



Aligning Energy Law with Sustainable Development Goals in India: Advancing Environmental Justice through Legal Reforms

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KEYWORDS

Sustainable Development, Energy Law, Renewable Energy, Environmental Justice

ABSTRACT

Energy is a fundamental prerequisite for human survival and socio-economic development, underpinning nearly all dimensions of contemporary life—from the fulfilment of basic human needs to the operation of complex industrial and technological systems. As a critical driver of economic growth, energy supports industrial production, commercial activity, and infrastructure development, thereby facilitating the efficient production, distribution, and transportation of goods and services. Access to adequate, reliable, and affordable energy is essential for employment generation, investment promotion, and the enhancement of living standards, positioning energy as a central catalyst of holistic development.

In this context, the regulation and rationalisation of the energy sector assume heightened significance to ensure alignment with the principles and objectives of sustainable development, as reflected in national priorities and international commitments. Beyond considerations of efficiency and growth, energy governance has profound implications for environmental justice, particularly in relation to the equitable distribution of environmental benefits and burdens arising from energy production, distribution, and consumption. This paper undertakes a comprehensive analysis of India's energy laws to assess their role and effectiveness in advancing sustainable development while addressing environmental justice concerns. It critically examines the existing legal framework, policies, and regulatory mechanisms governing renewable and non-renewable energy resources, energy access, and the protection of vulnerable and marginalised communities. The study identifies key challenges and opportunities in India's sustainable energy transition and offers targeted recommendations to strengthen the legal framework for a sustainable, equitable, and inclusive energy sector grounded in environmental justice.....

1. INTRODUCTION

India's pursuit of environmental justice is closely intertwined with its energy laws and sustainable development practices. This paper examines the country's energy regulatory framework and assesses its role in promoting sustainable economic growth while advancing principles of environmental justice. It undertakes a critical analysis of the legal and policy instruments governing the energy sector, evaluating their effectiveness in reconciling developmental objectives with environmental protection. Moving beyond a purely doctrinal assessment, the study also highlights practical challenges and achievements in the implementation of energy laws, offering insights into India's ongoing efforts to balance socio-economic aspirations with ecological sustainability.

Since 2000, India's energy consumption has more than doubled, with fossil fuels and biomass comprising nearly 80 percent of total energy demand¹. Notwithstanding this expansion, India's per capita energy consumption and corresponding emissions are still below fifty percent of the global average, as are other significant metrics such as vehicle ownership and .:

¹ IEA (2021), India Energy Outlook 2021, IEA, Paris <https://www.iea.org/reports/india-energy-outlook-2021>, Licence: CC BY 4.0



the consumption of steel and cement². Significantly, per capita energy consumption rose from 20,874 megajoules in 2012–13 to 24,453 megajoules in 2021–22 (provisional)³. The increasing energy demand coincides with a swiftly growing population⁴, thereby exacerbating the strain on current energy resources and highlighting the necessity for sustainable and equitable energy governance. As a result, India's total emissions from the energy sector rose from 1,651,928 Gg CO₂ equivalent in 2011 to 2,238,408.89 Gg CO₂ equivalent in 2020, based on the most recent estimates released by the NITI Aayog⁵. The energy sector remains the primary source of emissions, with its proportion increasing slightly from 55.95 percent in 2011 to 56.66 percent in 2016⁶. This trend emphasises the increasing strain on energy resources, particularly the ongoing dependence on fossil fuels to satisfy rising energy demands, underscoring India's continual reliance on non-renewable energy sources and the related environmental issues.

Energy in India should not be perceived as a singular commodity; instead, it represents a cohesive amalgamation of products and services essential for personal welfare, national advancement, and environmental sustainability. The historical development of India's energy sector has been characterised by disjointed and improvised decision-making, with energy selections frequently influenced by immediate economic and political factors rather than systematic long-term strategies⁷. This approach is becoming increasingly unsustainable due to escalating energy demand, environmental deterioration, and climate obligations. An urgent necessity exists to realign India's energy governance framework towards a secure, environmentally sustainable, and economically viable energy trajectory that can facilitate long-term human development. Understanding this transition requires extensive regulatory reform, encompassing the alignment of energy legislation, enhanced institutional collaboration, and the incorporation of sustainability and environmental justice principles into energy policy development. This transformation, though achievable, necessitates enduring political commitment and cooperative efforts among central and state governments, regulatory bodies, and various stakeholders in India's energy sector⁸.

In addition to the political commitment of governments and related institutions, achieving sustainable energy production and consumption necessitates active and significant engagement from the general public. In this context, all stakeholders engaged in the production, distribution, and consumption of energy resources must assume a pivotal role in promoting energy justice. Collaborative and inclusive participation among state authorities, regulatory agencies, industry stakeholders, and consumers is crucial to ensure that energy governance aligns with the long-term goals of sustainable growth and development⁹.

2. Conceptual Foundations of Energy Law and Sustainable Development

Initially, it is crucial to comprehend the principles of energy law and sustainable development, as well as their interconnection, especially regarding India's current energy transition. This conceptual foundation is essential for evaluating the impact of evolving energy systems and regulatory frameworks on sustainable development outcomes and environmental justice. In the last thirty years, India's energy legal framework has experienced substantial transformation,

² MoEFCC. (2022). India's long-term low-carbon development strategy. Ministry of Environment, Forest and Climate Change, Government of India.

³ Ministry of Statistics and Program Implementation, *Energy Statistics 2023*, available at https://www.mospi.gov.in/sites/default/files/publication_reports/Energy_Statistics_2023/EnergyStatisticsIndia2023.pdf

⁴ Press Information Bureau, Government of India, *Understanding Population-Related Issues, Tailoring Solutions, and Driving Progress* (2024), available at .

<https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=151925&ModuleId=3®=3&lang=1>

⁵ India Climate & Energy Dashboard. (n.d.). <https://iced.niti.gov.in/climate-and-environment/ghg-emissions/energy>

⁶ United Nations. (2023). *Energy Statistics India - 2023*. In *Energy Statistics India - 2023* (pp. 79–83). https://www.mospi.gov.in/sites/default/files/publication_reports/Energy_Statistics_2023/Chapter-8_07022024.pdf

⁷ S, Santhosh. (2019). Energy trading mechanisms in India: A comprehensive analysis of market structure, regulatory framework, and future prospects. *World Journal of Advanced Research and Reviews*. 1. 118-145. 10.30574/wjarr.2019.1.1.0145.

⁸ Masood Ahmed, Eduardo Araral, Muhammad Asif Khan, Barriers to just energy transition: Institutional and infrastructure challenges in developing countries, *Sustainable Futures*, Volume 10, 2025, 101414, ISSN 2666-1888, <https://doi.org/10.1016/j.sfr.2025.101414>.

⁹ Jörg Radtke, Ortwin Renn, Participation in Energy Transitions: A Comparison of Policy Styles, *Energy Research & Social Science*, Volume 118, 2024, 103743, ISSN 2214-6296, <https://doi.org/10.1016/j.erss.2024.103743>.



propelled by sectoral reforms, market liberalisation, and increasing climate change apprehensions¹⁰. Legislative measures like the Electricity Act of 2003 have reformed the power sector by fostering competition, efficiency, and universal access, whereas the Energy Conservation Act of 2001 has aimed to improve energy efficiency and diminish emissions through regulatory and institutional frameworks¹¹. Simultaneously, renewable energy policies such as the National Solar Mission, National Wind–Solar Hybrid Policy, and additional clean energy initiatives demonstrate India's dedication to transitioning to sustainable energy sources. These legal and policy frameworks seek to guarantee energy security and economic efficiency while also tackling equity, access, and the unequal environmental burdens faced by vulnerable and marginalised communities during the energy transition¹².

In contrast to more established disciplines like environmental law and climate change law, the theoretical advancement of energy law in academic scholarship has been comparatively limited. Despite ongoing discussions about its definition, scope, and conceptual limits, there has been a recent resurgence of academic interest in developing energy law as a distinct and cohesive area of legal study. The lack of consistent and systematic academic evaluation has frequently led to the division of energy law into narrower sub-disciplines, such as oil and gas law or mining law—an approach that has been extensively criticised for compromising the cohesive nature of modern energy governance¹³. The last thorough and impactful review of energy law was conducted by Adrian Bradbrook in 1996, creating a notable void in the literature, especially considering the advancing sustainability mandates, climate obligations, and energy transitions in developing nations like India. This gap offers a strong rationale for the current study, which aims to rigorously analyse energy law in relation to sustainable development and environmental justice, specifically within the context of the Indian legal and regulatory framework.

2. 1 Evolution of Energy Law Scholarship

The scholarship of energy law has advanced considerably since Adrian Bradbrook's pivotal work in 1986. Modern scholarship broadly defines energy law as the regulation of the rights, obligations, and responsibilities of stakeholders throughout the entire energy life cycle. From the perspective of sustainable development and environmental justice, energy law includes the legal principles, regulatory frameworks, and policy instruments that regulate the production, transmission, distribution, consumption, and conservation of energy resources—both renewable and non-renewable—aiming to harmonise economic growth, environmental protection, and social equity. This comprehensive understanding identifies energy law as an essential governance mechanism for guaranteeing equitable energy access, reducing environmental damage, and averting the unequal allocation of energy-related burdens on vulnerable and marginalised populations¹⁴. It includes following aspects-

Energy Resources Regulations: This field oversees the exploration, extraction, production, and utilisation of energy resources, encompassing oil, natural gas, coal, nuclear energy, and renewable sources such as wind, solar, and hydroelectric power. It pertains to licensing, safety regulations, resource management, and sustainability factors throughout the energy life cycle.

Environmental Regulations: This domain emphasises the reduction of environmental repercussions from energy operations, including pollution management, regulation of greenhouse gas emissions, implementation of climate change mitigation strategies, and the necessity of environmental impact assessments to guarantee adherence to environmental protection standards

¹⁰India's Expanding Role in the Global Energy Transition.(n.d.). Available at <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2219208=3&lang=1>

¹¹ Abhishek Malhotra, Trade-offs and synergies in power sector policy mixes: The case of Uttar Pradesh, India, *Energy Policy*, Volume 164, 2022, 112936, ISSN 0301-4215, <https://doi.org/10.1016/j.enpol.2022.112936>.

¹² Preeti Prajapati, Ru Guo, Angzu Cai, Rajendra Prashad, Navigating the energy transition in India: challenges and opportunities towards sustainable energy goal, *Water-Energy Nexus*, Volume 9, 2026, Pages 1-18,ISSN 2588-9125, <https://doi.org/10.1016/j.wen.2025.07.004>.

¹³ Benjamin K. Sovacool, David J. Hess, Roberto Cantoni, Dasom Lee, Marie Claire Brisbois, Hans Jakob Walnum, Ragnhild Freng Dale, Bente Johnsen Rygg, Marius Korsnes, Anandajit Goswami, Shailly Kedia, Shubhi Goel, Conflicted transitions: Exploring the actors, tactics, and outcomes of social opposition against energy infrastructure, *Global Environmental Change*, Volume 73, 2022, 102473, ISSN 0959-3780,

¹⁴ Stuti Halder, Ananya Peddibhotla, Amir Bazaz, Analysing intersections of justice with energy transitions in India - A systematic literature review, *Energy Research & Social Science*, Volume 98, 2023, 103010, ISSN 2214-6296, <https://doi.org/10.1016/j.erss.2023.103010>.



Energy Infrastructure Regulations: It pertains to the legal governance of essential energy infrastructure, encompassing pipelines, transmission and distribution networks, power generation facilities, and storage systems. It guarantees infrastructure security, dependability, grid stability, and equitable access to energy services.

Energy Contracts and Transactions: This domain encompasses the legal structures regulating energy-related contracts and commercial dealings, including agreements for the sale, purchase, transmission, and distribution of energy. It pertains to the allocation of contractual risk, adherence to regulations, and the resolution of disputes.

Electricity Market Regulations: This element governs the operation of electricity markets by supervising pricing mechanisms, competition, grid management, and market access, aiming to ensure efficiency, transparency, and consumer protection.

Renewable Energy Incentives and Policies: This domain focuses on the formulation and execution of policy mechanisms, including subsidies, tax incentives, feed-in tariffs, and renewable purchase obligations, intended to foster the advancement and utilisation of renewable energy technologies.

International Energy Law: This field includes international agreements, treaties, and collaborative frameworks that regulate transboundary energy matters, global energy commerce, investment, energy security, and energy obligations related to climate change.

Energy law in India encompasses a comprehensive set of legal frameworks and policy instruments designed to facilitate the efficient, equitable, and sustainable management of energy resources and demand amid the nation's ongoing energy transition. These frameworks aim to tackle environmental issues, foster technological innovation, and promote environmental justice by guaranteeing equitable energy access and mitigating the unequal distribution of environmental burdens on vulnerable and marginalised communities¹⁵. This paper examines the effectiveness of India's energy laws and policies in achieving these objectives in the following sections.

2. 2 Meaning of Sustainable Development

Sustainable development refers to a development paradigm that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. The concept was authoritatively articulated by the World Commission on Environment and Development (WCED) in its seminal report *Our Common Future* (1987) and has since become a foundational principle in international, national, and domestic legal and policy discourse¹⁶. At its core, sustainable development is premised on the integration of three interdependent pillars—economic development, environmental protection, and social equity—ensuring that progress in one dimension does not occur at the expense of the others. The concept emphasises long-term planning, prudent and efficient utilisation of natural resources, intergenerational equity, and the protection of ecological systems, while simultaneously promoting inclusive economic growth and human well-being. It recognises the inherent interconnection between economic growth, social welfare, and environmental conservation and seeks to address the adverse consequences of unregulated resource exploitation and environmental degradation through balanced and equitable development strategies¹⁷.

Sustainable development is further guided by certain cardinal principles that inform legal frameworks and policy formulation, including intergenerational equity, sustainable use and conservation of natural resources, environmental protection, the precautionary principle, the polluter pays principle, the duty to cooperate and assist, poverty eradication, and financial and technological support for developing countries. Collectively, these principles serve as normative benchmarks for evaluating development initiatives across sectors such as energy, infrastructure, and natural resource governance.

Over time, the concept of sustainable development has evolved into more structured and goal-oriented global frameworks. This evolution is reflected in the Millennium Development Goals (2000–2015) and, more comprehensively, in the adoption

¹⁵ Yazdani, Ghulam & Enam Firdos, Md. (2024). Energy Laws and Sustainable Development in India: A Brief Review in Quest of Environmental Justice. 9. a744-a752.

¹⁶ Jarvie, M.E. (2016, May 20). Brundtland Report. Encyclopedia Britannica. Available at <https://www.britannica.com/topic/Brundtland-Report>

¹⁷ Brown, M. (2017, December 22). Sustainable Development. Oxford Research Encyclopedia of International Studies. Retrieve, from <https://oxfordre.com/internationalstudies/view/10.1093/acrefore/9780190846626.001.0001/acrefore9780190846626-e-305>.



of the 17 Sustainable Development Goals (SDGs) in 2015, with a target horizon of 2030¹⁸. Unlike the MDGs, the SDGs adopt a universal and integrated approach applicable to all countries, seeking to reconcile economic growth and social inclusion with environmental protection and ecological sustainability. This evolution signifies the maturation of sustainable development into a holistic, inclusive, and implementation-oriented development paradigm¹⁹.

3. Linkage Between Energy and Sustainable Development

The relationship between energy and sustainable development is intricate and multifaceted, involving economic, social, and environmental aspects. Access to dependable, economical, and sustainable energy is universally acknowledged as essential for attaining inclusive and enduring development. Energy is a vital catalyst for economic growth, social progress, and environmental sustainability, rendering its sustainable production and consumption essential for the attainment of overarching sustainable development goals. The principle of sustainable development has thus become pivotal in modern policy and legal discussions, especially regarding India's growing economy and increasing energy requirements. The United Nations acknowledges the crucial importance of energy in fostering sustainable development and environmental protection by including Sustainable Development Goal 7 in its 2030 Agenda for Sustainable Development, which aims to guarantee access to affordable, reliable, sustainable, and modern energy for everyone. SDG 7 serves as a fundamental objective that is intricately connected to, and pivotal in promoting, various other SDGs²⁰. Energy is fundamental to nearly all socio-economic activities and is vital for human welfare and ecological equilibrium. Sustainable development requires energy that is dependable, economical, and environmentally friendly, thus harmonising developmental goals with climate and sustainability aims²¹.

The following key indicators can be directly associated with the energy sector, as they reflect its performance, sustainability, and developmental impact:

Economic Development: Energy is a crucial catalyst for economic development, as it fuels industries, enterprises, and infrastructure vital for productivity and expansion. Renewable energy sources, combined with effective energy utilisation, lead to cost savings, enhanced competitiveness, and heightened investment in clean technologies. These factors collectively facilitate stable and sustainable economic growth while diminishing reliance on finite resources²². Energy accessibility is closely connected to poverty alleviation. The lack of contemporary energy services, such as electricity and clean cooking options, sustains socio-economic disadvantage. Sustainable energy initiatives can improve living standards, facilitate income-generating activities, and generate employment opportunities, especially in the renewable energy sector²³.

Social Development: Accessible and dependable energy is essential for social development, particularly in the domains of education and healthcare. Access to energy enhances educational outcomes via illumination, digital connectivity, and educational technologies. In healthcare, it guarantees the efficient functioning of medical apparatus, vaccine preservation,

¹⁸ Enayat A. Moallemi, Shirin Malekpour, Michalis Hadjikakou, Rob Raven, Katrina Szetey, Dianty Ningrum, Ahmad Dhiaulhaq, Brett A. Bryan, Achieving the Sustainable Development Goals Requires Transdisciplinary Innovation at the Local Scale, *One Earth*, Volume 3, Issue 3, 2020, Pages 300-313, ISSN 2590-3322, <https://doi.org/10.1016/j.oneear.2020.08.006>.

¹⁹ Massimo Regona, Tan Yigitcanlar, Carol Hon, Melissa Teo, Artificial intelligence and sustainable development goals: Systematic literature review of the construction industry, *Sustainable Cities and Society*, Volume 108, 2024, 105499, ISSN 2210-6707, <https://doi.org/10.1016/j.scs.2024.105499>.

²⁰ Martin. (2025, September 10). Goal 7: Energy - United Nations Sustainable Development. United Nations Sustainable Development. <https://www.un.org/sustainabledevelopment/energy/>

²¹ Angela Mae Minas, Samira García-Freites, Christopher Walsh, Velma Mukoro, Jhud Mikhail Aberilla, Amanda April, Jaise Kuriakose, Carlos Gaete-Morales, Alejandro Gallego-Schmid, Sarah Mander, Advancing Sustainable Development Goals through energy access: Lessons from the Global South, *Renewable and Sustainable Energy Reviews*, Volume 199, 2024, 114457, ISSN 1364-0321, <https://doi.org/10.1016/j.rser.2024.114457>.

²² Birou Wen, Yu He, Xiaolan Jing, Muhammad Haroon, Advancing renewable energy and green finance for economic growth and ecological resilience, *Energy Strategy Reviews*, Volume 59, 2025, 101747, ISSN 2211-467X, <https://doi.org/10.1016/j.esr.2025.101747>.

²³ Deborah Andrew Ngusa, Barriers to the adoption of clean cooking energy technologies in rural households within selected lower-middle-income countries: A bibliometric analysis, *Energy Strategy Reviews*, Volume 61, 2025, 101834, ISSN 2211-467X, <https://doi.org/10.1016/j.esr.2025.101834>.



and prolonged service provision²⁴. Clean cooking solutions mitigate health risks linked to indoor air pollution, which disproportionately impacts women and children²⁵.

Environmental Protection: Reliance on fossil fuels has resulted in environmental deterioration and heightened greenhouse gas emissions²⁶. Shifting to renewable energy sources, including solar, wind, hydro, and geothermal power, is crucial for mitigating pollution, preserving ecosystems, and advancing environmental sustainability.

Climate Change Mitigation: Energy systems contribute substantially to global greenhouse gas emissions.²⁷ Advocating for renewable energy and improving energy efficiency are essential strategies for alleviating climate change. Mitigating climate risks is essential for sustainable development, as climate effects can destabilise economies, intensify poverty, and harm ecosystems.

Resource Efficiency: Sustainable energy systems promote optimal resource utilisation and waste minimisation. Renewable energy sources are typically less resource-intensive than fossil fuels, whereas energy efficiency initiatives enhance consumption and reduce environmental impacts²⁸.

In brief, we can understand the importance of energy in achieving sustainable development and environmental justice, especially in relation to SDG 7 and the progression of India's energy legislation. Energy access is not solely a technical or economic issue but a fundamental requirement for inclusive economic growth, poverty reduction, social advancement, and environmental conservation. Incorporating an environmental justice perspective into energy governance fortifies the normative basis of sustainable development by guaranteeing equitable distribution of the benefits of energy transitions and just allocation of their costs²⁹.

4. Energy Law in India

Energy law in India functions within a robust statutory framework grounded in constitutional provisions and judicial interpretation. The Constitution of India does not explicitly mention energy regulation; however, its governance is implicitly inferred from the constitutional framework, especially Articles 14³⁰ and 21³¹, which ensure equality before the law and the right to life, the latter of which has been broadly interpreted by the Supreme Court to encompass the right to a clean and healthy environment³². The guarantees are ensured by the Directive Principles of State Policy in Article 48A³³, mandating the State to preserve and enhance the environment, and the Fundamental Duty in Article 51A(g)³⁴, which compels citizens to protect natural resources. In this constitutional framework, essential legislative measures, including the

²⁴ Sadegh Seddighi, Edward J. Anthony, Hamed Seddighi, Filip Johnsson, The interplay between energy technologies and human health: Implications for energy transition, *Energy Reports*, Volume 9, 2023, Pages 5592-5611, ISSN 2352-4847, <https://doi.org/10.1016/j.egyr.2023.04.351>.

²⁵ Manik Halder, Nuruzzaman Kasemi, Doli Roy, Malasree Majumder, Impact of indoor air pollution from cooking fuel usage and practices on self-reported health among older adults in India: Evidence from LASI, SSM - Population Health, Volume 25, 2024, 101653, ISSN 2352-8273, <https://doi.org/10.1016/j.ssmph.2024.101653>.

²⁶ Jiannan Wang, Waseem Azam, Natural resource scarcity, fossil fuel energy consumption, and total greenhouse gas emissions in top emitting countries, *Geoscience Frontiers*, Volume 15, Issue 2, 2024, 101757, ISSN 1674-9871, <https://doi.org/10.1016/j.gsf.2023.101757>.

²⁷ IEA (2025), *Global Energy Review 2025*, IEA, Paris <https://www.iea.org/reports/global-energy-review-2025>, Licence: CC BY 4.0

²⁸ Osman, A.I., Chen, L., Yang, M. et al. Cost, environmental impact, and resilience of renewable energy under a changing climate: a review. *Environ Chem Lett* **21**, 741–764 (2023). <https://doi.org/10.1007/s10311-022-01532-8>

²⁹ Volodzkienė, L., & Streimikiene, D. (2025). Integrating energy justice and economic realities through insights on energy expenditures, inequality, and renewable energy attitudes. *Scientific reports*, 15(1), 27067. <https://doi.org/10.1038/s41598-025-12410-y>

³⁰ Equality before law : The State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India.

³¹ Protection of life and personal liberty: No person shall be deprived of his life or personal liberty except according to procedure established by law.

³² MK Ranjitsinh et al. v. Union of India et al. - The Climate Litigation Database. (2024, March 21). https://www.climatecasechart.com/document/mk-ranjitsinh-et-al-v-union-of-india-et-al_91a4

³³ **Protection and improvement of environment and safeguarding of forests and wild life: The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country.**

³⁴ (g)to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.

Electricity Act of 2003, the Energy Conservation Act of 2001, and the National Green Tribunal Act of 2010, form the foundational elements of India's energy governance system, supported by supplementary statutes and regulatory policies. The proposed Renewable Energy legislation, presently in draft form, aims to establish a systematic legal framework for the promotion and expansion of renewable energy generation in India³⁵. The proposed regulatory measures indicate the State's aim to synchronise domestic energy governance with international obligations concerning emission reduction and sustainable development³⁶. Within India's energy law framework, it assumes significance as it seeks to consolidate and strengthen the legal basis for renewable energy development. Judicial rulings—especially those acknowledging sustainable development, the precautionary principle, and the polluter pays principle as fundamental to Indian environmental jurisprudence—have further influenced the interpretation and application of energy laws.

This section conducts a comprehensive statutory analysis of these enactments, scrutinising their objectives, regulatory frameworks, and judicially informed function in reconciling energy security, sustainable development, and environmental justice within India's dynamic energy landscape.

4.1 Specific Legislation and Policies Related to Electricity and Allied Matters

The electricity sector in India is regulated by an extensive legal and policy framework designed to meet the dual goals of energy security and sustainable development. The foundation of this framework is the Electricity Act of 2003, which governs the generation, transmission, distribution, trading, and consumption of electricity. The Act aims to enhance competition, efficiency, transparency, and rationalisation in the power sector while ensuring universal access to electricity. The National Electricity Policy (NEP), established under the Act, delineates the government's long-term vision for the electricity sector's development, prioritising availability, accessibility, affordability, reliability, and quality of power supply. The National Tariff Policy (NTP) offers guiding principles for tariff determination by electricity regulatory commissions, emphasising transparency, consumer protection, cost recovery, and the advancement of renewable energy³⁷.

India's dedication to clean energy is evident in various renewable energy policies and regulatory frameworks, such as the National Solar Mission, National Wind–Solar Hybrid Policy, National Offshore Wind Policy, and bioenergy initiatives. These policies are underpinned by regulatory mechanisms, including Renewable Purchase Obligations (RPOs) and competitive bidding protocols.

The Energy Conservation Act of 2001 regulates energy efficiency and conservation, establishing the legal framework for diminishing energy intensity across various sectors. The Bureau of Energy Efficiency (BEE), constituted under this Act, is pivotal in executing energy efficiency initiatives, establishing performance benchmarks, and advocating for energy labelling.

Fiscal policies facilitating clean energy transitions were initially implemented via the Clean Energy Cess on coal, which was subsequently incorporated into the Goods and Services Tax framework, with proceeds allocated to clean energy and environmental projects³⁸. The National Policy on Biofuels, 2018 (revised in 2022), advocates for the utilisation of alternative fuels to diminish reliance on fossil fuels and decrease emissions³⁹.

At the sub-national level, State Electricity Regulatory Commissions (SERCs) wield regulatory power over tariff determination, licensing, and dispute resolution, thereby facilitating decentralised governance within the electricity sector. The National Smart Grid Mission (NSGM) further facilitates technological modernisation by aiming to improve grid efficiency, reliability, and sustainability through the implementation of smart grid technologies⁴⁰.

³⁵ Ananya Jain, Powering the Future: The Need for a Legal Framework for Renewable Energy in India, 6 (2) IJLMH Page 2020 - 2028 (2023), DOI: <https://doi.org/10.10000/IJLMH.114627>

³⁶ Government of India. (2026). Draft National Electricity Policy, 2026. https://powermin.gov.in/sites/default/files/webform/notices/Seeking_comments_on_Draft_Natioal_Electricity_Policy_2026.pdf

³⁷ Ministry of Power & Government of India. (n.d.). Tariff Policy, Ministry of Power, Government of India. https://www.orierc.org/CuteSoft_Client/writereaddata/upload/National%20Electricity%20Tariff%20Policy.pdf

³⁸ Cameron, R. (2020, November 24). India: Clean energy cess-tax on coal Industry. ICSC. <https://www.sustainable-carbon.org/india-clean-energy-cess-tax-on-coal-industry/>

³⁹ Cabinet approves National Policy on Biofuels 2018.(n.d.). <https://www.pib.gov.in/Pressreleaseshare.aspx?PRID=1532265&lang=2>

⁴⁰ Smart Grid National Smart Grid Mission, Ministry of Power, Government of India. (n.d.). <https://www.nsgm.gov.in/en/smart-grid>

The SHANTI Act, 2025⁴¹, as proposed, signifies a substantial transformation in India's nuclear energy regulation by allowing private sector involvement in designated areas of the nuclear power value chain⁴². Nuclear energy, traditionally governed by the public sector due to strategic, safety, and liability considerations, is anticipated to play a role in India's clean energy transition and long-term energy security. The Act aims to enhance nuclear capacity, attract private investment and technology, and facilitate India's decarbonisation obligations. From a regulatory standpoint, it poses significant questions regarding safety oversight, liability, regulatory autonomy, and environmental justice, especially in guaranteeing that the risks linked to nuclear energy are not disproportionately shouldered by local communities⁴³.

The Draft Electricity (Amendment) Bill, 2025, proposes reforms to facilitate network sharing and the segregation of carriage and content in the electricity sector. The Bill aims to enhance competition, improve efficiency, and minimise infrastructure duplication by allowing multiple service providers to utilise shared transmission and distribution infrastructure⁴⁴. This reform aims to enhance grid utilisation and promote the integration of renewable energy. Nonetheless, its success hinges on stringent regulatory oversight to avert market concentration and to guarantee the protection of consumer interests, especially for small and rural consumers.

The implementation of compulsory carbon credit trading constitutes a market-oriented regulatory framework aimed at diminishing greenhouse gas emissions by ascribing an economic value to carbon. Under this framework, obligated entities must achieve emission targets either by implementing direct reductions or by acquiring carbon credits⁴⁵. In India, mandatory carbon markets seek to enhance energy and climate policies by promoting low-carbon technologies and efficiency advancements. From an environmental justice standpoint, meticulous design is essential to guarantee that compliance costs do not disproportionately burden vulnerable populations or result in inequitable outcomes across sectors and regions.

The collective legislations and policies form the legal framework regulating India's electricity sector, indicating a continuous shift towards efficiency, sustainability, and equity in accordance with national development objectives and international obligations.

4.2 Legislation Related to Fossil Fuels in India

The fossil fuel sector in India is governed by a mixture of sector-specific legislation, overarching environmental laws, and regulatory policies designed to reconcile energy security, economic growth, and environmental conservation.

Coal Mines (Nationalisation) Act, 1973: This Act nationalised coal mining in India, transferring control to the public sector to guarantee planned development and energy security. Recent amendments have facilitated the entry of private entities into commercial mining, indicating a transition towards market-oriented reforms⁴⁶.

Mines and Minerals (Development and Regulation) Act of 1957: The MMDR Act establishes the comprehensive legal framework for the regulation of mining operations, including coal extraction. It regulates licensing, leases, and oversight, with amendments highlighting transparency and competitive distribution of mineral resources.

Oilfields (Regulation and Development) Act of 1948: This legislation governs the development and utilisation of oil and

⁴¹ The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) 2025

⁴² The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Bill, 2025. (n.d.). PRS Legislative Research. <https://prsindia.org/billtrack/the-sustainable-harnessing-and-advancementof-nuclear-energy-for-transforming-india-bill-2025>

⁴³ Puja Das, New nuclear law rewrites liability rules, opens private investment as India bets on atomic power for clean energy transition 2025, Down to Earth. <https://www.downtoearth.org.in/energy/new-nuclear-law-rewrites-liability-rules-opens-private-investment-as-india-bets-on-atomic-power-for-clean-energy-transition>

⁴⁴ Electricity (Amendment) Bill, 2025: Reforming the Electricity Sector (n.d.). <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2192895@=3&lang=2>

⁴⁵ India adopts regulations for planned compliance carbon market. (2024, September 2). International Carbon Action Partnership. <https://icapcarbonaction.com/en/news/india-adopts-regulations-planned-compliance-carbon-market>

⁴⁶ Coal India. (2000). Legislative History Of Coal Mining since 1971 and latest status. https://www.coalcontroller.gov.in/files/reading_materials_document/legislation.pdf

gas resources, conferring authority upon the Central Government for exploration, production, and conservation.

Regulations for Petroleum and Natural Gas, 1959: Established by the 1948 Act, these regulations dictate licensing, exploration rights, royalties, and operational conditions for oil and gas activities.

Petroleum Act of 1934: This Act governs the importation, storage, transportation, and distribution of petroleum products, emphasising safety and the regulation of hazardous materials.

Pricing and Subsidy Structure: Administered Pricing Mechanism (APM) and Deregulation Policies- While not a statute, pricing policies for petroleum products have historically played a crucial role in fossil fuel governance, influencing affordability, subsidies, and fiscal stability.

Environment (Protection) Act of 1986: Fossil fuel operations must adhere to environmental approvals, emission regulations, and pollution control standards as stipulated by this overarching legislation. Although fossil fuels remain predominant in India's energy composition, these legislations increasingly function in conjunction with climate policies, carbon market mechanisms, and energy transition strategies. From an environmental justice standpoint, the challenge is to ensure that fossil fuel regulation alleviates environmental damage, safeguards impacted communities, and facilitates an equitable transition to cleaner energy alternatives.

4.3 General Legislation and Policies Related to the Energy Sector.

Hydrocarbon Exploration and Licensing Policy (HELP): The Hydrocarbon Exploration and Licensing Policy (HELP) was implemented by the Government of India in 2016 to reform and modernise the regulatory framework for the exploration and production of hydrocarbons, encompassing oil, natural gas, coal bed methane, shale gas and gas hydrates. HELP supplanted the previous New Exploration Licensing Policy (NELP) with the aim of streamlining processes, bolstering investor confidence, and augmenting domestic hydrocarbon production to fortify energy security⁴⁷.

A principal characteristic of HELP is the implementation of a revenue-sharing model, which supplanted the cost-recovery mechanism established under NELP. This transition aimed to diminish regulatory conflicts and enhance transparency by correlating government revenue directly with production instead of the expenses borne by operators⁴⁸. The policy implemented uniform licensing, permitting a single licence for the exploration and production of all hydrocarbon types, thus promoting optimal resource utilisation. HELP additionally facilitates open acreage licensing, allowing bidders to choose their preferred exploration blocks, and grants enhanced pricing and marketing autonomy, especially for natural gas. The policy seeks to enhance efficiency and self-sufficiency, yet it also elicits apprehensions regarding environmental protections and community effects. From the standpoint of sustainability and environmental justice, the effective execution of environmental clearances, oversight, and stakeholder engagement is crucial to guarantee that hydrocarbon development does not inflict unequal ecological or social burdens⁴⁹.

Environment Impact Assessment (EIA) Notifications, 1994 and subsequent Amendments: The Notification of 1994 represented India's first formal initiative to institutionalise environmental evaluation of developmental projects by requiring prior environmental clearance for designated categories of activities⁵⁰. It, promulgated under the Environment (Protection) Act of 1986, established the framework for incorporating environmental considerations into project planning across the energy, mining, infrastructure, and industrial sectors. The EIA Notification, 2006, thoroughly revised this framework by establishing a decentralised clearance mechanism that classifies projects into Category A (cleared at the central level) and Category B (cleared at the state level). The 2006 regime fortified procedural components, including screening, scoping, public consultation, and appraisal, thus improving transparency and stakeholder engagement, especially for substantial

⁴⁷ Azhar, Professor. (2011). New exploration licensing policy (NELP) in India. OPEC Energy Review. 35. 10.1111/j.1753-0237.2011.00187.x.

⁴⁸ Ministry of Petroleum and Natural Gas, Government of India, & Kelkar, V., th. (2014). Roadmap for Reduction in import Dependency in the Hydrocarbon sector by 2030. <https://taxindiaonline.com/RC2/pdffdocs/FinalReportKelkarCommittee2014.pdf>

⁴⁹ Cerovšek, T. (2025). Advancing Sustainable Construction Through 5D Digital EIA and Ecosystem Restoration. Sustainability, 17(20), 9062. <https://doi.org/10.3390/su17209062>

⁵⁰ Sharma Seema, Environmental Impact Assessment in India: An Analytical Study Global Journal of Transformation in Law, Human Rights and Social Justice Vol. 4, Issue 2 – 2020 ISSN: 2581-4001

energy and infrastructure initiatives⁵¹.

Subsequent amendments aimed to optimise procedures but raised apprehensions about the erosion of environmental protections. The concerns escalated with the Draft EIA Notification, 2020, which suggested substantial modifications, including post-facto environmental clearances, diminished public consultation obligations for specific projects, and broadened exemptions. Critics contend that these provisions diminish preventive environmental regulation and compromise principles such as the precautionary principle, public participation, and environmental justice, particularly concerning energy and extractive projects that disproportionately impact vulnerable communities⁵².

The EIA framework is an essential regulatory instrument from the standpoint of energy transition. The effectiveness hinges on balancing business facilitation with stringent environmental safeguards, climate considerations, and substantial public engagement, ensuring that developmental initiatives, especially in the energy sector, conform to sustainable development and constitutional environmental requirements.

National Green Tribunal (NGT) Act, 2010: The National Green Tribunal Act, 2010 was enacted to establish a specialised judicial body for the efficient and prompt resolution of cases concerning environmental protection, forest conservation, natural resource management, and the enforcement of environmental legal rights. The Act enshrines India's constitutional obligations under Articles 21, 48A, and 51A(g) and harmonises domestic environmental jurisprudence with international environmental law principles. The Tribunal has jurisdiction over civil cases of designated environmental statutes, including the Environment (Protection) Act of 1986, the Forest (Conservation) Act of 1980, and the Air and Water Acts⁵³. It is authorised to provide relief and compensation for environmental harm and to mandate the restoration of degraded ecosystems. The NGT is required to implement principles such as sustainable development, the precautionary principle, and the polluter pays principle, which are fundamental to India's environmental jurisprudence. Within the realm of energy law, the NGT is instrumental in evaluating energy projects—specifically those related to fossil fuels, hydropower, and extensive renewable sources—for adherence to environmental standards and impact assessment mandates. The NGT Act enhances regulatory accountability by establishing a specialised forum for environmental justice, ensuring that energy development aligns with sustainability, ecological preservation, and the rights of impacted communities.

5. The Role of Energy Law and Policy in Advancing the Sustainable Development Goals

The energy sector has become pivotal in attaining the Sustainable Development Goals, directly and indirectly affecting various developmental outcomes. In this context, it is imperative to identify and critically analyse energy laws and policies to evaluate their alignment with sustainable development objectives while promoting principles of environmental justice. In the modern Indian context, energy legislation aims to achieve two objectives: fostering energy development and ensuring sustainability.

Notwithstanding the adoption of numerous energy efficiency and conservation strategies, energy demand persists in its substantial increase, underscoring the essential role of energy across all facets of human endeavour- from routine domestic requirements to the operations of major institutions and industrial enterprises. India's primary energy demand has significantly escalated, increasing from roughly 441 million tonnes of oil equivalent (Mtoe) in 2000 to approximately 775 Mtoe in 2013. Forecasts suggest that this demand is expected to increase substantially, attaining between 1,250 Mtoe, as estimated by the International Energy Agency, and 1,500 Mtoe, as projected in the Integrated Energy Policy report, by 2030. According to the World Energy Outlook 2024, India's energy demand was 1074 Mtoe in 2023 and is expected to rise to 1921 Mtoe by 2040, concurrent with significant population growth⁵⁴. This simultaneous trend has exacerbated pressure on current energy systems, presenting substantial risks to energy security, environmental integrity, and economic competitiveness, while highlighting the increasing strain on India's energy infrastructure. Addressing these challenges requires a holistic approach that incorporates supply security, universal access, affordability, and environmental

⁵¹ Kumar Hatwal, V. & Ministry of Environment, Forest and Climate Change. (2025). Requirements and procedures for Category 'A' & 'B2' Environmental Clearances (EC) proposals. <https://dghindia.gov.in/assets/downloads/67e2992109d84ppt1.pdf>

⁵² Singh, A. (2023, May 27). The Draft EIA Notification, 2020: What went wrong? Fox Mandal. <https://foxmandal.in/the-draft-eia-notification-2020-what-went-wrong/>

⁵³ National Green Tribunal. (n.d.). <https://greentribunal.in/about-us.php>

⁵⁴ Preeti Prajapati, Ru Guo, Angzu Cai, Rajendra Prashad, Navigating the energy transition in India: challenges and opportunities towards sustainable energy goal, Water-Energy Nexus, Volume 9, 2026, Pages 1-18, ISSN 2588-9125, <https://doi.org/10.1016/j.wen.2025.07.004>.



sustainability.

By the end of 2025, India's installed electricity capacity exceeded 500 GW, marking a decisive shift in the national power landscape. Non-fossil energy sources accounted for nearly 51 percent, approximately 256 GW, while conventional thermal generation constituted the remainder, reflecting a clear structural realignment of the sector⁵⁵. Within this transition, renewable energy capacity stood at about 254 GW as of November 2025, driven primarily by solar power (around 133 GW) and wind energy (approximately 54 GW), alongside contributions from bioenergy and hydropower. This growth has been reinforced by record-breaking annual additions, with more than 40 GW of renewable capacity commissioned in 2025 alone, underscoring the rapid scaling-up of clean energy deployment in India⁵⁶.

India has strategically enhanced the diversification of its energy portfolio by rapidly implementing renewable sources, including solar, wind, and hydropower, in alignment with its long-term clean energy transition objectives. Policy instruments, such as fiscal incentives, tax concessions, competitive procurement frameworks, and Renewable Purchase Obligations, have been pivotal in expanding renewable capacity and diminishing reliance on fossil fuels. Concurrently, energy efficiency has become a fundamental aspect of sustainable energy governance, with the Bureau of Energy Efficiency executing extensive initiatives to curtail demand growth, enhance end-use efficiency, and instill sustainable consumption practices across various sectors.

Electricity Act of 2003 and the Draft Electricity (Amendment) Bill, 2025: To advance India's national and international obligations to sustainable development, the Electricity Act of 2003 includes various provisions that explicitly emphasise environmental protection and sustainable energy governance. The alignment is apparent in the lengthy title⁵⁷ of the Act, which delineates its goals as the consolidation of laws concerning the generation, transmission, distribution, trading, and utilisation of electricity, while explicitly highlighting the promotion of efficient and environmentally sustainable policies. The incorporation of environmental factors in the statute's objectives indicates legislative acknowledgement of the necessity to harmonise energy development with sustainability requirements.

Sections 3 and 4 of the Electricity Act of 2003 establish a crucial legal framework mandating the Central Government to develop the National Electricity Policy and the National Tariff Policy. These policies are essential to direct the advancement of the power system through the optimal utilisation of available resources, including coal, natural gas, nuclear energy, hydropower, and renewable energy sources⁵⁸. This provision embodies a comprehensive strategy for energy planning, acknowledging the significance of diversifying the energy portfolio and progressively enhancing the contribution of cleaner and renewable energy sources. In accordance with these regulations, the Ministry of Power promulgated the National Electricity Policy, 2005, which tackles essential matters including the accessibility of economical electricity, energy security, and environmental conservation⁵⁹. The policy explicitly recognises the environmental impacts of traditional energy production and underscores the necessity of increasing the proportion of non-conventional and renewable energy sources, such as hydro and nuclear power, to alleviate environmental degradation. It acknowledges the significance of decentralised and renewable energy solutions in facilitating rural electrification, especially in remote and off-grid regions, thus promoting electricity access, social equity, and environmental sustainability concurrently. Additionally, the National Electricity Policy established the framework for the development of periodic National Electricity Plans, generally formulated every five years, to evaluate demand, capacity expansion, and transmission needs. These plans serve as dynamic tools for incorporating sustainability factors into long-term electricity planning, encompassing the enhancement of renewable energy capacity and the fortification of transmission infrastructure to facilitate cleaner energy sources.

⁵⁵ PIB, 2025 marks Highest-Ever renewable Energy expansion in India's energy transition journey. (n.d.). <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2209478=3&lang=1>

⁵⁶ Agarwal, N. (2025, November 24). India's renewable capacity in 2025: Progress toward the 500 GW goal. Wright Research. <https://www.wrightresearch.in/blog/indias-renewable-capacity-in-2025-progress-toward-the-500-gw-goal/>

⁵⁷ An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto. THE ELECTRICITY ACT, 2003 [No.36 of 2003]

⁵⁸ National Electricity Policy Government of India Ministry of Power. <https://powermin.gov.in/en/content/national-electricity-policy>

The Energy Conservation Act, 2001, establishes a legal framework to enhance energy efficiency across various sectors and resulted in the creation of the Bureau of Energy Efficiency (BEE), which is responsible for executing energy conservation initiatives, setting efficiency standards, and promoting sustainable energy practices throughout the country. This is a statutory body established under Section 3 of the Energy Conservation Act, 2001⁶⁰, tasked with ensuring the effective execution of the Act and promoting energy efficiency across various sectors. To achieve this objective, Sections 14 and 15 of the Act authorise the Central Government and State Governments to establish and execute Standards and Labelling (S&L) programs for appliances and equipment, which are implemented through the BEE. The Standards and Labelling programme is acknowledged as one of the most economical regulatory mechanisms for enhancing energy efficiency in appliances and industrial equipment, while concurrently decreasing energy consumption and electricity expenses for consumers⁶¹. Mandatory energy efficiency standards set minimum performance criteria, while comparative energy labels offer clear information regarding energy consumption and efficiency levels. Collectively, these measures empower consumers to make informed purchasing choices by selecting energy-efficient products that yield long-term cost savings and diminish environmental impact.

The Energy Conservation Act, 2001, while not explicitly requiring the promotion of electric vehicles (EVs), is fundamentally aimed at enhancing energy efficiency and decreasing the energy intensity of the economy, which is directly pertinent to the electrification of the transportation sector⁶². The Bureau of Energy Efficiency has gradually taken on a supportive role in the advancement of electric vehicle (EV) infrastructure, specifically concerning energy-efficient charging systems and standards for public EV charging infrastructure. This position is closely aligned with India's comprehensive electric mobility strategy, particularly the National Electric Mobility Mission Plan (NEMMP), which aims to facilitate widespread adoption of electric vehicles to improve energy security, diminish vehicular emissions, and foster sustainable transportation. The Faster Adoption and Manufacturing of Electric Vehicles (FAME) schemes, executed in phases, actualise the goals of the NEMMP by offering financial incentives for electric vehicle adoption and facilitating the development of charging infrastructure across the country⁶³. The participation of the BEE in standard-setting and infrastructure facilitation enhances these schemes by guaranteeing that EV deployment is supported by energy-efficient and dependable systems. This policy synergy collectively reduces reliance on fossil fuels, alleviates environmental pollution, and promotes climate action goals. The Energy Conservation Act does not directly govern electric mobility; however, its institutional frameworks bolster India's electric vehicle policies and facilitate a synchronised shift towards a low-carbon and energy-efficient transportation sector. The BEE's initiatives influence consumer behaviour and market transformation, thereby decreasing overall energy demand, mitigating greenhouse gas emissions, and promoting sustainable development goals⁶⁴.

The Draft Electricity (Amendment) Bill, 2025, aims to implement extensive reforms to modernise India's power sector by amending the Electricity Act, 2003. The objectives encompass not only market efficiency but also the enhancement of competition in electricity distribution, fortification of regulatory institutions, financial viability of utilities, optimisation of tariff structures, and expedited integration of renewable energy⁶⁵. Collectively, these reforms emphasise that the Electricity Act of 2003 operates not only as a market-driven statute but also as a comprehensive governance tool that integrates sustainable development principles into India's electricity framework. The Act establishes a legal framework that promotes

⁶⁰ Establishment and incorporation of Bureau of Energy Efficiency.—(1) With effect from such date as the Central Government may, by notification, appoint, there shall be established, for the purposes of this Act, a Bureau to be called the Bureau of Energy Efficiency.

⁶¹ Chuneekar, Aditya. (2014). Standards and Labeling program for refrigerators: Comparing India with others. *Energy Policy*. 65. 626-630. 10.1016/j.enpol.2013.09.069.

⁶² Ahmed G. Abo-Khalil, Mohammad Ali Abdelkareem, Enas Taha Sayed, Hussein M. Maghrabie, Ali Radwan, Hegazy Rezk, A.G. Olabi, Electric vehicle impact on energy industry, policy, technical barriers, and power systems, *International Journal of Thermofluids*, Volume 13, 2022, 100134, ISSN 2666-2027, <https://doi.org/10.1016/j.ijft.2022.100134>.

⁶³ National Electric Mobility Mission Plan 2020. <https://policy.asiapacificenergy.org/sites/default/files/National%20Electric%20Mobility%20Mission%20Plan%202020.pdf>

⁶⁴ Yu, S., Yang, Y., Li, J. et al. Exploring low-carbon and sustainable urban transformation design using ChatGPT and artificial bee colony algorithm. *Humanit Soc Sci Commun*, 252 (2024). <https://doi.org/10.1057/s41599-024-02765-4>

⁶⁵ Puja Das. (2026b, January 19). Electricity Amendment Bill: Centre signals course correction after stakeholder pushback. *Down to Earth*. <https://www.downtoearth.org.in/energy/electricity-amendment-bill-centre-signals-course-correction-after-stakeholder-pushback>

renewable energy deployment, enhances energy access, and incorporates environmental factors into policy formulation, planning, and tariff regulation, thereby aligning electricity sector development with long-term sustainability and environmental justice goals.

Draft National Electricity Policy, 2026⁶⁶, the proposed renewable energy legislation, aims to establish a comprehensive legal framework for the renewable energy sector by setting ambitious targets for clean energy production and implementation. Currently, renewable energy governance in India is chiefly managed by the Ministry of New and Renewable Energy (MNRE), operating in conjunction with the Electricity Act of 2003 and the Energy Conservation Act of 2001. The MNRE is pivotal in the formulation, execution, and coordination of policies for the advancement and implementation of renewable energy technologies. The articulated vision aims to advance the development of new and renewable energy technologies, processes, materials, components, and services in alignment with international standards and performance benchmarks, with the dual goals of bolstering national energy security and reinforcing India's status as a globally competitive manufacturer and exporter in the renewable energy sector. India aims to enhance its clean energy transition through this coordinated institutional framework, aligning domestic energy policy with sustainable development and climate obligations.

The Government of India is proactively promoting the advancement and implementation of alternative fuels, such as green hydrogen, biofuels, and synthetic fuels, as a component of a comprehensive strategy to reconcile domestic oil supply with demand and diminish reliance on imported fossil fuels. The National Green Hydrogen Mission is a key element of this strategy, aiming to advance the production, utilisation, and export of green hydrogen via renewable energy methods, thus facilitating the decarbonisation of challenging sectors and bolstering long-term energy security⁶⁷. The amended National Policy on Biofuels promotes the utilisation of ethanol, biodiesel, and advanced biofuels to diversify the fuel mix, bolster agricultural value chains, and reduce greenhouse gas emissions in the transportation sector⁶⁸.

The government is augmenting the proportion of clean electricity by rapidly deploying renewable energy sources, including solar, wind, hydroelectric, geothermal, bioenergy, and tidal power, in conjunction with alternative fuels, thereby complementing fossil fuel-based generation. These initiatives encompass not only electricity generation but also energy needs for cooking, heating, motive power, and captive generation across rural, urban, industrial, and commercial sectors. The green hydrogen and biofuel policies, in conjunction with the expansion of renewable energy, exemplify a cohesive strategy for energy transition that emphasises affordability, accessibility, sustainability, and diminished environmental impact.

6. Barriers to Sustainable Energy Production

India's energy demand has surged significantly in recent years owing to accelerated economic growth and increasing industrial and residential requirements. Despite fossil fuels remaining the predominant source of the country's primary energy consumption—constituting a substantial portion of the energy mix and related greenhouse gas emissions—India has made notable progress in augmenting renewable energy capacity as part of its energy transition and climate obligations. The global energy transition requires extraordinary capital mobilisation and ongoing financial dedication⁶⁹. Recent international evaluations suggest that yearly global investment in clean energy must rise to around USD 4–5 trillion by 2030 to align with climate and sustainability trajectories, with total investment requirements anticipated to surpass USD

⁶⁶Government of India. (2026). Draft National Electricity Policy, 2026. https://powermin.gov.in/sites/default/files/webform/notices/Seeking_comments_on_Draft_National_Electricity_Policy_2026.pdf

⁶⁷ Singh, B. N., Ratn, T., Jha, P., Yadav, A. Ernst & Young LLP (2024). India's Green Hydrogen Revolution – an ambitious approach (By Ernst & Young LLP; EY LLP,Ed.). <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2024/may/doc2024510336301.pdf>

⁶⁸ Prangon Chowdhury, Nafisa Anjum Mahi, Rahbaar Yeassin, Nahid-Ur-Rahman Chowdhury, Omar Farrok, Biomass to biofuel: Impacts and mitigation of environmental, health, and socioeconomic challenges, Energy Conversion and Management: X, Volume 25, 2025, 100889, ISSN 2590-1745, <https://doi.org/10.1016/j.ecmx.2025.100889>.

⁶⁹ Rabindra Nepal, Nirash Paija, Bhawna Tyagi, Charles Harvie, Energy security, economic growth and environmental sustainability in India: Does FDI and trade openness play a role?, Journal of Environmental Management, Volume 281, 2021, 111886, ISSN 0301-4797, <https://doi.org/10.1016/j.jenvman.2020.111886>.

150–200 trillion by mid-century⁷⁰. Rectifying this financing deficit is essential for attaining sustainable development, energy security, and climate mitigation goals.

In the Indian context, fulfilling these investment requirements demands the implementation of innovative and diversified financing mechanisms. Instruments like green bonds have become crucial for directing capital towards renewable energy, energy efficiency, and low-carbon infrastructure projects, while India's developing carbon market framework, encompassing both mandatory and voluntary carbon credit trading, aims to internalise emission costs and promote low-carbon investments.

Apart from this, the expansion of renewable energy capacity requires the establishment of resilient infrastructure and the smooth incorporation of fluctuating energy sources into the power grid. Principal challenges encompass sustaining grid stability, equilibrating supply and demand, and proficiently addressing the intermittency linked to renewable generation. In the Indian context, these challenges highlight the necessity for substantial improvements in transmission and distribution networks, as well as investments in grid modernisation, storage solutions, and smart grid technologies. Simultaneously, regulatory focus should also be directed towards demand-side management and the encouragement of sustainable consumption habits. Regulating and optimising energy consumption is crucial for alleviating systemic strain on the grid and minimising the environmental repercussions of energy utilisation, thus aiding in climate change mitigation and diminishing the likelihood of climate-related adverse effects.

7. Conclusion

Historically, India's energy legislation has predominantly emphasised economic development and infrastructure growth, concentrating on augmenting energy production and guaranteeing supply to satisfy the requirements of swift industrialisation, urbanisation, and population increase. This development-focused approach has promoted investment, technological progress, and extensive energy access, yet it frequently neglects resource conservation, demand-side regulation, and long-term environmental sustainability. Consequently, regulatory frameworks have traditionally been inadequate in mitigating excessive energy consumption, inefficiencies, and the unsustainable utilisation of natural resources, such as fossil fuels, minerals, and water.

In the last twenty years, India has systematically restructured its energy governance framework via significant legislative and policy measures, including the Energy Conservation Act of 2001, the Electricity Act of 2003, and an increasing array of renewable energy and climate-related policies. These reforms demonstrate an increasing acknowledgement of the detrimental effects of climate change and environmental degradation resulting from unsustainable energy practices, indicating a gradual transition towards the incorporation of sustainable development principles into energy legislation.

Despite this advancement, considerable challenges remain, such as infrastructure limitations, funding deficiencies, regulatory intricacies, and institutional capacity constraints that hinder the extensive implementation of renewable energy and energy-efficient technologies. Reconciling India's escalating energy requirements with environmental sustainability constitutes a significant policy challenge. Initiatives like the National Action Plan on Climate Change and India's leadership in the International Solar Alliance highlight the nation's dedication to promoting sustainable energy development both nationally and internationally.

In summary, although India's energy legislation has transitioned from a primarily supply-focused and growth-driven framework to a more sustainability-oriented system, additional reforms are necessary. Enhancing regulatory focus on resource efficiency, demand-side management, and consumption moderation is crucial for aligning energy governance with environmental preservation and intergenerational equity. A revised legal framework that aligns development goals with conservation needs will be essential for achieving a resilient, equitable, and sustainable energy future for India

⁷⁰ Furkan Ahmad, Ameni Boumaiza, Antonio Sanfilippo, Luluwah Al-Fagih, A comprehensive review on green finance and its impact on net zero energy transition: From the perspective of renewable energy development, *Energy Strategy Reviews*, Volume 62, 2025, 101948, ISSN 2211-467X, <https://doi.org/10.1016/j.esr.2025.101948>.