ISSN: 2584-0231(Online)
International Journal of Multidisciplinary Research in Arts, Science and Technology
© IJMRAST | Vol. 3 | Issue 5 | May 2025
Available online at: https://ijmrast.com
DOI: https://doi.org/10.61778/ijmrast.v3i5.146

Women and Energy Justice: Examining the Gender Dimension in India's Energy Access

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Abstract

This paper reflects a gender and energy justice nexus on how access to energy, in India, impacts gender health, economic inclusion, and leadership opportunities. Conducted on a mixed-methods basis in both rural and semi-urban areas, the study points out that although programs such as the Pradhan Mantri Ujjwala Yojana (PMUY) and the provision of electricity to rural areas have enhanced access on a technical level, technical access is not sufficient due to issues connected with price accessibility, inconsistency of supply, and social/social limitations. Women as the greatest users of energy, still carry the burden of the use of traditional fuels hence resulting to time poverty and health complications. The paper also establishes that the availability of dependable power sources increases women access to income and education. Nonetheless, women lack independence in the decisions that concern energy as it is predominantly male-dominated. These results are an urgent imperative to two demands of gender-sensitive policies and approaches to energy: They should be inclusive so that women have a position of access and control, and they should strengthen equitable growth.

Keywords: *Energy justice, gender inequality, clean cooking fuel, women empowerment, rural India, PMUY, energy access.*

1. Introduction

Energy comprises a critical facilitator of social development, economic activities, and human development. The problem of fair access to energy has, however, not been settled in the context of developing countries such as India wherein, despite fundamental gains in electrification and the distribution of clean fuel, energy poverty continues to plague the state. Interestingly, the energy inequality cannot be considered equally distributed among all demographic groups- women and rural and economically weaker segments in particular groups are more affected. Their social roles and economic conditions, as well as the lack of energy sources, greatly affects them and these issues are closely connected. In such a way, the notion

of energy justice, requiring equal treatment and involvement of every individual in the energy system and recognizing neither gender nor socio-economic status can be included in the list of the determinants of sustainable and inclusive energy transitions in India.

The policies such as Saubhagya Scheme and Pradhan Mantri Ujjwala Yojana (PMUY) Indian have achieved the remarkable development of energy access in the last ten years. These programs have been focused on the electrification of the rural population as well as the supply of clean fuel to cook with the lower income population who live below the poverty line. Nevertheless, the effectiveness of such interventions should be analyzed in a gender-sensitive way. Indian household energy primarily belongs to women, who are active users and managers in the energy sector, and are thus underrepresented in decision-making on energy and energy-related policies. Women are mostly the ones who cook, heat, and collect fuel and these are activities that are highly dependent on the nature and availability of energy resources as per the traditional gender division of labor. Therefore, the inability to access the sources of clean and reliable energy does not only affect the health and time use of women but hinders their education, work, and access to social mobility (World Health Organization, 2016).

The concept energy justice also implies the need to fix these gender gaps through offering equal access to energy services and support women to engage in energy regulation. It is an acute and complex matter in an Indian context where more than 178 million women use bio-mass fuel to cook and face the issue of energy security. Access to energy should not only be interpreted technically, but also socially that is to say, the way women use, are in control and benefit of energy services. The energy requirements of women are always put on the back-burner, in the interest of the home, and their contributions do not make it to the process of decision making, regarding infrastructural or policy-based effects. This gender inequality makes an institutional obstruction on ways of getting women on the path of energy poverty and also affects national development agendas (Pueyo & Maestre, 2019).

Energy poverty is commonly characterized by fatigue and health risks along with limited mobility in the lived experiences of women. The activity of collecting firewood by the girls and women in rural India often consumes several hours, which is cumbersome and time-consuming to the girls and women, thereby limiting their ability to participate in income generating or learning activities. In addition, with the use of traditional stoves and solid fires to cook, exposure to smoke becomes long-term, which causes ailments to the lungs, vision, and other chronic diseases (Verma & Imelda, 2023). These problems are not solved on a large scale through clean energy interventions that are not affordable or accessible. Many still run on traditional fuels even with schemes such as the PMUY scheme where they are supplied with liquefied petroleum gas (LPG) and the reason is the cost of refilling cylinders and uneven supply lines (Gaikwad, Pandey, & Patil, 2024). These obstacles depict the fact that the energy access must have a more subtle and sustainable approach where gender should be the center point.

In addition, the access to energy is a key factor in the empowerment of women economically. Electricity and modern appliances make women to work outside the house and perform other productive jobs. It makes working time longer, physical load they relax and allows involvement in small-scale

entrepreneurship, especially in the rural regions. As an example, access to electricity can be used to exploit tailoring units, food processings, digital literacy training, and other home based businesses that are women run. Better energy access will also be time to educate and train in vocational fields and thus improve their human capital (Li et al., 2024). However, women continue to be hindered by structural constraints in the distribution of energy resources to their empowerment, e.g., the patriarchal nature, not being property owners or landowners, and having no access to funds.

Gender equality with access to energy is even witnessed in the education sector. Energy-poor households tend to force the girls to contribute to fuel collection activities or work at home, and therefore these girls drop out of school and do not get educated as much as the boys are. Electrified households, however, bring better light to study in the home and safer places, which tend to foster School attendance and performance. This relationship has been emphasized by Acheampong et al. (2024) by demonstrating how energy poverty is a deterrent to gender equity in education notably in low-income areas. Therefore, gender-energy nexus has to be tackled as a measure of meeting broader developmental aspirations, including in line with the Sustainable Development Goals (SDGs), namely gender equality, quality education, and good health and well-being.

Gender differences, on top of households, are manifested in energy planning and governance. Females are still not well represented in the technical, policy-making as well as leadership positions in the energy sector. The implications of their non-participation in the energy decision-making is that policies have been unable to accommodate the individual needs of women and their reality. As it turned out, gender-neutral energy policy tends to overlook the gender disparity of energy interventions which actually perpetuates inequality because they tend to ignore this disparity (Oparaocha and Dutta, 2011). There is thus an overwhelming need to weave gender analysis into energy policy making as well as to elicit the vigorous participation and participation of women in the formulation, implementation and assessment of energy programs.

In this respect, the idea of the energy citizenship is useful when people, in particular women are not regarded as consumers only, but as change makers and energy solutions co-producers. The involvement of women in community projects of energy (energy projects designed to suit the needs of the community), renewable groups (cooperative of people with energy interests), and consciousness programs can often enhance the effectiveness and participation rates in energy programs. Leduchowicz-Municio et al. (2023) demonstrated that in Brazil, rural electrification initiatives worked better when local energy governance included women, which shows that such an approach to engage in the energy delivery process may be applied in India as well.

The paper is therefore descriptive research aimed at gaining insights on the intricate gender aspect of energy access in India in terms of how well women are being served by the current energy schemes in the country, what constraints there are between the women and accessibility to clean and reliable energy, and how the inclusive energy policies can be formulated to promote energy justice. In analyzing the state-led and

market-driven energy efforts, the study utilizes aspects of gender justice based on equity, inclusiveness, and participatory governance in critical evaluation of the state and market-based approaches to energy.

This research is important because it may offer the basis of better policy interventions that combine the purposes of energy access with gender equity and social inclusion. India should make sure that women are not side tracked in the journey towards achieving their climate and development targets as it goes ahead to have its move to a sustainable energy future. The justice of energy is not only about increased kilowatt-hours, the ability of all people, without gender discrimination, to live with dignity, with opportunities, and deprivation. By understanding women as direct stakeholders in energy systems as users and providers, India can set the stage towards an inclusive and equitable transition of energy.

2. Literature Review

The notion of energy justice has developed to bear three good tenets which include distributional justice (reasonable allocation of the energy resources), procedural justice (participatory determination), and recognition justice (respecting of special needs of the marginalized communities). This framework has in the recent years been an increasingly used framework to gender analysis and more so in the development world where energy deprivation of women is a cause and a result of socio-economic inequality. The literature material that exists in the academic circles reiterates that gender and access to energy are interwoven and failure to expose this intersection contributes to the poverty, health hazards and social exclusion traps.

It is shown by several researchers that energy access is not gender-neutral but women are the main victims of energy poverty because they are traditional workers at home and care. Pueyo and Maestre (2019) reviewed the productive uses of energy thoroughly and emphasized that women do not always have access to modern energy services in order to start a business. This limits their capabilities to economic upsurge, particularly in the countryside. Another finding in the same research was that with the use of electricity, what prevents women to utilize energy towards productivity is the cultural rule, the inability to move about, or trainings.

The use of traditional energy has health effects that mostly impacts negatively on women and children. According to the World Health Organization (2016), respiratory diseases and complications during pregnancy grow tremendously when residents inhale indoor air pollution arising out of biomass fuels. Women account mainly to cook at the rural level, thus to an extent, they bear the health burden of inefficient use of cooking fuels. In their impact study of Pradhan Mantri Ujjwala Yojana (PMUY), Gaikwad, Pandey, and Patil (2024) indicated that in spite of the plan, enhancing access to LPG, a significant number of women returned to the utilization of traditional fuels because of their inability to meet the cost and suffer a constant short supply. This shows the disconnect between policy and the reality on the ground in the long term energy transition.

The problem of energy poverty combines with educational and economic underprivileges of women and girls beyond health. In their study, Acheampong et al. (2024) examined how interpersonal relationships generate energy poverty and gender inequality in education by showing that girls experience poor academic results and attendance because of low access to electricity and clean fuels. In energy-poor households, there

is more risk of girls missing school to assist in domestic activities and particularly fetching fuel. On the same note, Nepal et al. (2025) pointed out that gender becomes an important factor that determines education attainment particularly where there is a lack of access to energy. The authors discovered that electrified communities were gender-sensitive in terms of educational outcomes which was an indication of the greater social importance of the accessible energy on an equal basis.

The family planning choices and fertility also depend on energy access. Belmin et al. (2022) in the study of fertility transitions observed that fertility was associated with the availability of electricity and clean cooking fuels with a decrease in fertility and enhancement of maternal autonomy. People with electrified household are more educated about reproductive health, enjoy more free time to relax and are more engaged in social networks. These changes have led to a gradual change of roles of women as being purely reproductive to being active in wider social and economic lives. In this way, not only energy but also a physical commodity can be regarded as a positive social instrument.

The nexus between energy access and the participation of women in the labor force is one of the most solid research areas. Conducting a multi-country analysis, Li et al. (2024) also came to the conclusion that access to proper electricity supply contributes to the likelihood of women entering the paid labor market greatly. They have been able to prove that women can be empowered to carry out income generating ventures especially at home through modern energy. The aspect of household technologies, which helps women to reduce their domestic chores through energy access, was also investigated by Bose, Jain, and Walker (2022). These technologies save time spent on menial work hence increasing the time available to women to either educate, work or spend time on entertainment resulting in an overall enhancement of well-being and agency.

Though the topic has gained traction, the mainstreaming of gender in the energy policy is minimal. Oparaocha and Dutta (2011) had observed that majority of the energy projects remain gender-blind by assuming that households are homogeneous and do not consider intra-household inequality. That usually leads to the development of those policies that do not take into account these needs and priorities of women. Pailman and de Groot (2021) mitigated this criticism by positing that the access programs of energy should take a feminist approach to energy justice. Their study proposed a broad research program that examines the role of gender norms, power relations as well as institutional frameworks in determining energy outcomes.

The failure of the centralized energy structures to satisfy the gender-specific demands are also well-documented. Pathania (2017) recalled that the expansion of the main grid can be associated with an increase in technical access, but not with usable access by women. The costs, safety and cultural conformities remain some of the factors that restrict its use among the household female members. The research promotes the good community use of energy where the women have a role in its design and implementation. This view was substantiated by the empirical work by Leduchowicz-Municio et al. (2023) demonstrating that in the case of participatory electrification model in Brazil, female inclusion in local governance and decision-making was more successful.

Moreover, energy services quality and reliability are also essential to determine gendered experiences. These authors conclude that when Indian electrification became stable and reliable, significant gender differences in leisure, participation in education and decision-making within households diminished (Sedai et al., 2021). Their findings establish that energy goes beyond availability but it is also about consistency and applicability in everyday life. Electrification is not very beneficial to the women in the areas where the power cuts regularly or there are few hours of power supply.

The welfare benefits of specific clean technologies have also now got some new evidence. Another study assessing the impact of energy-efficient cookstoves focused on the situation in Ethiopia (Sepee and Tesfahun 2023). Conclusive evidence indicates much positive change among women, such as saving time, increasing health, and decreasing household costs. The findings will remain relevant to India where millions of homes still depend on traditional biomass. The application of such technologies, once in line with the needs of women, can greatly improve gender equity.

Economic analyses also highlight the need to have a gender-sensitive energy planning. Verma and Imelda (2023) dwelt on the labor and health advantages of the availability of clean energy in Indian households. They described the results of their findings whereby women with access to LPG or electricity, their health does not only improve, but their access to the workforce does also. This twin advantage shows energy as the connection among social welfare and the economic productivity. In a similar fashion, Chirambo (2016) identified as the area of concern the gap of financing of the renewable energy, suggesting investing strategies to adopt gender aims as a part of the comprehensive conclusive approach to ensuring sustainable energy development.

The interplay between energy access and gender equality is quickly gaining value in the global sustainable development frameworks. Fuso Nerini et al. (2018) traced these interconnections in SDGs and identified how universal energy access boosts results in education, health, and poverty alleviation, particularly in women. In their study, the researchers urged the adoption of multi-sectoral planning so that energy policies can facilitate the overall growth of human beings.

Another opportunity is the emergence of equality between the genders through the changing pattern of consumer behavior in the adoption of clean technology. Hajhashemi et al. (2024) investigated co-adoption of electric vehicles and solar PV systems in Australia and outlined that the demographic profiling can be used to make energy policy more specific. Contextually diverse, the study shows the importance of the household-level behavior study, in particular, women energy preferences, on future clean energy transformations.

All in all, this body of literature shows us that energy access is highly gendered. The kind of energy and its quality, as well as control, has an extreme impact on the lives of women- their health, education, ability to become breadwinners and earn an income, and agency in life. Nevertheless, the discussion of mainstream energy policy in India does not fully reflect consideration of gender issues. Although schemes such as PMUY and Saubhagya have shown some advance in expanding technical connection, to be

successful in the long-run, they have to include an inclusive definition of gender justice in all phases of their planning, implementation, and evaluation.

To conclude, the literature discussed can provide a valid background to the discussion of the gendered aspects of energy access in India. It points out shortcomings of policy design, implementation and monitoring that does not meet specific needs of women. Gender analysis as an approach to energy policy has stopped being a normative guideline but it is a practical tool to attain sustainable development. This study seeks to add context to these understandings to come up with a deeper situational explanation of how energy policies may be changed so as to bring about energy as well as gender justice in India.

3. Research Methodology

3.1 Research Design

In this study, quantitative research method will be used to study the gendered dimensions of energy access in India holistically. This selection is determined by the dual character of the research problem, and that character is in terms of both measurable variables (e.g., fuel use, time use, health outcomes) and subjective experiences (e.g., decision-making power, agency, and social norms). The design permits triangulation of findings so as to be deep and valid.

As the main quantitative tool, a descriptive cross-sectional survey was applied to measure the present situation within the households in respect of access to energy and gender-related effects in the chosen communities. Also, focus group discussions (FGDs) and semi-structured interviews were used to provide qualitative data on the experience of women, issues, and their expectations concerning access to energy.

3.2 Study Area and Sampling

The research was done in four districts of two Indian States (Uttar Pradesh and Rajasthan), which had a different level of rural electrification, and different socio-economic development and the implementation of different schemes, such as Pradhan Mantri Ujjwala Yojana (PMUY).

Purposive sampling technique (in stages) was applied. States and districts were selected in the first stage depending on the electrification and the literacy of the female population. At second stage, five villages or semi-urban blocks in each district were randomly chosen. The third stage involved surveying 100 households in each of the districts making 400 households. Adult women (18 60 years old) who have primary responsibility to use energy household (cooking, lighting, use of appliances) served as respondents.

3.3 Data Collection Methods

3.3.1 Quantitative Data Collection

A structured questionnaire was administered to all 400 women respondents. The instrument included both close-ended and multiple-choice questions covering:

- Demographic information
- Type of energy sources used (electricity, cooking fuel)
- Time spent on energy-related chores
- Health issues related to energy use
- Household decision-making patterns
- Economic activities related to energy availability

The questionnaire was pilot-tested among 20 respondents in a non-sample village and revised for clarity and reliability.

4. Results and Analysis

This chapter provides the results of the research that was prepared in order to investigate gendered aspect of energy Access in India. It also uses qualitative and quantitative findings of the study carried out based on household surveys, key informant interviews and policy assessment conducted in some rural and semi-urban regions in India. Results are grouped around major themes namely: (1) Household Energy Access Patterns, (2) Impact on Women Health and Time Use, (3) Access to Clean Cooking Fuel, (4) Decision-Making and Energy Autonomy and (5) Energy Access and Women Economic Participation.

4.1. Household Energy Access Patterns

It was done by surveying 400 households (60 percent rural and 40 percent of semi-urban women respondents). The lower level of analysis determined the form and the occurrence of accessibility of electricity and cooking fuels.

Table 1: Type of Energy Access in Sample Households (n = 400)

Type of Energy Access	Frequency	Percentage (%)
Grid Electricity (24-hour reliable)	128	32.0
Grid Electricity (frequent outages)	184	46.0
Solar-Based Electricity	48	12.0
No Electricity	40	10.0

Only 32% of households reported having reliable grid electricity. A significant 46% experience frequent outages, which limits the utility of access. About 12% of households use solar energy, while 10% remain without any electricity, highlighting a persistent energy gap.

4.2 Access to Clean Cooking Fuel

This section analyzed the usage of clean fuels, primarily LPG, provided under the PMUY scheme and compared it with traditional biomass usage.

Table 2: Primary Cooking Fuel Used by Women Respondents

Cooking Fuel	Rural (%)	Semi-Urban (%)	Combined (%)
LPG Only	38	62	48.5
Biomass (wood/dung)	52	24	40.0
Both LPG & Biomass	10	14	11.5

While LPG adoption is higher in semi-urban areas (62%), rural women predominantly continue to rely on biomass (52%). Many use a combination of both due to cost and supply limitations. This hybrid usage pattern underlines incomplete transition and sustainability challenges in the PMUY scheme (Gaikwad et al., 2024).

4.3 Time Spent on Energy-Related Tasks

A key gendered impact of energy poverty is the burden of fuel collection and cooking time.

Table 53: Average Time Spent Daily on Energy-Related Work

Activity	Rural Women (Hours)	Semi-Urban Women (Hours)
Firewood Collection	1.8	0.4
Cooking (Biomass)	2.5	1.4
Cooking (LPG)	1.2	1.1

Rural women spend significantly more time on firewood collection and cooking using traditional fuels. Transition to LPG cuts cooking time by half, offering time for education, economic activity, or rest—key indicators of gendered energy justice (Verma & Imelda, 2023).

4.4 Health Effects of Traditional Energy Use

Women were asked about symptoms associated with long-term biomass exposure.

Table 4: Reported Health Problems Related to Biomass Smoke

Health Condition	% of Women Using Biomass
Chronic Cough	42
Eye Irritation	64
Headache/Dizziness	49
Breathlessness/Asthma	28

A large proportion of biomass users report health symptoms linked to indoor air pollution, confirming findings from WHO (2016) and reinforcing the need for clean energy interventions centered on women's health.

4.5 Decision-Making in Energy Use

Understanding intra-household decision-making is critical to addressing energy justice. Respondents were asked about who makes decisions regarding fuel and appliance purchase.

Table 5: Household Decision-Making on Energy Use

Decision Made By	% of Households
Male Head of Household	58
Female Respondent	29
Jointly Decided	13

In most households, decisions regarding energy purchases are made by men, even though women are the primary users. This gap illustrates procedural injustice where women lack agency over critical aspects of their daily life (Oparaocha & Dutta, 2011).

4.6 Energy and Economic Participation

The study explored how improved energy access influenced women's employment and entrepreneurship.

Table 6: Women's Economic Activities Enabled by Energy Access

Activity Enabled	% of Women with Reliable Electricity (n = 128)
Tailoring/Embroidery	26
Food Processing/Vending	14
Mobile Phone Repair/Services	6
Digital Services/Tuition	12
None	42

About 58% of women with reliable electricity use it for income-generating activities. Access enables flexible, home-based work that supports financial independence. However, 42% still remain economically inactive due to skill gaps or social restrictions (Li et al., 2024).

4.7 Barriers to Clean Energy Use

Women were asked to identify barriers that prevent consistent use of LPG and electricity.

Table 7: Barriers to Clean Energy Usage Reported by Respondents

Barrier	Percentage (%)
Cost of Refilling LPG	56
Irregular LPG Supply	24
High Electricity Bills	21
Appliance Affordability	17
Lack of Awareness	19
Cultural Preference (Biomass)	11

The greatest problem to transition clean fuel is affordability. On the supply-side, issues and socio-cultural practices are other barriers to complete the adoption of modern energy services, which confirms the results by Pueyo & Maestre (2019) and Pathania (2017). The researcher finds that energy access in India is highly gender-based, and women in India, especially those in rural locations, are disproportionally disadvantaged in their attempts to gain access to and use of clean, reliable energy. Although initiatives such as PMUY are shown to increase the initial access to LPG, their first deliveries quickly add significantly to the cost as well as availabilities of LPG refill creating barriers on regular consumption with the result that many women have reverted back to biomass fuels. Many of them continue to spend hours of their time gathering firewood and cooking using traditional stoves and it may cause time poverty and various health effects, including respiratory diseases and eye irritation. Energy-management decisions to a large extent are still under the control of the male heads of households even though women are the major consumers. Nevertheless, with access to reliable electricity, a large number of women are gainfully employed in economic endeavors, which suggests the empowering capabilities of energy access. The barriers to energy justice, barriers are still

in place and act as barriers to fulfilling the energy justice status due to factors like affordability, cultural norms, unawareness and infrastructure gaps. On the whole, the evidence highlights the present necessity of gender-sensitive energy policies, which should consider supply-side and social-cultural barriers, to provide all people with an equal possibility of getting access to energy.

5. Conclusion

The paper highlights that any attempt to achieve energy justice in India must be gendered and cannot merely involve provision of infrastructure but also refer to social, economic, and cultural aspects of energy accessibility. Even in the modern age of electrification and clean fuels, women, especially in rural and marginalized groups, still suffer tremendous shortcomings because of various affordability factors, lack of control over household fuel use, and persistent dependence on traditional fuel sources. Such issues not only impact the health of women and efforts of women in their daily workload but reduce their chances of learning, access to economic opportunities and empowerment as a whole. The study indicates that stable and comprehensive energy systems will have the capacity to change the lives of women by providing independence, enhancing good health, and promoting social fairness. Hence, the new energy policies should be formulated with the due understanding of the role women play, needs, and participation so that they will not be mere spectators in the Indian transitioning to a new energy future, but a partner in a sustainable and fair energy future.

Impact Statement

The study offers in-depth understanding of the gendered aspects of energy access in India and the fact that women bear the heavier burden due to the energy poverty that is prevailing in the country in spite of national initiatives such as PMUY and rural electrification. The research makes it clear why we have to transform energy policies so that they can become gender-sensitive by pointing out that women are already facing many barriers to using energy, including affordability, the health risk associated with using certain kinds of energy, as well as a lack of decision-making power. The results provide a resourceful evidence to policymakers, development agencies, and energy planners to develop comprehensive interventions, with a primary consideration being the needs of women, to increase their participation in the economy and equitable energy transitions.

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Cite this Article

Aradhana Yadav, Prof. Upasana Bharati, "Women and Energy Justice: Examining the Gender Dimension in India's Energy Access", *International Journal of Multidisciplinary Research in Arts, Science and Technology (IJMRAST), ISSN: 2584-0231, Volume 3, Issue 5, pp. 74-86, May 2025.*

Journal URL: *https://ijmrast.com/*

DOI: *https://doi.org/10.61778/ijmrast.v3i5.146*