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Energy Justice and Transitions in India: Between Security and Developmental Imperatives

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Abstract

India's energy transitions present a distinctive case in global just transitions discourse, shaped by the intersecting imperatives of postcolonial (fossil) developmentalism, energy justice and security, and climate governance. This article examines how just transitions are conceptualized and operationalized in India through a thematic analysis of national and subnational policy documents, regulatory frameworks, and scholarly literature. It argues that India's approach diverges fundamentally from prevailing just transitions frameworks, situating decarbonization within a broader architecture of energy sovereignty and distributional stability rather than an accelerated fossil fuel phase-out. The article demonstrates that India invokes distributive justice selectively, prioritizing aggregate energy access while obscuring intra-regional inequalities and displacing procedural and restorative justice claims through intermediary-controlled governance and international climate negotiations, respectively. It examines how India's energy transitions are influenced simultaneously by its domestic structural constraints and climate diplomacy. Lastly, it analyses both hard and soft infrastructures and reveals a transition pathway partially compatible with distributive justice but structurally constrained in advancing procedural and restorative justice for coal-dependent communities.

Keywords

climate governance; coal; energy justice; energy security; India; just transitions; postcolonial developmentalism

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1. Introduction

India's contemporary energy landscape is characterized by a complex interplay between domestic developmental imperatives, structural dependencies, and aspirational global climate leadership. As the world intensifies efforts to achieve rapid decarbonization, India occupies a distinctive position as both a major developing economy and a central actor in global climate governance. The scale of India's energy demand—driven by sustained economic growth, rapid urbanization, and persistent developmental disparities—renders its energy transitions structurally, institutionally, politically, and socio-economically challenging. Within this context, the concept of "just transitions" has emerged as a central analytical and policy concern. Yet, in India, this concept acquires meanings that diverge substantively from those prevalent in advanced industrial economies. Rather than signifying an accelerated coal exit, the Indian policy discourse positions just transitions within the broader architecture of energy security, system stability, and long-term structural transformation.

Against this backdrop, the article aims to situate India's evolving approach to just transitions by offering a more nuanced understanding of how the country conceptualizes and operationalizes them within the broader framework of energy security, justice, and developmental imperatives. In doing so, it highlights the inherent tensions and trade-offs that define India's transition trajectory and underscores the need for context-specific, socio-economically embedded, politically feasible, and temporally aligned approaches to achieving a just and sustainable energy future.

Methodologically, this article analyses policy documents to examine India's energy transitions, guided by three interlinked research questions: (a) how just transitions are conceptualized in India, (b) how domestic drivers shape India's approach to energy justice, and (c) how these conceptualizations inform energy policy priorities and infrastructural pathways. In this article, energy justice and just transitions are treated as analytically distinct but related concepts. Energy justice is used as an analytical framework to examine the fairness of energy systems, particularly along distributive, procedural, and restorative dimensions. On the other hand, just transitions refer to the policy and governance processes through which energy systems are transformed, often incorporating, but not limited to, energy justice considerations. The study inductively identifies and interprets themes from policy documents, government reports, regulatory frameworks, and peer-reviewed scholarship. The scope of the article's analysis of energy remains limited to electricity, specifically focusing on coal-based electricity generation.

Based on the research questions, Sections 2 and 3 examine conceptual and operational foundations of just transitions in India through key policy and institutional documents, including those of the National Institution for Transforming India (NITI Aayog), the Government of India's official think tank; Government of Jharkhand Task Force on Sustainable Just Transition; and reports by research organizations such as The Energy and Resources Institute (TERI) and International Forum for Environment, Sustainability & Technology (iFOREST). Section 4 traces India's evolving climate diplomacy, highlighting tensions between climate ambition and development priorities. Section 5 investigates domestic drivers shaping India's just transitions approach. Section 6 evaluates how conceptual and structural constraints shape India's energy infrastructure, using Harris and De Leeuw's (2022) distinction between hard (physical systems such as generation, transmission, and storage) and soft (institutional governance and policy frameworks) infrastructure. The analysis is based on a purposively selected set of primary documents designed to capture both foundational and more recent

developments in India's energy transitions. Documents were included based on three criteria: (a) their status as official policy instruments, such as legislation, regulatory frameworks, or strategy papers, directly related to energy, electricity, climate policy, or just transitions; (b) their substantive engagement with themes of energy security, energy justice, decarbonization, renewable energy deployment, coal transitions, or climate governance; and (c) their production by national or subnational institutions with formal policy-making or implementation authority (such as the Ministry of Power, Ministry of Coal, Ministry of New and Renewable Energy, NITI Aayog, and Government of Jharkhand).

The peer-reviewed literature situates the analysis within debates on energy transitions, climate diplomacy, the political economy of coal (Goyal, 2018; Lahiri-Dutt, 2014), renewable manufacturing challenges (Behuria, 2020), and the micropolitics of mining communities (Oskarsson et al., 2024). Additionally, official statistics and data sources offer empirical grounding, drawing on the Central Electricity Authority, the Ministry of Statistics and Programme Implementation, NITI Aayog's Climate and Energy Dashboard, and industry reports to substantiate claims regarding the energy mix, sectoral consumption, regional renewable potential, and employment patterns.

2. Conceptualizing Energy Justice and Just Transitions From an Indian Perspective

A focus on energy security is central to this article, as it underpins how just transitions are articulated and implemented in the Indian context. The Government of India's definition of energy security emphasizes not only availability, but also affordability, reliability, and resilience:

> We are energy secure when we can supply lifeline energy to all our citizens irrespective of their ability to pay for it as well as meet their effective demand for safe and convenient energy to satisfy their various needs at competitive prices, at all times and with a prescribed confidence level considering shock and disruptions that can be reasonably expected. (Parikh et al., 2006, p. 54)

Reflecting this approach, the Ministry of New and Renewable Energy (2025) has underscored the importance of energy security for India's energy transition policies, economic growth, and sustainability goals.

Energy justice in India is generally conceptualized via a postcolonial developmentalist lens focused on fossil fuels. Three key characteristics define fossil developmentalism, which is seen as a continuation of postcolonial developmentalism. The first characteristic is energy infrastructure, which has been a central instrument for nation building and for asserting state legitimacy in postcolonial countries. Under colonial rule (British Raj in India), "the dissemination of fossil technologies" was "haphazard" and "electrification" was "incidental to imperialism" (Chatterjee, 2020, pp. 6–9), often restricted to military use or extraction rather than general development. When India gained independence, the country's leaders viewed electricity not as a luxury commodity but as an "industrial necessity" for "modern life and civilization" and a "moral technology" that demonstrated "state power" (Chatterjee, 2020, pp. 13-16). At the same time, electricity was an index of civilization and state success: "the very life blood of the industrial nation," as the Indian National Congress declared (Chatterjee, 2020, p. 13). To catch up with the West, postcolonial states pursued "technonationalist" mega-projects. This included massive hydroelectric dams (described by India's first Prime Minister Jawaharlal Nehru as the "temples of modern India"; Chatterjee, 2020, pp. 13–14) and centralized grids, which were prioritized over decentralized or market-based systems to showcase rapid modernization.

Decentralized energy systems gained attention in India during the 2010s, particularly through the promotion of solar mini-grids in states such as Uttar Pradesh and Bihar as alternatives for rural electrification in areas poorly served by the central grid. However, with the acceleration of universal electrification programs and grid extension, decentralized approaches gradually lost policy prominence and were increasingly subsumed within a centralized vision of electricity access (Sharma et al., 2020).

The second characteristic is energy security, which is redefined not just as reliable energy supply, but as political independence from external influence. Therefore, any transition pathways must accommodate the way energy security is to be achieved (NITI Aayog, 2022). India's historical engagement with Just Energy Transition Partnerships, which are plurilateral financial and energy transition mechanisms that allow a developing country with a high carbon footprint to accelerate the transition from fossil-based energy to renewable energy sources with the financial and technical assistance of developed countries and international financial institutions, demonstrates this priority (Mukherjee, 2023). During India's G20 presidency in 2023, there was considerable international expectation that the country might enter a Just Energy Transition Partnership agreement. These expectations, however, dissipated due to India's firm insistence on retaining full autonomy over its transition strategy and its reluctance to commit to the early phase-out of coal-based power plants (Srivastava & Wettengel, 2024).

The third characteristic is the democratization of energy consumption, which is considered a key basis for ensuring equitable development, thereby subordinating considerations of ability to pay to prioritizing the fulfilment of people's basic needs. For example, in the southern state of Tamil Nadu, the Madras High Court ruled that the right to electricity access is a human right (Chatterjee, 2020). However, this has led to industrial inefficiency and financial instability, as can be seen in the state of India's energy distribution companies, many of whom operate at a loss (Biswas et al., 2025).

While synthesizing postcolonial developmentalism with the energy justice framework, distributive, procedural, and restorative justice assume significance. The energy justice framework describes distributive justice as evaluating how benefits and burdens of the energy systems are distributed across communities and households (Jenkins et al., 2016; Nock, 2026). Procedural justice is defined by whether diverse groups can meaningfully participate in the decision-making processes, rather than merely being formally included (Jenkins et al., 2016; Sovacool & Dworkin, 2015). Restorative justice is defined in terms of how various groups get compensated for past injustices incurred upon them (Heffron & McCauley, 2018; Nock, 2026). In the context of energy transitions, these pillars provide a framework for assessing whether the shift towards low-carbon energy systems is undertaken in a manner that equitably distributes benefits and burdens, supports meaningful participation by affected stakeholders, and addresses historical social, economic, and environmental injustices.

In terms of distributive justice, the Indian context is characterized by a persistent challenge of energy poverty, with fossil developmentalism prioritizing fossil fuel-driven economic growth as the primary means of expanding energy access to underserved populations. Rather than leaving energy to the market, the Indian state has viewed energy as an "entitlement" and attempted to "democratize consumption" (Chatterjee, 2020, pp. 4, 12) through massive subsidies for farmers and the poor. However, despite these state efforts, distributive injustice remains as subsidies are often leaked (Chatterjee, 2020, p. 18) to the rich (such as wealthy farmers or urban elites), while the poor still lack reliable access. In a similar vein, energy

transitions in India are primarily framed through distributive concerns such as energy access, affordability, and employment (Haldar et al., 2023). Extending this perspective, Malakar et al. (2019) envision energy justice in terms of low-carbon energy transitions as a process that must simultaneously achieve intra-generational justice through equitable access to energy and inter-generational justice through long-term sustainability and decarbonization.

In the South Asian context, and particularly in India's coal sector, procedural justice is better understood as a struggle for political legitimacy (Oskarsson et al., 2024) than as formal inclusion, given the sector's deeply informal and intermediary-driven labor relations. Goyal (2018) illustrates how this informality shapes local power structures. For example, union leaders often double as sardars—informal labor contractors—who embed workers in debt-based dependency networks, ensuring a steady supply of cheap and compliant labor. Rather than broadening democratic inclusion, union involvement may legitimize existing hierarchies and intermediary control. Hence, the central question becomes not simply whether local actors are "included" in just transitions planning, but whose participation is recognized as legitimate and whose interests are advanced. These micropolitics reveal that grassroots conceptualizations of just transitions are shaped less by formal consultation mechanisms and more by entrenched systems of political authority, dependency, and representation within the informal coal economy. For example, Haldar et al. (2023) argue that India's energy transitions remain largely top-down and risk reproducing existing social inequalities unless the needs and agency of marginalized communities are more explicitly incorporated into transition planning and governance. As a case in point, although solar policies in India increasingly promote energy access, job creation, economic growth, and skill development, they remain limited in addressing deeper concerns of energy justice, including community participation, gender inclusion, local ownership, and equitable distribution of benefits (Batra et al., 2025).

In India's case, the idea of restorative justice is contextualized within broader concerns of postcolonial developmentalism, energy security, energy sovereignty, and the principle of Common But Differentiated Responsibilities & Respective Capabilities (CBDR-RC; Thakur & Jayaram, 2024). Therefore, restorative justice is primarily invoked at the international level, focusing on historical responsibility for climate change and the unequal distribution of mitigation burdens between developed and developing countries. This contrasts with the energy justice framework that looks at the local populations who are affected by energy transitions. For example, elements of restorative justice are evident in several Indian state-level solar policies (such as Telangana, West Bengal, and Kerala) through mandated community development contributions, rehabilitation payments, revenue-sharing arrangements, and protections for landowners' rights. However, their effectiveness and inclusivity vary considerably and often fall short of fully addressing the needs of all vulnerable and affected groups (Batra et al., 2025).

3. Policy Operationalization of Energy Justice in India

The Electricity Act (2003, amended in 2004 and 2007), National Electricity Policy (2005; Ministry of Power, 2005), and Tariff Policy (2016) address energy security primarily through state-controlled operational mandates, focusing on efficient grid operations and the smooth transfer of power via regional and state load dispatch centers. For instance, Section 28(e) of the Electricity Act specifically mandates that the Regional and State Load Dispatch Centres ensure "secure and economic operation of" the "regional" and "state" grids, respectively (Ministry of Law and Justice, 2003, pp. 28, 30). This operational emphasis can be interpreted

as a developmentalist imperative to secure the physical infrastructure necessary for nation-building, treating grid stability and system reliability not merely as a technical requirement but as a prerequisite for state legitimacy.

In the preamble of the Draft National Energy Policy 2017, the framing of energy security shifts from operational stability to a broader developmental goal. The draft prioritizes energy security and security of supply through renewable diversification and reduced fossil fuel dependence (NITI Aayog, 2017). This evolution mirrors the moral framing underlying fossil developmentalism, where the state assumes responsibility for guaranteeing energy not just as a market commodity but as a necessary condition for national survival and progress. Similarly, the Tariff Policy (2016) emphasizes adequate and uninterrupted power supply through the "creation of adequate capacity reserves" (Ministry of Power, 2016, p. 24). This can be conceptualized as democratization of consumption, positioning continuous supply as a consumer entitlement that the state must deliver, prioritizing access over purely market-driven efficiency.

The Draft National Renewable Energy Act 2015 further illustrates this synthesis of energy security and developmentalism. Its opening statement declares that the purpose of the Act is to "promote the production of energy to reduce dependence on fossil fuels, ensure security of supply and reduce emissions of CO2 and other greenhouse gases" (Ministry of New and Renewable Energy, 2015, p. 1). By prioritizing access to all forms of energy while ensuring long-term sustainability, the draft demonstrates how India's pursuit of energy security is inextricably linked to distributive justice. It reflects a state-driven effort that may be understood as seeking to balance the techno-nationalist desire for independence from imported fossil fuels with the domestic moral obligation to provide secure energy access. Similarly, the Energy Conservation Act (2001, amended in 2022) extends India's approach to energy security beyond securing supply by promoting energy efficiency standards and demand-side management, including through the Energy Conservation Building Code and carbon markets (Ministry of Law and Justice, 2022), which may be seen as techno-managerial tools for sustaining growth while reducing import dependence.

Other key texts, such as those from NITI Aayog, the Government of Jharkhand, TERI, and iFOREST, provide a temporal framing of just transitions, highlighting long-term developmental transformation, energy resilience and independence, hybrid multi-level governance, and diversification of the national energy supply. The NITI Aayog report frames "just transition" as a long-term objective, arguing that coal will remain essential in the "foreseeable future" (NITI Aayog, 2022, p. 2). Similarly, Jharkhand's Sustainable Just Transition Vision emphasizes being "future ready," reinforcing the deferred nature of coal phase-out and fossil developmentalism (Task Force, Sustainable Just Transition, & CEED, 2023). In contrast, TERI advocates a phased but more immediate transition through the gradual substitution of coal with renewables (Mitra et al., 2023), allowing India to balance climate commitments with distributive energy justice. Furthermore, the Jharkhand report promotes green hydrogen as a pathway to decarbonize hard-to-abate sectors, while iFOREST links just transitions to achieving energy independence by 2047 and net zero by 2070, advocating diversification of Coal India Limited into renewable sectors (Bhushan & Banerjee, 2023). However, NITI Aayog emphasizes technological diversification through clean coal technologies, revealing tensions within India's transition strategy.

Governance structures further illustrate these dynamics. NITI Aayog proposes a three-tier, top-down framework complemented by local consultation, while the Jharkhand government emphasizes decentralized

planning. Yet, across reports, technocratic oversight dominates, reflecting procedural justice limitations where participation is mediated through state-led institutions. This approach aligns subnational transitions with national energy security priorities but risks reproducing existing hierarchies.

4. India's Climate Diplomacy

India's approach to climate diplomacy has been shaped by its effort to position itself as a "bridging nation," balancing developmental priorities with climate commitments (Jayaram, 2021). This has produced competing domestic and international pressures influencing India's just transitions policy. India's renewable energy expansion is driven partly by strategic vulnerabilities associated with heavy dependence on imported fossil fuels, particularly crude oil, and is linked to broader diplomatic and economic goals. This strategy is characterized by three elements: projecting India as a responsible global climate actor, strengthening domestic manufacturing to mitigate supply risks, and reducing external energy dependence. Changes in the global climate governance architecture since the adoption of the Kyoto Protocol in 1997 have reinforced this reorientation away from merely resisting binding mitigation obligations based on the CBDR-RC principle. As early as 2009, India signaled a shift in its stance, with Environment Minister Jairam Ramesh seeking to "change the narrative" of India's role in international climate negotiations (Vihma, 2011, p. 75).

India's pursuit of a renewable energy transition was crystallized in its updated Nationally Determined Contribution, announced at the 26th Conference of the Parties (COP26), where Prime Minister Modi unveiled the "Panchamrit" targets, centered on expanding renewable energy capacity and reducing the emissions intensity of GDP (Srivatsan, 2021). This leadership narrative continued at COP27 and COP28 through initiatives such as the Lifestyle for Environment campaign, launched with the United Nations Development Programme (UNDP), and participation in the United Arab Emirates-led Green Credits Programme, signaling an emphasis on behavioral change and multilateral cooperation. In its latest updated Nationally Determined Contribution (released in 2026), India has committed to "reduce emissions intensity of its GDP by 47 percent by 2035 from 2005 level" and "achieve 60 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2035" (Cabinet, 2026).

Despite these international commitments, domestic structural constraints act as strong impediments to rapid renewable expansion. India's late adoption of renewable manufacturing has increased reliance on imported technology, particularly in solar components (Behuria, 2020). Efforts under the Atmanirbhar Bharat framework to promote local production, including the Domestic Content Requirement and the Approved List of Models and Manufacturers, have yielded mixed results. While module capacity expanded to 100 GW by 2023, upstream manufacturing remains weak, with only 2.2 GW of ingot and wafer capacity supported under the Production Linked Incentive scheme (Wood Mackenzie, 2025). Moreover, geographical constraints such as land usage remain a key issue in the utilization of solar and wind energy. A "precautionary, high-side estimate" for achieving net zero by 2050 places land requirements between 50,000 and 75,000 km^2 for solar energy and 15,000–20,000 km^2 (total project area) for wind energy (Worringham, 2021, p. 1). While it only accounts for about 1.5–2.2 percent of India's land, it affects a significant portion of the population whose livelihoods and social identities are tied to land utilization. Large land requirements for solar and wind projects also risk displacement and ecological conflict, mirroring inequalities associated with coal-based development (Ortiz et al., 2022).

5. Domestic Drivers of India's Just Transitions Approach

Coal forms an integral part of India's national development narrative while simultaneously shaping the lives of a large section of the population. The pervasive nature of the sector invites a host of challenges at both national and local levels. This article delimits its focus to two major challenges as perceived by the Indian state: (a) the intermittent nature of renewables, and (b) the monoculturalization of national and local economies.

With electricity demand growing at approximately 9 percent annually since Financial Year 2021 (FY2021), a marked increase from the average annual growth rate of 5 percent recorded during the preceding decade (Agarwal et al., 2025), energy supply reliability is paramount in India's policy discourses. Coal is a relatively inexpensive, indigenous, and reliable source of fuel. Figures 1–4 contextualize coal's centrality in India's energy strategy.

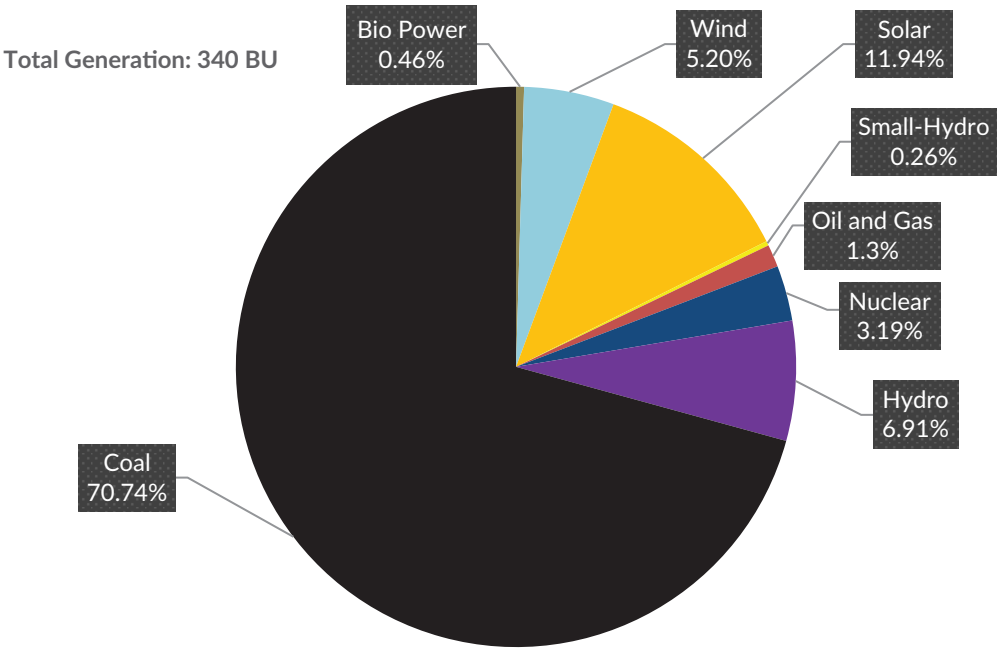


Figure 1. Source-wise electricity generation 2026–2027 (as of 31 May 2026). Note: BU = billion units. Source: NITI Aayog (n.d.-a).

As seen in Figure 1, renewable energy sources, while growing, still represent a relatively small proportion of the overall electricity generation mix. As per Figure 2, the volume of electricity generated across India during 2024–2025 was over 1,800 billion units. The largest share came from thermal power, at around 76 percent of the total electricity generation. This proportion remained consistently above 70 percent throughout the period 2018–2025, demonstrating the stability and entrenchment of coal-based power generation, despite the rapid expansion of renewable energy sources such as solar and wind in terms of installed capacity (Figure 3). Furthermore, as per Figure 4, the industrial sector accounted for the highest share of electricity consumption across India in FY2025, at 40 percent, highlighting the continued reliance on coal-based generation to meet the stable baseload requirements of industrial demand. However, the increasing share of renewable capacity (Figure 3) indicates a gradual diversification of India's power infrastructure.

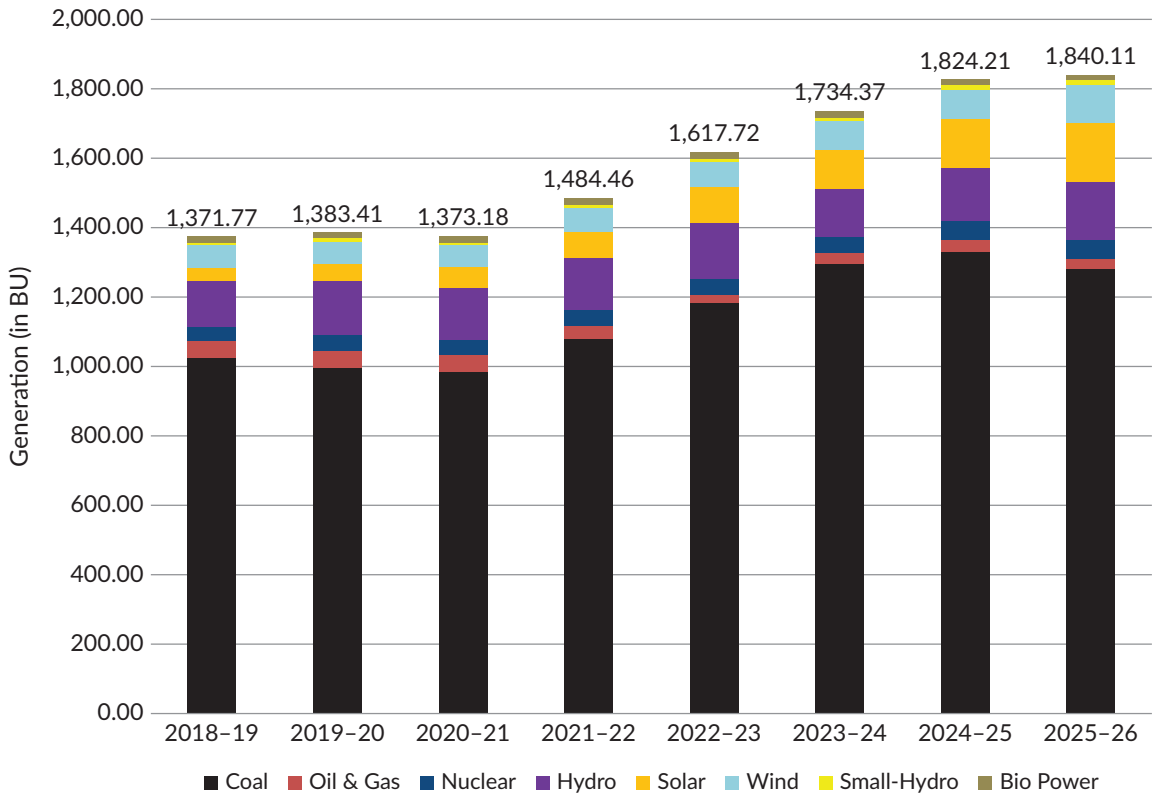


Figure 2. Source-wise electricity generation trends (from FY2018–2019 to FY2025–2026, in BU). Note: BU = billion units. Source: NITI Aayog (n.d.-b).

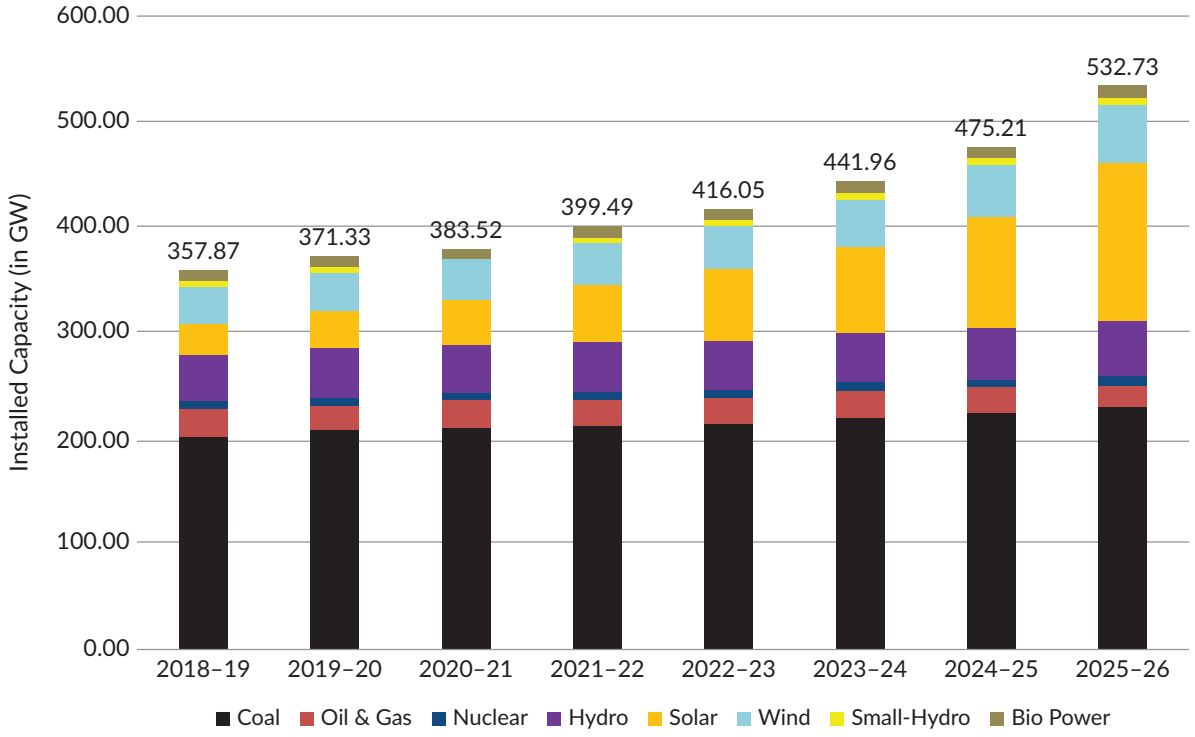


Figure 3. Source-wise installed capacity trends (from FY2018–2019 to FY2025–2026, in GW). Source: NITI Aayog (n.d.-c).

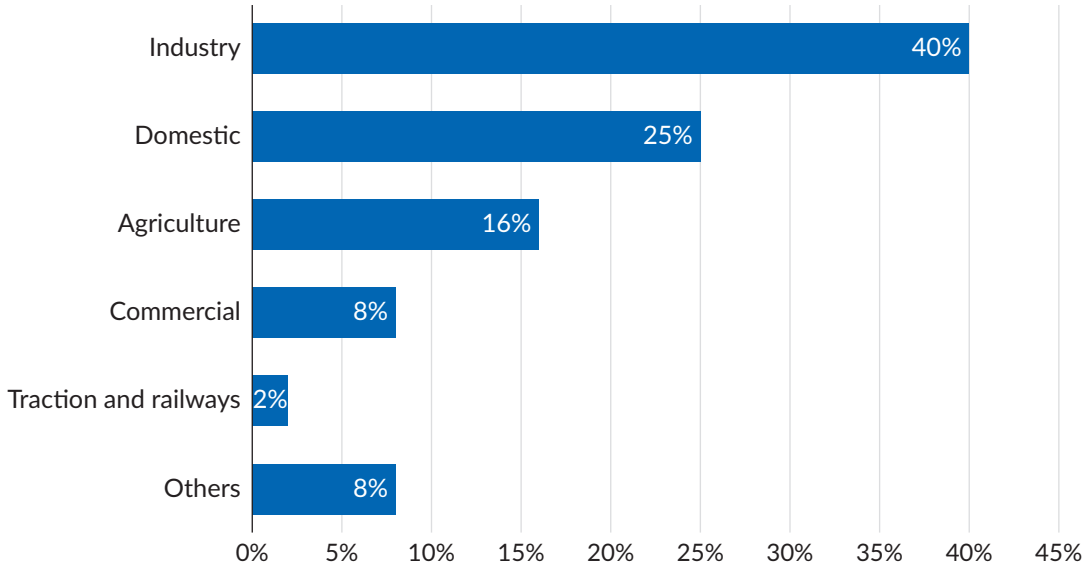


Figure 4. Distribution of electricity consumption across India (FY2025, by sector). Source: Ministry of Statistics and Programme Implementation (2026).

Despite renewable technology advancements, the Ministry of Power explicitly states that coal will not be phased out until energy storage becomes viable (Samant, 2023), prioritizing energy security over rapid decarbonization. The Government of India is exploring battery technologies, including Chhattisgarh's largest solar-battery project (Ministry of New and Renewable Energy, 2024) and pumped storage in de-coaled mines (Ministry of Coal, 2023); however, these initiatives remain at an early stage, while grid integration continues to present additional technical and institutional challenges (Manjula et al., 2024). These technical limitations disproportionately affect coal-dependent eastern India, a region hindered not only by renewable intermittency but also by inherently low solar and wind potential. NITI Aayog estimates that solar potential in Chhattisgarh (126.48 GW), Jharkhand (51.83 GW), and Odisha (139.47 GW) is substantially lower than Rajasthan's 828.78 GW (NITI Aayog, n.d.-d), with wind potential showing a similar gap—2.75 GW, 0.02 GW, and 12.13 GW versus 284.25 GW, respectively (NITI Aayog, n.d.-e).

Power distribution companies face mandated Renewable Purchase Obligations yet struggle to comply due to substantial integration investment requirements and financial instability—a legacy of democratized consumption principles where subsidies and below-cost tariffs created systemic inefficiency. According to a NITI Aayog report authored by Mothkoor et al. (2024), Renewable Purchase Obligation compliance in 2019–2020 varied "from 3.7% in Manipur to 250% in Karnataka." Examining how these benefits and burdens distribute across communities and households reveals profound injustices, regional disparities in renewable potential, and uneven transition geographies. For instance, financial constraints faced by distribution companies concentrate particularly in coal-dependent regions, limiting their capacity for grid upgrades necessary for renewable integration precisely where alternatives to coal are most urgently needed.

This creates distributive injustices where transition burdens (job losses, economic disruption, energy insecurity, etc.) concentrate in coal-rich regions, while stable renewable energy benefits accrue to states with superior natural endowments and grid capacity. Without technological solutions to intermittency and targeted infrastructure investments, energy transitions risk replicating unequal energy access patterns that postcolonial developmentalism sought to address through democratized consumption. The inequality now

manifests not in a lack of access, but in unreliable supply that forces households and industries to choose between energy security and decarbonization. In 2023, overall, India ranked fourth globally in installed renewable energy capacity. However, as Figure 5 illustrates, renewable energy capacity is skewed towards the western, southern, and northern parts of the country as opposed to the eastern region where coal mining dominates.

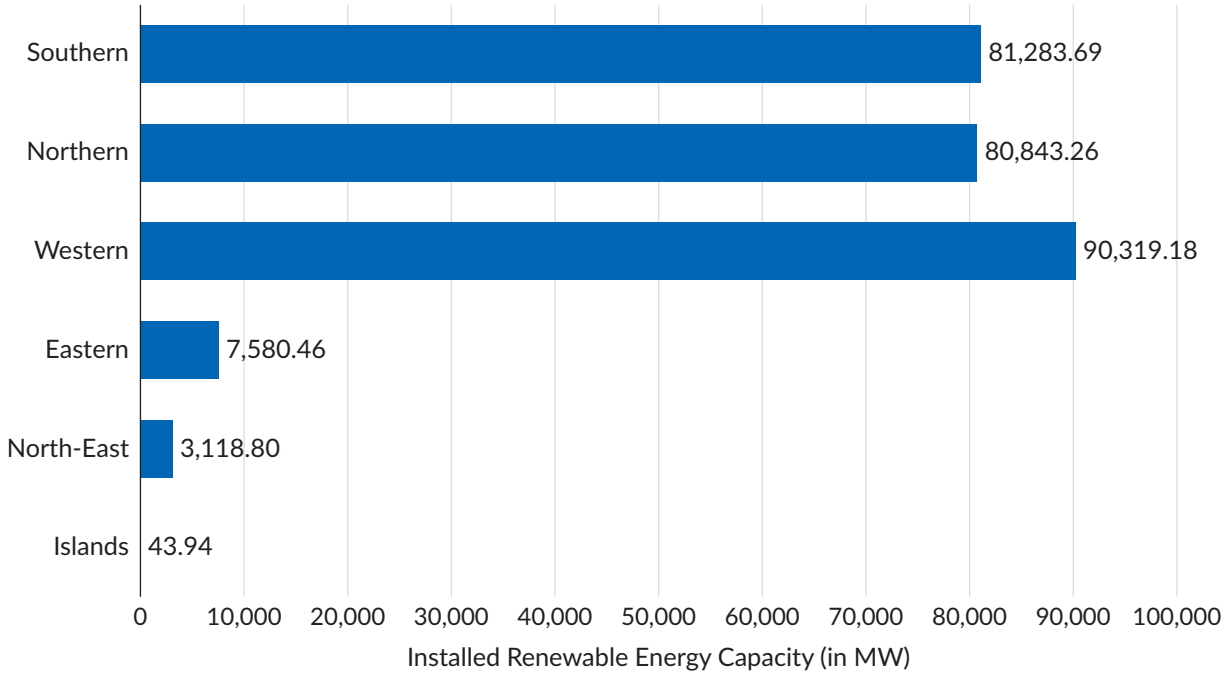


Figure 5. Installed renewable energy capacity in India (January 2026, by region, in MW). Source: Central Electricity Authority (2026).

Another challenge to just transitions is monoculturalization that arises from economies of scale created by resource abundance and accessibility, but in the Indian context, it is reinforced by sub-national "extractive regimes" that prioritize resource extraction over local welfare (Chhotray, 2022, p. 74). Coal's seemingly inexhaustible supply has driven massive investment in extraction, creating complex distributional effects that challenge the energy justice framework's conceptualization of allocation of benefits and burdens. A NITI Aayog (2022, p. 3) report observes, "Coal bearing regions have been subsumed into mainly monoculture societies centered around coal mining and its use…affecting livelihoods, infrastructure, environmental conditions, state revenues, and quality of life." However, this dependence is not merely economic; it is the result of political and institutional structures that shape the discursive and political context of extraction. Viewed through the distributive justice lens, this regime is inherently paradoxical—it simultaneously provides livelihoods while contributing to adverse health outcomes, enables upward mobility while entrenching social hierarchies, and generates state revenue while perpetuating regional underdevelopment.

The Indian government's framing of coal dependence not as transition failure but as a moral imperative, treating coal as the material foundation for democratized consumption, is reflective of the postcolonial developmentalist framework. However, this discourse obscures the injustices of the coal heartlands, particularly in states like Jharkhand and Chhattisgarh. As a Gond Adivasi activist noted, there is a profound irony where "a coal train…runs through the forest, all day, every day," yet the communities watching the train

pass often lack electricity themselves (Chhotray, 2022, p. 75). In contrast to energy justice, the government's focus on aggregate national security deflects scrutiny from how the "extractive imperative" distributes burdens locally, leaving indigenous communities to bear the "climate debt" of the country's growth (Chhotray, 2022, p. 75).

This selective framing becomes evident when examining the political economy of coal-dependent regions. Coal mining has largely operated according to a rentier logic, prioritizing extraction over sustained local reinvestment (Lahiri-Dutt, 2014). Over 47 percent of coal districts in Chhattisgarh, Jharkhand, and Odisha are classified as Aspirational Districts (a program launched by the Government of India in 2018 and anchored by NITI Aayog to identify districts with low socioeconomic indicators and uplift them through interventions in health and nutrition, education, agriculture and water resources, basic infrastructure, and financial inclusion and skill development), underscoring persistent patterns of regional underdevelopment (Mitra et al., 2023). These states function as "broker states" or "regimes of dispossession," balancing land acquisition for private capital with the management of local resistance (Chhotray, 2022, p. 77). In Chhattisgarh, this manifests as a cohesive, often repressive regime utilizing "efficient" institutional mechanisms to fast-track mining. In Jharkhand, it appears to be a fragmented system in which bureaucratic apathy hampers rehabilitation. These "extractive regimes" create path dependencies where coal extraction becomes the primary mechanism for redistributing wealth through state welfare, rather than sustainable local development, locking regions into a cycle of exploitation (Lahiri-Dutt, 2014).

The distributive justice implications are most acute in employment patterns. Coal-producing public sector undertakings officially employ 369,053 individuals (Ministry of Coal, 2024). However, these figures obscure a vast "shadow economy" of informal workers and coal scavengers who bear the physical burdens without protections (Chandra et al., 2025, p. 11). These informal workers predominantly belong to lower-income and socially marginalized communities, whose livelihoods often depend on contractual and casual labour arranged through contractors. The participants in the shadow economy are often not counted towards employment, thereby making them vulnerable to being left out of any just transitions. The transition to renewables risks exacerbating this precarity. Unlike the labor-intensive coal economy, solar parks require land (Worringham, 2021) but very little continuous labour, at times threatening to create a "precariat" rather than absorbing the workforce shed by coal (Stock, 2021). The government's selective invocation of justice, therefore, defends coal by emphasizing aggregate access, while overlooking how extractive regimes have distributed benefits upward (to state revenues and private contractors; Lahiri-Dutt, 2014) and burdens downward (to Adivasi communities and informal workers; Chandra et al., 2025).

6. India's Energy Infrastructure Beyond Technical Systems

By bifurcating India's energy infrastructure into hard and soft infrastructure, this article broadens the meaning of the term "infrastructure" beyond a purely technical paradigm to encompass the human dimension. This expansion recognizes two main factors—first, the limited recognition of the human element in energy systems research; and second, the need to contextualize the challenges facing India's energy infrastructure within broader social and institutional frameworks.

6.1. Hard Infrastructure: Technical Dimensions of Just Transitions

Hard infrastructure in India's energy transitions, comprising generation assets, transmission networks, and storage systems, is typically framed through strategies prioritizing system stability, continuity, and energy security (APEC Investment Experts Group, 2011). These strategies can be situated within postcolonial developmentalism, where electricity infrastructure underpins both developmental objectives and state legitimacy. In this context, grid stability, storage expansion, and renewable integration acquire a distributive energy justice dimension, centered on ensuring reliable and affordable access.

Regulatory mechanisms governing ancillary services provide an important illustration of this distributive logic. The Central Electricity Regulatory Commission's mandates for Primary, Secondary, and Tertiary Reserve Ancillary Services seek to maintain grid frequency stability and manage transmission congestion (Central Electricity Regulatory Commission, 2022). These interventions aim to prevent power disruptions that could undermine industrial productivity, rural electrification, and domestic consumption, thereby reinforcing electricity's role as a developmental public good. Similarly, the increasing incorporation of energy storage systems and demand-response mechanisms into grid balancing markets (Ministry of Power, 2023) reflects attempts to reconcile renewable intermittency with the state's longstanding priority of energy security.

Policies promoting firm and dispatchable renewable power—Energy Storage Obligation for distribution companies, and Resource Adequacy Plans—aim to ensure continuous electricity supply while expanding renewable capacity (Ministry of Power, 2022b, 2023). While these measures can contribute to distributive justice by protecting consumers from supply volatility, they may simultaneously reinforce centralized and technocratic governance structures. Decision-making regarding storage deployment, transmission planning, and infrastructure expansion remains largely concentrated within regulatory bodies and state utilities, potentially limiting opportunities for meaningful local participation and weakening procedural justice.

Large-scale infrastructure initiatives such as the Green Energy Corridor (Ministry of Power, 2026) and pumped storage projects (Shankar et al., 2023) further reveal the dual nature of India's transition strategies. These projects indicate techno-nationalist ambitions and state-led infrastructural expansion—characteristics of postcolonial developmentalism, emphasizing modernization, national energy sovereignty, and technological self-reliance. From a distributive justice perspective, these projects facilitate renewable integration and reduce regional disparities in electricity supply. However, they also reproduce developmental patterns in which infrastructure expansion can impose localized socio-ecological burdens, particularly in contexts where participatory processes, impact assessments, and compensatory mechanisms remain limited or unevenly implemented (Stock & Sovacool, 2023). This is further evidenced in some of the project-level assessments in states such as Karnataka (AMPYR Energy, n.d.) and Gujarat (Asian Development Bank, 2024), which incorporate detailed stakeholder engagement plans, impact assessments, and grievance redress mechanisms, showing how procedural justice can be formally embedded within project design even as its effectiveness remains contingent on implementation in practice.

Financial and market instruments designed to support infrastructure stability further expose these contradictions. For example, Viability Gap Funding schemes for battery storage projects aim to reduce capital costs and encourage adoption of emerging technologies, while transmission asset monetization frameworks seek to unlock public capital for reinvestment in grid expansion (Ministry of Power, 2022a,

2025). Although these interventions promote technological solutions and long-term system stability, they also introduce market-based governance mechanisms that may redistribute transition risks toward distribution companies and end consumers. This creates potential distributive inequities if rising system costs translate into tariff pressures or reduced service quality for vulnerable populations (Das & Srikanth, 2020). These tensions underscore that India's energy transition is not simply a technological modernization project but a deeply political and developmental process that balances decarbonization objectives with historically embedded priorities of state-building, energy sovereignty, and socio-economic stability.

6.2. Soft Infrastructure: Non-Technical Dimensions of Just Transitions

An analysis of policy documents suggests that India's soft energy infrastructure is shaped by five interrelated characteristics: sectoral governance, large-scale implementation, integrative and complementary policy design, minimization of disruptions to existing energy systems, and reliance on voluntary participation through subsidies and market incentives. These characteristics reflect a broader institutional logic rooted in postcolonial developmentalism, where policy interventions seek to gradually embed decarbonization goals within existing development structures rather than pursue transformative structural transformation. This governance model primarily advances distributive justice by prioritizing continuity of energy access, economic stability, and welfare protection during transitions, while simultaneously generating contradictions in procedural and restorative justice.

India's reliance on sectoral governance signals historically embedded institutional patterns in climate policymaking. As Pillai and Dubash (2021) observe, climate initiatives in India frequently emerge within individual sectoral ministries before being incorporated into national climate commitments in an ex-post manner. This governance structure illustrates how climate action in India is not necessarily driven by centralized cross-sectoral coordination but emerges through developmental priorities embedded within specific economic sectors. This approach suggests the persistence of state-led planning traditions, where targeted sectoral interventions may be seen as reproducing postcolonial developmentalist logics, as climate governance is shaped by sectoral priorities centered on broader developmental imperatives.

Flagship programs such as the Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (PM-KUSUM; https://pmkusum.mnre.gov.in) illustrate the developmental-distributional nexus within India's transitions strategy. By enabling farmers to install decentralized solar systems and generate income through electricity sales, PM-KUSUM frames renewable energy adoption as a livelihood diversification strategy rather than a purely environmental intervention. However, as Batra et al. (2026) argue, while decentralized solar micro-grids improved energy access and availability, their impact on existing gendered power relations remained limited. Although women were identified as important stakeholders and beneficiaries of electrification initiatives, access to electricity did not automatically transform entrenched social hierarchies or patterns of inequality. Similarly, the Pradhan Mantri Ujjwala Yojana (PMUY; https://www.pmuy.gov.in/about.html) expands access to clean cooking fuels among women in below-poverty-line households, addressing public health, gender inequality, and environmental sustainability simultaneously. Yet, as Michael (2023) contends, PMUY adopts a limited gender-responsive approach that primarily views women as household caregivers and beneficiaries of cleaner cooking fuels, doing little to challenge existing gendered divisions of labor or expand women's participation in energy governance and decision-making, thereby limiting its transformative potential within a just transitions framework.

The scale of initiatives such as PM Surya Ghar Muft Bijli Yojana also reinforces the distributive orientation. By providing large-scale subsidies for rooftop solar deployment targeting 10 million households and generating substantial employment opportunities, the program extends India's long-standing model of subsidy-driven developmental expansion into the renewable energy sector (Ministry of New and Renewable Energy, 2024). However, the voluntary and incentive-based structure of such programs introduces contradictions within the distributive justice paradigm. Access to subsidies and participation opportunities is often shaped by institutional capacity, credit accessibility, and infrastructural readiness, which may entrench regional and socio-economic disparities in transition benefits (Ahmed et al., 2025).

Complementarity across policy initiatives reflects India's incremental transitions strategy. Policies such as the National Wind-Solar Hybrid Policy and the National Green Hydrogen Mission seek to optimize existing infrastructure while facilitating technological diversification (Press Information Bureau, 2025). These initiatives demonstrate compatibility between postcolonial developmentalism and energy justice by linking renewable deployment with energy sovereignty, industrial competitiveness, and import substitution. Using the fossil developmentalist logic, technological diversification is not conceptualized as a replacement of existing energy systems but as an expansion of the national developmental toolkit. However, these strategies also reveal procedural justice contradictions, as large-scale initiatives are largely led by state and industrial sectors, often limiting community participation.

Decentralized initiatives such as rooftop solar adoption also introduce new forms of distributed generation and income diversification, potentially strengthening procedural justice by expanding local participation in energy production. Demand-side efficiency programs such as the Unnat Jyoti by Affordable LEDs for All (UJALA) and the Street Lighting National Programme (SLNP) complement supply-side transition efforts by reducing system demand and improving affordability (Ministry of Power, 2022c). Nevertheless, their success remains dependent on consumer awareness, financial accessibility, and institutional implementation capacity (Anbarasan & Rathinam, 2025).

India's emphasis on research collaboration and technological innovation, particularly under the Strategic Hydrogen Innovation Partnership and related public–private partnerships, further reflects techno-nationalist dimensions of postcolonial developmentalism. These initiatives can be viewed as positioning technological self-reliance and domestic manufacturing as essential components of long-term energy security (Press Information Bureau, 2025). Similarly, programs such as the Sustainable Alternative Towards Affordable Transportation aim to reduce fossil fuel imports while promoting circular economic models (Ministry of Petroleum and Natural Gas, 2022). By prioritizing macroeconomic security and technological competitiveness, policy frameworks often defer compensation, retraining, and structural economic diversification for communities historically dependent on fossil fuel economies (Dorband et al., 2020).

7. Conclusion

This article examines India's just transitions through the intersecting lenses of energy security, postcolonial developmentalism, and energy justice. India's transitions discourse is not structured around rapid fossil fuel phase-out, but around the preservation of distributional stability, infrastructural reliability, and national energy sovereignty. Through thematic analysis of policy frameworks, regulatory instruments, and domestic political-economic structures, the study shows that just transitions in India are conceptualized as a gradual, state-managed restructuring embedded within historically entrenched developmental priorities.

Domestic structural constraints, including coal-dependent regional economies, extractive governance regimes, uneven renewable resource endowments, grid limitations, and financial fragilities within distribution companies, substantially influence the scope and pace of decarbonization. Simultaneously, India's climate diplomacy reflects a prudent strategy that reconciles climate leadership with developmental autonomy under the normative framework of CBDR-RC.

The analysis of hard and soft infrastructure reveals a transition pathway that is partially compatible with distributive justice, particularly in safeguarding access, affordability, and reliability, while remaining structurally limited in advancing procedural inclusion and restorative action for coal-dependent communities. Hence, India's energy transitions are best understood not as a linear technological transformation, but as a politically negotiated process conditioned by historically embedded institutional structures and the imperatives of postcolonial developmentalism.

This article reveals that technological substitution alone cannot secure just transitions in developing economies of the Global South. Without confronting the structural and institutional legacies of extractive governance and regional inequalities, decarbonization risks reproducing distributive asymmetries under a renewables paradigm. A context-sensitive and multi-scalar conception of energy justice is therefore necessary to align climate governance ambition with socio-economic stability in India's transition trajectory.

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Conflict of Interests

The authors declare no conflict of interests.

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