastructure would be a better option for urban household electrification than an off-grid system that relies on batteries. Monthly Net metering would allow consumers who generate some or all of their electricity and to use that electricity anytime, rather than when it is generated.

Rooftop solar panels are up to 79% cheaper today than in 2010. A 1.5 kilowatt solar system may cost between Rs. 90,000 (On-grid) to Rs. 160,000 (Off-Grid/Hybrid). A typical vendor provides a 1-year warranty on the solar system, 2 years on the inverter, 5 years on the solar battery, and 25 years on solar panel performance. A middle-class urban family, however, might find an upfront investment challenging. Further, for a firm supplying solar rooftop systems, securing industrial or commercial consumers is more lucrative.

Thus, in situ power generation for urban end users would need appropriate policies to achieve scale. In addition, the following initiatives could complement rooftop solar

- 1) Solar-wind hybrid model for power generation in high-rise buildings.
- 2) Utilising space below the rooftop solar panel for Agri-voltaic farming and planting Air Purifying plants.
- 3) Replacing Liquefied Petroleum Gas with Solar Cookers (in standalone urban houses) or Electric Cooking Appliances (in multistorey residential apartments) and gradual adaptation of low-wattage everyday appliances.
- 4) Mandating the installation of Solar Panels in secure areas like offices of multinational companies.
- 5) Introducing Distributed Renewable Energy-based charging infrastructure for Electric Vehicles in existing fuelling stations.

Appendices and Boxes

Appendix A

Transition Impact on Workforce: A case study of Kota Super Thermal Power Station (KSTPS)

Simran Grover and Naini Swami

The Kota Super Thermal Power Station (KSTPS) was established in 1983, with two units of 220 MW capacity each. Owned by Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUNL), the power station has a current capacity of 1240 MW with seven units in operation. The plant's average age is 27 years as of March 2022. Units 1, 2, 3, and 4 are past their useful life of 25 years, and they are proposed for decommissioning after December 2022.

Over the years, KSTPS has been among the key drivers for the growth of the local economy. The plant creates direct employment and transacts with many associated businesses and service providers. It facilitates a thriving ecosystem of allied livelihoods, such as local transport, real estate, and consumer goods and services, primarily helmed by local small businesses. The power station is deeply integrated with the local economy. This includes full-time employees of RVUNL, contractual employees and labour, service providers, big and small business owners, and various informal workers in the unorganised sector.

The aforementioned livelihood landscape encompasses many marginal workers and groups. Understanding their vulnerabilities in the context of energy transition, particularly repurposing (including decommissioning) the thermal units, requires a nuanced understanding of vulnerabilities at the intersection of caste, class, gender, and employment location.

KSTPS and Livelihoods Landscape

For a qualitative understanding, livelihoods dependent on the plant are classified based on the statutory responsibilities KSTPS bears towards respective individuals or entities. This includes direct livelihoods (permanent and contractual workers), associated livelihoods (entities exchanging goods and services, including the fly-ash brick industry and its wage workers), and allied livelihoods (informal workers and other local businesses that thrive on the economic contribution of KSTPS).

In terms of organisational structure concerning direct livelihoods, KSTPS is divided into 15 administrative departments. Officials (the plant's permanent employees) oversee the work carried out by the permanent and contractual workers in their respective departments. Presently, KSTPS has around 656 permanent employees and 2012 contractual workers (Bask Research 2022). With the increase in their numbers over time, the contractual workers also perform tasks previously reserved solely for permanent technical workers. Despite the similar nature of their work, there is a high wage disparity between permanent and contractual workers. There is also considerable heterogeneity among contractual workers based on their wage categories: skilled, semi-skilled, or unskilled. Broadly, the tasks performed by the plant's labour fall into civil, electrical, and mechanical works. Most skilled workers at the plant are engaged in electrical works, whereas primarily semi-skilled and unskilled workers are involved in civil and mechanical works.

The Factories Act classifies power generation plants as an industry involving hazardous processes because of the perilous nature of the work involved. However, working conditions and exposure to hazards differ as per the location of workers inside the plant. The plant's boiler and turbine management sites entail working in proximity to high temperatures and heavy machinery. Loss of life and limb due to accidents is common at such sites. Given the presence of high-voltage power operations, electrical work at the plant is critical, albeit not physically taxing. In contrast, work at the coal handling operations that deploy the highest concentration of unskilled contractual workers is highly strenuous. Workers in the department are continually exposed to coal dust and a poor work environment without adequate cooling facilities. As a result, skin diseases and deterioration (and eventual loss) of eyesight are reported as routine consequences.

In the context of the associated livelihoods, the condition of the fly-ash industry workforce is particularly concerning. Prolonged exposure to fly ash is known to increase the risk of asthma, inflammation, respiratory diseases, and cancer. The industry workers report a frequent occurrence of many such health concerns. A majority of the workforce (mostly daily wage labour) in the fly-ash industry is informal, and the sector is unorganised, given the small size of the fly-ash brickmaking units. As a result, safety provisions for workers in the units are poorly implemented or absent, and no social security is provided to cope with the health consequences of their work.

Vulnerability of Workforce and Potential Impact of KSTPS Closure

India's labour market, shaped by substantial and procedural aspects of labour laws, accords differential employment status to permanent and contractual workers, significantly limiting rights and entitlements for the latter category of workers. Contract workers account for nearly 75% of the workers employed in the thermal power generation sector (Bask Research 2022). This principal section of the workforce is inherently more vulnerable in the context of repurposing of an associated thermal power plant and the potential loss of employment.

In general, workforce compositions are diverse, comprising individuals with differentiated skills, capabilities, and socio-economic backgrounds. The legal classification of skilled, semi-skilled, and unskilled workers is a commonly used stratification for the contractual workforce.

However, this stratification, which primarily signifies wage difference, doesn't fully represent the differential capabilities of workers across respective skill groups.

A meaningful understanding of the capabilities of workers to deal with employment loss may be gathered by measuring (or mapping) some of the fundamental factors that shape their opportunities and provide tools for resilience against the impact of employment loss. Their capabilities and hence resilience to deal with the stress of livelihood loss in the context may be explored as a function of their inherent capitals, that is, economic, human, social, and political capital. The resulting capabilities and resilience of a worker (and their household) are likely to define their ability to deal with the loss of livelihood, navigate its perils, and ultimately seek opportunities for income substitution.

Using the above approach, the table below presents a qualitative mapping of the different forms of capital of the skilled, semi-skilled, and unskilled contractual workforce at KSTPS, along with workers of the associated fly-ash brick industry. The parameters used for evaluating economic capital include current income sources, assets, savings, and credit access. Human capital is evaluated based on educational and professional qualifications, skill level, well-being, and occupation co-relations. Social capital is defined as a function of caste position and related networks, neighbourhood, and community relations. Political capital is evaluated based on the degree and nature of participation in local politics and associations, including engagements through labour unions.

A qualitative mapping of capital cross the landscape of particularly vulnerable workers associated with thermal power plants

<i>Category of workers</i>	<i>Economic capital</i>	<i>Human capital</i>	<i>Social capital</i>	<i>Political capital</i>
Skilled (mechanic fitter, electrician, light and heavy vehicle drivers, operators, supervisors)	<p>Minimum daily wage of Rs. 283 as specified by GoR.</p> <ul style="list-style-type: none"> • Better positioned to access opportunities for additional income through other means of livelihood such as small shops, working in other industries. • Indicate a higher degree of asset ownership, including houses and lightweight vehicles. • Insured under the ESI scheme. • EPF deposit serves as the primary saving. • Both formal sources, such as banks and microfinance institutions, and informal sources, such as relatives or colleagues, are utilised to access credit. 	<p>Typically hold at least matriculation, with most recent recruits holding ITI diplomas.</p> <ul style="list-style-type: none"> • Conditions of work are harsh with high occupational hazard risk. • Relatively less prolonged and direct exposure to hazardous materials. • Better positioned to receive alternative employment at current wages as skills and experience are ratified through experience certificates. • Provided with required safety gear such as helmets, gloves, and shoes. 	<p>Includes a mix of persons from different caste backgrounds, including Brahmins, Rajputs, Scheduled Castes, and Other Backward Castes.</p> <ul style="list-style-type: none"> • Most are locals or migrants from nearby areas such as Kota, Tonk, and Newai. Hence likely to have mature social networks. 	<p>Members of labour unions, visible and vocal participation in union activities.</p> <ul style="list-style-type: none"> • As local residents or residents of nearby areas, have some political voice in local decision-making.
Semi-skilled (Helper, junior fitter, welders, gardeners)	<ul style="list-style-type: none"> • Minimum daily wage of Rs. 271 as specified by GoR. • Access to opportunities for additional income is curtailed due to strenuous work shifts. • Many possess local housing with a high degree of informality in tenure. Some workers possess marginal agricultural land in places of origin. • Insured under the ESI scheme. • EPF deposit serves as the primary saving. • Credit is secured through informal sources such as relatives, neighbours, employers, or colleagues. Express aversion to formal sources of credit. 	<p>Typically middle school graduates.</p> <ul style="list-style-type: none"> • Under-recognition of skill level gained through hands-on work experience. • Degree of direct and prolonged exposure to hazardous materials is high, impacting physical and mental well-being. • Access to alternative employment at existing wages is curtailed due to a lack of formal recognition of skills and experience. • Provision of safety gear such as helmets, gloves, and shoes is not adequate and timely. 	<p>Primarily includes workers belonging to Other Backward Castes and Scheduled Castes.</p> <ul style="list-style-type: none"> • The majority are locals or migrants from nearby areas such as Tonk, Newai, and Jhalawar and hence, likely have mature social networks. 	<p>Members of labour unions. However, active and vocal participation is not uniform across the category.</p> <ul style="list-style-type: none"> • As local residents, may exercise some say in local decision-making. However, capacity for active participation is curtailed due to the informal nature of their settlements.

(Continued)

<i>Category of workers</i>	<i>Economic capital</i>	<i>Human capital</i>	<i>Social capital</i>	<i>Political capital</i>
Unskilled (labour, cleaning, and sanitation workers)	<ul style="list-style-type: none"> • Minimum daily wage of Rs. 259 as specified by GoR. • Access to opportunities for additional income is significantly reduced due to the physically strenuous work. • Many possess local housing with a high degree of informality in tenure. Few indicate none to marginal agricultural land holding in places of origin. • Insured under the ESI scheme. • EPF deposit serves as the primary saving. • Credit is secured through informal sources such as relatives, neighbours, employers, or colleagues. Express high aversion to formal sources of credit. 	<ul style="list-style-type: none"> • Generally comprise primary school graduates. • Perform physically arduous manual labour, including civil construction and maintenance work, as well as cleaning and sanitation work. • Opportunities for professional growth are usually stagnant. • Poorly positioned to gain alternative employment due to highly informal nature of work and limited opportunity to gain skills. Provision of safety gear such as helmets, gloves, and shoes is not adequate and timely. 	<ul style="list-style-type: none"> • The majority belong to Scheduled Castes and Scheduled Tribes, with sanitation and cleaning workers being predominantly Dalits. • Accounts for significant participation of female workforce across the overall livelihood spectrum. • Mainly locals or migrants from nearby areas such as Tonk, Newai, and Jhalawar. Hence likely to have mature social networks. 	<p>Members of labour unions. Participation in union activities is minimal.</p> <ul style="list-style-type: none"> • The participation of women is virtually absent. • As local residents, may exercise some say in local decision-making. However, capacity for active participation is curtailed due to the informal nature of their settlements.
Fly-Ash Brick Industry Workers	<ul style="list-style-type: none"> • Determination of wages for workers is based on productivity (units of bricks produced or loaded/unloaded). (Rs. 180/190) • The majority of workers are migrants and do not possess any local assets. Some indicated small to marginal agricultural land holding in their places of origin. • Not insured under the ESI scheme, limiting access to healthcare. • Not covered under the EPF Act. Formal savings are absent. • Credit is secured through informal sources such as relatives, neighbours, employers, or colleagues. Express high aversion to formal sources of credit. 	<ul style="list-style-type: none"> • Majority were primary school graduates. • High and prolonged exposure to hazards at the workplace. • Poorly positioned to gain alternative employment due to highly informal nature of work and limited opportunity to gain skills. • Not provided with required safety gear such as helmets, gloves, shoes or masks. 	<ul style="list-style-type: none"> • The majority belong to Scheduled Castes and Dalit communities. • Most are migrant workers from MP, UP, Bihar, and other parts of Rajasthan. As a result, mature local social networks are likely to be absent. 	<p>Participation in local politics is virtually absent.</p> <ul style="list-style-type: none"> • Organised workers' associations are absent.

The capability and resilience of a worker to deal with the impact of the loss of livelihood is a function of their economic, human, social, and political capital. Similarly, a worker is exposed to intersectional vulnerabilities of caste, class, and gender. The observations surfacing during this qualitative research highlight how intersectionality affects workers of thermal power plants. We argue that interventions for “Just Transition” need to take cognizance and be sensitive towards the intersectional vulnerabilities of TPP workers.

The wage and economic differential between the skill-based workforce groups is apparent. The disparity is further aggravated by systemic challenges such as capability reflective skill recognition, ability to pursue additional economic opportunities, and access to finance. Semi-skilled and unskilled workers were observed to be more exposed to hazardous environments and employment-associated risks. This includes exposure to thermal discharge, coal dust, fire, and explosion hazards, etc.

Notably, it is primarily the unskilled workers who occupy hazardous locations such as coal and ash handling. Such exposure is observed to have long-term detrimental impact on the health and well-being of the concerned workers. For instance, many workers who have spent their lifetime in coal handling complain of degradation of eyesight and blindness. Similarly, workers involved in fly-ash brick industries (allied jobs) are directly exposed to hazardous waste. Both groups of workers reported high instances of skin and respiratory issues, including silicosis. Such employment locations, while being low-paid, carry high long-term risks for the workers and high financial costs associated with chronic health issues. The associated degradation of health and well-being may severely impact their ability to work and sustain themselves.

Exploration of the social configuration of worker groups associated with the TPP further highlights their intersectional vulnerabilities. Skilled workforce displays a heterogeneous social composition, and includes persons from the General Category, Other Backward Castes, and Scheduled Castes. However, social configuration becomes increasingly homogenous as we move to semi-skilled and unskilled workers. Semi-skilled workers primarily belong to Other Backward Castes and Scheduled Castes; unskilled workers are primarily from Scheduled Castes and Scheduled Tribes. The disadvantages which arise from social position reflect in community support systems and collective vulnerability. Large groups of marginal workers from disadvantaged backgrounds serving the TPP have high collective vulnerability. Consequently, this reduces their resilience to deal with the impact of an event such as decommissioning of a thermal plant because of high exposure at the community level. It may be noted that the vulnerability is being discussed in the context of the spatial coordinates and social composition of the workforce.

Furthermore, the ability of workers to voice their challenges and demand safeguards for a Just Transition through policy intervention is a function of their political capital. Observably, political capital drastically diminishes as we move from skilled worker groups to unskilled worker groups. While skilled workers are active and vocal members of labour unions, the participation and engagement among semi-skilled workers are inconsistent. Further, the participation of unskilled workers in union activities is tokenistic and their representation

in union leadership is usually absent. Political capital of semi-skilled and unskilled workers is also lower by virtue of their social positions, informal nature of their settlements, and their voting status. The latter is a function of the fact that most unskilled workers are migrants from different backward regions of the state and the country.

It is worth noting that women are estimated to constitute approximately 10% of the contractual workforce engaged by thermal power plants in Rajasthan (Bask Research 2022). They are primarily engaged as unskilled labour for menial jobs such as gardening, cleaning, etc. The associated flys-ash brick industry employs a larger number of women at menial wages. The gendered impact of possible decommissioning is yet to be understood. However, it is clearly observed that women's voices are grossly under-represented, while they are likely to be more vulnerable because of structural gender-based inequalities in India.

While thermal power generation industry employs a large number of people, the majority of the workers are engaged in low-paying jobs with high associated risks. Since the nature of employment is primarily contractual, the legal rights and safeguards for such workers are very limited. Further, the vulnerabilities of these workers are aggravated because of intersectionality of employment position (work environment risks), social positions, economic status, gender, and age. Hence, designing and planning policy interventions for Just Transition demand a deep understanding of intersectional vulnerability.

Appendix B

Workforce Transition Management in Rajasthan Raja Vidyut Utpadan Nigam Ltd

Simran Grover and Manideep Gudela

Context

The clean energy transition is reshaping Rajasthan's energy landscape in more ways than one. More than 90% of the solar capacity is commissioned in western districts of Rajasthan (Jodhpur, Jaisalmer, and Bikaner) because of favourable conditions and the availability of large tracts of land. In contrast, a majority (60%) of the 11.5GW of thermal power capacity is located in the state's eastern districts (Baran, Kota, and Jhalawar). Further, renewable energy sources (solar, wind, and biomass) account for 60% of the total generation capacity (32 GW) installed capacity in Rajasthan of which 98% are private sector investments. This contrasts with 73% of thermal (coal and gas) capacity ownership by Rajasthan Raja Vidyut Utpadan Nigam Ltd (RVUNL), a public sector generation utility, signifying a fast-paced shift in generation asset ownership within the state.

As of Mar 2023, RVUNL owns and operates 8.6 GW of power generation capacity, of which 7,830 MW (91%) is powered by coal, 603 MW (7%) is gas, and the

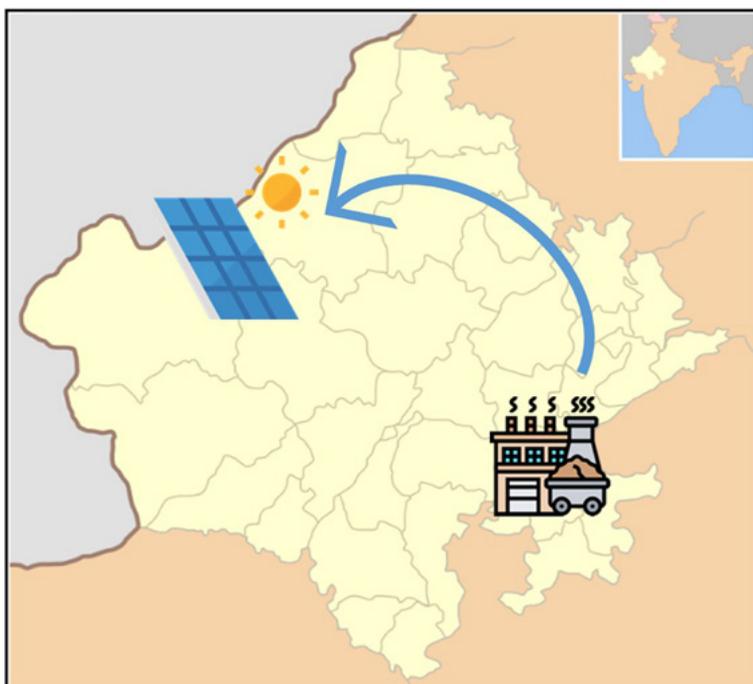


Figure 5.A.1 Geographical shift in electricity generation in Rajasthan.

remaining 164 MW (2%) is hydel. With its current capacity, the utility met 55% of the state's peak demand and 35% of the state's annual energy requirement in FY22.

Given Rajasthan's energy transition trajectory and trends of private sector driven clean energy investments, it is likely that the private sector shall increasingly dominate the power procurement portfolio. RVUNL's clean energy transition shall accelerate the energy transition of Rajasthan, create new opportunities for investments and jobs, facilitate competition through healthy public and private sector participation, and strengthen Rajasthan's energy security.

As per its latest annual report (FY22), RVUNL employs 3,836 permanent employees, all of whom are skilled category workers. Contractual employees include work-persons from skilled, semi-skilled, and unskilled categories. Based on analysis of data obtained through RTI, Centre for Energy, Environment and People (CEEP), reports that the utility employs 2.5 contractual employees for every permanent employee at its coal power plants. Based on this, an estimated 13,295 are employed by RVUNL. Additionally, it also provides hundreds of associated livelihoods (equipment manufacturers, vendors, consultants, contractors, etc.) and thousands of allied livelihoods (livelihoods linked to local economic activities that exist as a consequence of being in the vicinity of a power plant – domestic helpers in employee residences, grocery vendors in the neighbourhood, transport operators for workers, etc.).

RVUNL doesn't have a defined decommission plan for its coal fleet yet, although, as of Mar 2023, 850 MW of its coal power capacity is over 25 years old. The utility's current expansion plans include the addition of 2,245 MW of new

coal power capacity and 810 MW of solar power capacity (RVUNL, 2022). We explore the transition scenarios for RVUNL and evaluate the macro impact on jobs.

Transition Scenarios for RVUNL

We develop three scenarios for RVUNL for the period 2022–2030 based on differentiated rates of decarbonisation. The respective transition pathways aid us in arriving at RVUNL's power generation portfolio mix until 2030 and analyse plausible employment creation (and loss) in the commissioning and operations of different assets. Employment creation for decommissioning thermal assets is not considered.



Figure 5.A.2 Methodology for assessing the impact on jobs.

Source: Author's compilation and analysis.

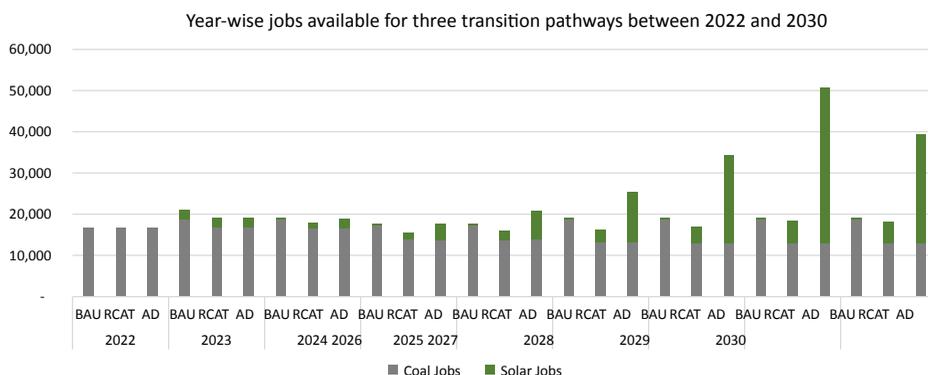


Figure 5.A.3 Year-wise jobs available for three transition pathways between 2022 and 2030.

Source: Author's compilation and analysis.

Scenario 1 – Business As Usual (BAU): Here, the proposed coal power capacity of 2.2GW is considered to be commissioned by 2027, with an addition of 810 MW of Solar capacity in 2024 (announced in the FY22 budget). Considering

a realistic decommissioning trajectory based on historical trends, existing coal assets past 35 years are considered for retirement.

Scenario 2 – Redirecting Capital For Accelerated Transition (RCAT): Here, we assume zero thermal capacity addition with the equity capital budgeted by GoR redirected towards solar PV capacity addition. The solar PV capacity addition in this scenario is in addition to the planned 810 MW of Solar capacity simulated in Scenario 1. Further, the retirement of coal assets past the age of 30 years is considered.

Scenario 3 – Aggressive Decarbonisation (AD): This scenario involves aggressive decarbonising by shelving the current plans to add new coal capacity and retiring the existing coal plants at 25 years. The share of Rajasthan's energy requirement met through RVUNL's generation in 2030 shall remain at the current level of 35%, which is achieved through an accelerated addition of solar PV capacity.

Table 5.3 Snapshot of the RVUNL transition under the three scenarios

	2023	2030		
		BAU	RCAT	AD
RVUNL generation capacity (MW)				
Coal	7,830	9,435	6,730	5,535
Gas	604	604	604	604
Hydro	164	164	164	164
Solar	0	810	4,842	10,754
Total	8,597	11,012	12,340	17,056
RJ peak demand (MW)	17,206			
RJ Peak Demand (MW) - 20th EPS		23,534	23,534	23,534
RVUNL generation (MU)				
Coal (R)	42,621	51,358	36,634	30,129
Gas (R)	2,518	2,518	2,518	2,518
Hydro	196	196	196	197
Solar	0	1,419	8,484	18,841
Total	45,335	55,491	47,831	51,685
RJ energy requirement (MU)	95,172			
RVUNL generation vs RJ energy requirement (%)		1,49,063	1,49,063	1,49,063
Additional capital investments (Rs., crores)		19,683	19,683	43,715
Emissions (million tonnes of CO₂)				
Released in the year	49.363	53.533	38.579	31.972
% Change from 2022 to 2030 (+/-)		8%	-22%	-35%
Total emission saving b/w 2023-30		5.67	62.50	87.08
Impact on Jobs				
Number of Job years as on 2022	13,295			
Change in Coal Job years by 2030		2,254	-2,247	-4,145
Pre-Comm. Solar Job years on 2030		0	2,857	6,345
Post-Comm. Solar Job years on 2030		405	2,421	5,377
Total Solar Job years on 2030		405	5,278	11,722
Total Jobs Years Available on 2030		15,955	16,326	20,872
Jobs Created b/w 2023 and 2030		19,672	15,601	33,416

Coal and gas generation(R) is based on rated capacity and normative PLF, and availability adjusted for auxiliary consumption.

Source: Author's analysis.

The impact on jobs is estimated for each transition scenario based on estimated jobs created for the addition of solar and coal power capacity and adjusting for the loss of jobs against the decommissioning of coal power plants. For a comparative analysis, we estimate equivalent job years per megawatt per annum for solar and coal power generation. A job-year is defined as the ratio of time an employee spends on a particular project/task in a given year to the standard total working hours in that particular year. The analysis is carried out for pre-commissioning, post-commissioning, and decommissioning stages, as shown below.

Analysis for Pre-commissioning, Post-commissioning, and Decommissioning Stages

The costs of transition are estimated based on available benchmarks for the commissioning of power plants Rs. 7.3 Cr per MW (GoR, 2022) for coal and Rs. 4.07 Cr per MW (IEEFA, 2022) for solar.

The BAU scenario results in the augmentation of thermal capacity and solar capacity by 2030, resulting in an increase in annual CO₂ emissions of the utility by 8% from its 2022 levels. In the RCAT, the annual CO₂ emissions of the utility level shall reduce by 22% by 2030 from the 2022 levels. The third scenario (AD) is ambitious, wherein the RVUNL, while maintaining its share in the Rajasthan energy landscape, aggressively pursues early decommissioning of thermal assets. This shall demand an investment of Rs. 44,000 Cr², save 87 million metric tonnes of CO₂ between 2023 and 2030, and reduce annual emissions by 35%. A summary of the analysis follows.

Impact on Jobs

As can be seen from the table, in the AD (accelerated decarbonisation) scenario, RVUNL is likely to create 33,000 jobs between 2023 and 2030. In comparison, the BAU and RCAT scenarios shall create 19,000 and 15,000 jobs, respectively. Net jobs created are a function of jobs lost due to decommissioning thermal assets and jobs created in the renewable energy industry. It may be noted that additional jobs may be created by repurposing thermal power plants and prioritising adoption of more job-intensive technologies such as distributed solar, but the same are not considered in our analysis.

Energy transition in electricity generation will not simply replace coal jobs with renewable energy jobs as the transition presents a significant spatial shift in the loci of energy generation from the eastern to the western region in Rajasthan. This raises concerns for both direct employment and allied jobs.

The nature and quality of jobs is also a concern. The deployment of renewable energy assets creates a majority of jobs in the construction and pre-commissioning phases, whereas the job intensity for operations and maintenance is very low.

The pre-commissioning jobs for solar PV assets include business development, design and pre-construction, and construction and commissioning, typically lasting less than a year. The majority of the jobs are created during the construction and pre-commissioning phase (2.7 job-year per MW), with 65% being unskilled and semi-skilled (electricals and panel installation) and 35% skilled (site engineering

Equitable Distribution of Market Risks – A Critique of the Electricity Act 2003

Simran Grover

The Electricity Act (EA) 2003 is a landmark legislation which paved the way for unbundling the electricity board, establishing the Appellate Tribunal for Electricity, defining powers of regulatory commissions and framing the market design for private sector participation. It facilitated many milestones of the last two decades, including a pan-India synchronous grid (“one nation, one grid, one frequency”), sufficiency in electricity generation through private sector participation, and significant improvements in the quality of supply. A critical evaluation of the Act, with respect to the efficiency of overall market design shaped by it and its impact on consumers, follows to serve as inputs to design legislative and policy interventions for clean energy transition of the power sector.

The nature of power sector demands long-term planning, overseen by State agencies under the purview of the Act. The push for private sector participation and competition was facilitated by safeguarding investors from long term demand risks. The Central Government was tasked with preparing the National Electricity Policy and Plan (Section 3, EA 2003) in consultation with the State Governments, for the development of power systems based on optimal utilisation of resources. The electricity regulatory commissions were accorded the authority to specify terms and conditions of tariff, commonly known as tariff regulations, for generation and transmission companies under Section 61 of the Act. Efficiency, economic use of resources, optimum investments, and safeguarding consumer interests are some of the key principles guiding the regulatory commissions. Further, Section 62 provides for the determination of the tariff for a power utility/company. Section 63 provides for adoption of tariffs discovered through competitive bidding mechanisms, wherein the bidding process shall be in accordance with the guidelines issued by the Central Government. The Act allowed prudent costs for supply of electricity to be passed to the consumers and recovered through electricity supply tariffs, as per the National Tariff Policy and subsequent regulations notified by appropriate regulatory commissions.

The resulting growth in market share of private sector across the three verticals of generation, transmission and distribution has been very different. Since the EA 2003 was notified, the private sector’s share in electricity generation has increased to approximately 50%, while the rest is shared between the Central and State power generation utilities (MoP, n.d.). The contribution of the private sector in the transmission business has been increasing with a push for tariff-based competitive bidding, while the distribution sector is still dominated by state electricity distribution utilities.

While the power sector has grown significantly in the last two decades, the electricity distribution sector has lagged, with distribution companies accruing a debt of Rs. 5.5 trillion as of March 2021. This dismal state of distribution utilities is often attributed to poor management practices, need for modernization, growing regulatory assets, and high technical and commercial losses. However, a conceptual analysis of risk distribution across the three key verticals of electricity generation, transmission, and distribution and the fundamental structural issues in market design offer a critical understanding of the failures of electricity distribution sector.

Long-term electricity demand is a significant uncertainty in the power sector, especially in the context of power sector planning. Error in demand estimation on either side (over or under estimation) has significant economic implications. Energy deficits directly impact productivity and economic growth. Excess capacity, resulting from over investment in infrastructure, results in lower capacity utilization. Consequentially higher electricity tariffs required to be levied for recovery of costs, impact affordability, and industry competitiveness.

Power sector planning is typically done for a ten-year horizon, accounting for timeframes for commissioning power generation and transmission, especially inter-state transmission lines. The Central Electricity Authority and, typically, State Electricity Departments forecast electricity demand, based on which, investments for electricity generation and transmission are approved. As distribution utilities are required to enter into long-term generation and transmission contracts to meet their current, near term and long-term electricity demand, the demand risk is solely concentrated in the distribution sector.

In the last two decades, India has experienced significant underutilization of generation capacity because of low realization of demand growth, poor fuel linkages, poor planning, and other issues (Prayas (Energy Group), 2017). The investment in generation increased through private sector participation, while the public sector dominated distribution companies struggled to keep pace. The passthrough of investments in generation and transmission to electricity consumers ensured that the participating players were immune to demand risk. However, distribution companies are caught up in the political economy of electricity, bearing the burden of planning inefficiencies. It may be noted that the State Governments play a critical role in shaping power sector planning, and the distribution companies have only a notional role to play in such matters.

Inefficiencies in power sector planning and over investments should create a negative market signal because of an increase in electricity tariffs. However, such signals are muted by using instruments such as subsidies and regulatory assets (delayed recovery of costs through retail electricity tariff). Inefficiencies in disbursement of subsidies and liquidating regulatory assets have consistently constrained cash flow of distribution utilities and inhibited necessary investments in infrastructure, technology, and human capital to strengthen the sector.

The distribution sector also has inherently high operational and business risks. These include large operational network, consumer behaviour and political economy risks. The latter often contributes to electricity theft and poor recovery of dues. Further, public distribution companies often do not enjoy appropriate autonomy in planning and management to navigate the complexities, as they are vulnerable to indirect control by the respective state governments.

It may be argued that in many states distribution companies are systemically forced into debt cycles and resource starvation, resulting in their deplorable condition. In this context, the discourse around privatization of public distribution companies has garnered mainstream support. While it is true that privatization may address some of the challenges faced by public distribution companies since they are inherently more autonomous, privatization does not address the structural issues of power sector governance, especially equitable distribution of risks across the generation, transmission and distribution sectors.

The power sector is witnessing a substantive increase in complexity. This is a function of the increasing renewable energy integration, distributed generation, sales migration, electric mobility, decarbonisation across sectors, technology risks, and climate risks. Demand risk has substantively increased across short, medium, and long term horizons. Planning and sectoral management inefficiencies are likely to pose a significantly higher cost to the consumers and the country's economic sustainability. In this context, while the role of public electricity distribution companies may shrink in the wake of privatization, displacing them completely may not be advisable. Instead, it is necessary to align incentives across generation, transmission, and distribution sectors to address the energy trilemma of affordability, reliability, and sustainability. Equitable distribution of market risks is paramount, lest we risk derailing India's energy transition and sustainability of its power sector.

related) in nature. The jobs in the business development phase are 100% skilled, and the design and pre-construction phases require 62% skilled workers. At the same time, in the post-commissioning, the solar plants employ – semi and lowskilled workers, with the majority – 86% of the jobs from unskilled (50%) and semi-skilled (36%) categories (Kuldeep et al., 2017).

The thermal power industry offers long-term jobs, and the majority of personnel employed belong to unskilled and semi-skilled categories. The condition of workers employed for coal handling can be particularly grievous, while their wages do not reflect their risk exposure.

Although the clean energy industry has relatively less hazardous conditions, the wages of the labour force and the short-term nature of the clean energy jobs may impact the long-term sustenance and growth of the associated labour.

References

- Government of Rajasthan (GoR) (2022). Annual financial statement. Jaipur. Budget Speech, Rajasthan Budget, 2022-23, Available at <https://finance.rajasthan.gov.in/docs/budget/statebudget/2022-2023/Budget2022-23English.pdf>
- IEEFA (Institute for Energy Economics and Financial Analysis). (May, 2022). Solar tariffs projected to increase by one-fifth over the next year.
- Kuldeep, N. (2017) Greening India's Workforce. Available at <https://www.ceew.in/sites/default/files/CEEW-NRDC-Greening-India-Workforce-report-20Jun17.pdf>
- RVUNL (2023) 22nd Annual report FY 2022-23, Available at [http://103.122.36.131/content/dam/raj/energy/rvunl/pdf/AnnualReport/RVUN %20AR %202021 -22 _Main _compressed .pdf](http://103.122.36.131/content/dam/raj/energy/rvunl/pdf/AnnualReport/RVUN%20AR%202021-22_Main_compressed.pdf)