SOLAR MICROGRID-ENABLED WOMEN ENTERPRISES

AND SOLAR DIDI-LED SKILL DEVELOPMENT MODELS

A Feasibility Study

In Ramgarh District, Jharkhand

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ACKNOWLEDGEMENT

The present report entitled “Feasibility Study on Solar Microgrid–Enabled Women Enterprises and Solar Didi–Led Skill Development Models in Ramgarh District, Jharkhand” was undertaken to assess the potential of decentralized renewable energy systems, women-led solar enterprises, and climate-resilient livelihood opportunities in mining-affected rural communities of Jharkhand. The study involved extensive field consultations through In-depth Interviews (IDIs), Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs), across selected Panchayats of Ramgarh district.

I would also like to extend my sincere appreciation to Mr. Munna Jha, Director – State Climate Action (Bihar & Jharkhand), Asar Social Impact Advisors Private Limited (ASAR), for his invaluable guidance, thoughtful inputs, and continuous support throughout the ideation, conceptualisation, and development of this report. His insights and constructive feedback were instrumental in shaping the study and strengthening its findings. I am equally grateful to the ASAR team, SAARTHI partner organizations, for their active engagement, insightful discussions, and valuable contributions throughout the research process. Their perspectives, field experiences, and collaborative spirit significantly enriched the analysis and helped ensure that the report reflects the diverse voices and realities of Jharkhand.

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I wish to place on record my special appreciation to the facilitators and enumerators of Asmita Organisation, Ramgarh, for their dedicated efforts in conducting IDIs, organising FGD, facilitating KIIs, and ensuring timely and systematic collection of field-level information. Their commitment to the study process were instrumental in generating meaningful insights from the field. I extend my sincere thanks to all members involved in the research coordination, data compilation, documentation, and report preparation process for their valuable contribution and teamwork throughout the study.

Finally, I extend my gratitude to Ms. Minakshi Tripathy, Senior consultant and Richa Chaudhary-Co-Founder URJA ARROWHEAD LLP in data management, analysis, documentation, and report preparation. Their collective efforts have helped translate field evidence into actionable insights that can inform future investments in renewable energy, women-led green livelihoods, and locally anchored just transition pathways.

I sincerely hope that the findings and recommendations of this report will contribute meaningfully toward planning and implementing decentralized renewable energy systems, women-led solar enterprises, and sustainable livelihood interventions in mining-affected communities of Jharkhand, while supporting a more inclusive and climate-resilient development transition.

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URJA ARROWHEAD LLP

URJA ARROWHEAD LLP is a development consulting, action research, and capacity-building organization established in 2023 with a commitment to advancing inclusive, sustainable, and community-led development based on action research. URJA is anchored by a multidisciplinary team of professionals with extensive experience in public policy, decentralised local governance, action research, curating livelihood opportunities, women's economic empowerment, promoting climate resilience practices and grassroot institutional strengthening, The team combines strong technical expertise with extensive field experience across rural and tribal landscapes, enabling the organization to design solutions that are both evidence-driven and grounded in local realities.

URJA's work is rooted in the belief that sustainable development can only be achieved when communities, local institutions, and market systems are strengthened simultaneously. The organization specializes in feasibility studies, baseline and diagnostic assessments, value chain and market analyses, social research, capacity building, entrepreneurship promotion, and livelihood enhancement initiatives. Through participatory methodologies and robust analytical frameworks, URJA supports stakeholders in designing interventions that are locally relevant, economically viable, socially inclusive, and environmentally sustainable.

Over the last few years, URJA has successfully undertaken large-scale research and assessment assignments across Bihar, Jharkhand, and West Bengal, covering themes such as women's economic empowerment, livelihood diversification, skill development, migration, local governance, farmer producer organizations, and community institutions. The organization has conducted field studies involving households and stakeholders, generating actionable insights for programme design and policy decision-making.

As India moves towards a cleaner and more inclusive energy future, URJA is increasingly engaging with themes related to green livelihoods, climate resilience, renewable energy adoption, and just transition pathways. Its expertise in community engagement, livelihood systems, women's empowerment, and institutional strengthening positions the organization uniquely to undertake studies and interventions that explore the social, economic, and operational dimensions of renewable energy initiatives such as the current study.

Executive Summary

The global transition towards cleaner energy systems presents both opportunities and challenges for coal-dependent regions. While renewable energy is increasingly recognized as a critical pathway for achieving climate goals, the transition must also address the socio-economic realities of communities whose livelihoods remain linked to extractive industries. In Jharkhand, one of India's leading coal-producing states, districts such as Ramgarh are experiencing the dual challenge of declining certainty in coal-based livelihoods and the growing need for reliable, affordable, and sustainable energy solutions capable of supporting rural development and economic diversification.

Against this backdrop, the present feasibility study, titled **"Solar Microgrid Empowering Women Entrepreneurship and Solar Didi-Led Skill Development Model in Ramgarh District, Jharkhand"**, was undertaken to assess the viability of decentralized solar energy systems as a catalyst for livelihood enhancement, women's economic empowerment, and a just transition in mining-affected communities. The study specifically explored the potential for establishing village-level solar microgrids and developing a cadre of locally trained women solar technicians ("Solar Didis") capable of supporting operation, maintenance, and enterprise development at the community level.

The assessment was conducted in **Pundi and Hesagarha Gram Panchayats of Mandu Block**, Ramgarh district, through a combination of household surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) with elected representatives, government officials, community leaders, and local institutions.



1.

Socio-Economic Context of Ramgarh

Ramgarh district occupies a strategically significant position in Jharkhand's coal economy and hosts extensive mining operations, industrial activities, and mining-linked settlements. According to Census data, Ramgarh district has a population of approximately **9.49 lakh**, with nearly **56 percent residing in rural areas.** The district literacy rate stands at **73.17 percent,** although substantial gender and livelihood disparities persist across rural communities. Scheduled Tribes constitute more than **21 percent** of the district's population, highlighting the importance of inclusive development approaches in the region.

Mandu Block, the largest block in Ramgarh district, has a population of approximately **2.53 lakh people** distributed across **74 villages and 11 urban settlements**. More than half of the population resides in rural areas, while Scheduled Tribes account for approximately **20 percent** of the block's population. Despite a relatively high literacy rate compared to many rural regions, employment opportunities remain heavily influenced by coal mining and mining-related economic activities.

The local economy reflects a transition phase. While mining and mining-linked labour continue to provide employment opportunities, increasing mechanization, uncertain future demand for coal, and concerns regarding long-term sustainability have generated anxiety among communities regarding future livelihood security. Agriculture, livestock rearing, petty trade, wage labour, and informal enterprises continue to serve as important supplementary income sources, particularly among rural households.



2. Energy Access and Solar Context

Although rural electrification has expanded significantly in Ramgarh district, access to reliable electricity remains a persistent concern. Communities participating in the study reported frequent power interruptions, voltage fluctuations, transformer failures, and inadequate electricity supply for productive economic activities. Several villages continue to depend on alternative arrangements such as inverters and backup systems to meet basic household and livelihood needs.

The study also found that while government-supported solar installations exist in some locations, many systems have become non-functional due to inadequate maintenance, absence of local technical support, and delayed repair services. These experiences have shaped community perceptions regarding renewable energy systems and underscore the importance of creating localized maintenance ecosystems.

At the same time, communities expressed strong interest in decentralized solar solutions capable of supporting irrigation, drinking water systems, household electricity, street lighting, enterprise development, and community infrastructure. Importantly, respondents viewed solar energy not merely as an energy source but as a potential driver of economic development, employment generation, and improved quality of life.

3. Rationale and Need for the Study

The study was undertaken in response to three emerging realities within mining-affected regions of Ramgarh:

First, the **growing uncertainty surrounding coal-dependent livelihoods** necessitates identification of alternative economic opportunities capable of supporting a just transition.

Second, despite improvements in electrification, **significant gaps persist in reliable and productive energy access, particularly for rural enterprises, irrigation systems, and community infrastructure**.

Third, there exists **an untapped opportunity to integrate renewable energy interventions with women's economic empowerment** by developing local technical capacities and supporting women-led enterprises.

The proposed Solar Microgrid and Solar Didi Model seeks to address these interconnected challenges by simultaneously improving energy access, creating green livelihood opportunities, strengthening local capacities, and enhancing community resilience.

4. Study Approach and Methodology

The study adopted a mixed-methods approach combining quantitative and qualitative research techniques.

Primary data collection included:

- **250 household surveys** conducted across Pundi and Hesagarha Gram Panchayats.
- **Six Focus Group Discussions (FGDs)** conducted across villages within the study Panchayats involving **108 participants**, including women, youth, farmers, Self-Help Group members, and community stakeholders.
- **Key Informant Interviews (KIIs)** with Panchayat representatives, officials from livelihood and skill development institutions, community leaders, and other stakeholders.

The study examined household energy access, livelihood patterns, willingness to adopt solar energy, willingness to pay for decentralized electricity services, perceptions regarding women's participation in solar enterprises, and the feasibility of community-managed renewable energy systems.

Key Findings

The feasibility assessment generated compelling evidence supporting the introduction of Solar Microgrid-enabled Women Enterprises and Solar Didi-led Skill Development Models in the study area. Findings from the 250 household surveys, six FGDs, and multiple KIIs reveal strong community demand for reliable electricity, growing concern regarding future livelihood security, and significant acceptance of women-led renewable energy solutions.

1. Socio-Economic Context of Households

The study reveals that the surveyed communities are characterised by moderate educational attainment, medium-sized families, and a heavy dependence on labour-oriented livelihoods. The majority of respondents belong to the economically productive age group of 26-40 years (55.2%), indicating the availability of a sizeable workforce that can potentially engage in new livelihood opportunities.

Agricultural labour emerged as the dominant livelihood source, either independently or in combination with other income sources. Although coal mining continues to influence the local economy, only 14.4% of households reported direct dependence on coal-based livelihoods. However, an overwhelming 89.6% of respondents believe that coal-dependent livelihoods will become uncertain in the future, indicating widespread livelihood insecurity.

1. **55.2%** respondents belong to the 26-40 years age group.
2. **29.6%** have no formal education.
3. **5.54** Average household size: 5.54 members.
4. **84.8%** households are not directly dependent on coal-based livelihoods.
5. **89.6%** anticipate decline in coal-related employment

2. Strong Aspirations for Livelihood Diversification

The study clearly demonstrates a strong aspiration among households to diversify beyond traditional and coal-linked livelihoods. Reliable electricity is viewed as a critical enabling factor for economic transformation.

Nearly all respondents (95.2%) expressed interest in pursuing alternative livelihoods if reliable electricity becomes available. Solar-powered irrigation emerged as the most preferred livelihood option, followed by solar-powered sewing units, charging stations, food processing, and welding enterprises.

FGDs further revealed that women and youth view solar energy not only as an energy solution but also as a pathway to entrepreneurship, income generation, and local employment.

1. **95.2%** willing to pursue diversified livelihoods with reliable electricity.
2. **72.8%** interested in solar irrigation services.
3. **32.8%** interested in solar-powered sewing enterprises.
4. **15.2%** interested in charging stations.
5. **14.4%** interested in food processing enterprises.

3. Existing Energy Access Remains Inadequate for Productive Use

Although 83.2% of surveyed households are connected to the electricity grid, the quality and reliability of supply remain inadequate.

More than half of households reported receiving electricity only for 8-17 hours daily. Frequent power cuts, low voltage, and unreliable service continue to affect household welfare and economic activities.

The impact of unreliable electricity is reflected in everyday life. Respondents highlighted disruptions in children's education, water access, mobile charging, and enterprise operations.

FGDs consistently identified electricity reliability as one of the most pressing development concerns across villages.

1.

83.2%

connected to the grid.

2.

30%

Only 30% receive electricity for 18-24 hours.

3.

54.4%

reported frequent power cuts.

4.

52.8%

reported low voltage issues.

6.

81.2%

identified water access as being affected by power cuts.

7.

83.6%

identified mobile charging disruptions.

8.

78.8%

identified impacts on children's education

4. Existing Solar Infrastructure Has Created Awareness but Limited Household Adoption

The study found substantial exposure to solar infrastructure at the village level but limited household ownership. Approximately three-fourths of respondents reported the presence of some form of solar infrastructure in their village, primarily solar street lights and solar irrigation systems. However, only 2.4% of households currently use a personal solar system.

This gap suggests that while awareness and visibility of solar technology exist, affordability, maintenance concerns, and access remain barriers to household-level adoption.

1.

74.0%

reported solar infrastructure in their villages.

2.

2.4%

Only households currently use solar systems.

3.

Solar street

lights are the most common technology.

4.

Solar irrigation

systems have significant visibility.



5. Repair and Maintenance Remain the Biggest Bottleneck

One of the strongest findings emerging from both IDIs and FGDs relates to the absence of local maintenance ecosystems. Respondents repeatedly cited lack of repair services as the primary reason for dissatisfaction with existing solar systems. FGDs revealed several examples of solar assets becoming non-functional due to delayed maintenance and absence of local technicians.

This finding directly validates the need for locally available repair and maintenance services.

Among dissatisfied users:

1. **53.5%** cited lack of repair services.
2. **14.0%** cited lack of repair services combined with maintenance costs.
3. **11.6%** cited lack of repair services combined with low power output.
4. **2.3%** Only 2.3% cited maintenance cost alone.

6. Strong Demand for Solar Microgrids

The study reveals exceptionally high community acceptance of decentralized solar microgrids.

Nearly 90% of respondents expressed willingness to obtain a connection if a solar microgrid is established. Households associate solar microgrids with improved electricity reliability, lower costs, and enhanced livelihood opportunities.

FGDs further confirmed that communities see solar microgrids as a practical solution to persistent electricity challenges.

1. **89.6%** willing to take a microgrid connection.
2. **80.4%** willing to pay monthly fees.
3. **95.2%** willing to pay ₹200-500 per month.
4. **71.6%** identified low-cost electricity as the primary expected benefit.
5. **26.4%** identified reliable electricity as the key benefit.

7. Community Preference for Flexible Payment Systems

Households strongly favour payment mechanisms that align with fluctuating rural incomes. The majority preferred Pay-As-You-Go systems over fixed monthly tariffs. Respondents indicated that flexibility would increase affordability and improve long-term sustainability.

However, trust in management emerged as the most significant payment-related concern.

1. **78.0%** prefer Pay-As-You-Go payment systems.
2. **14.8%** prefer fixed monthly fees.
3. **60.4%** cite trust in management as the biggest payment concern.
4. **29.2%** fear system failure.
5. **25.2%** cite irregular income as a payment challenge.

8.Exceptional Community Support for the Solar Didi Model

The most significant finding of the study is the extraordinary level of support for the proposed Solar Didi model. Communities overwhelmingly support training local women as solar technicians, operators, and community energy facilitators. Respondents expressed strong confidence in women managing technical and financial aspects of solar systems.

FGDs further revealed that women perceive the model as a dignified livelihood opportunity that can generate local employment while improving service delivery.

1.

98.4%

support training local women as Solar Didis.

2.

97.2%

believe women would be interested in the role.

3.

90.8%

expect Solar Didis to undertake repairs and maintenance.

5.

100%

trust local women to manage solar systems and fee collection.

5.

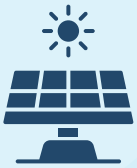
100%

support payment of a regular honorarium to Solar Didis.

The findings of the study demonstrate that Ramgarh possesses favourable social, economic, and institutional conditions for piloting Solar Microgrid-Enabled Women Enterprises and Solar Didi-Led Skill Development Models. Community demand for reliable electricity is high, acceptance of renewable energy is widespread, and there is strong support for women-led maintenance and enterprise systems. Importantly, the study highlights that decentralized solar energy can serve as a powerful instrument for advancing energy access, livelihood diversification, women's economic empowerment, and just transition objectives in coal mining-affected regions. With appropriate institutional support, community participation, and convergence with existing government programmes, the proposed model has the potential to evolve into a scalable framework for sustainable rural development across Jharkhand.



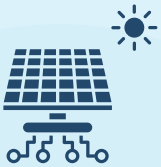
Strategic Recommendations



Priority should be accorded to establishing 10 Pilot Solar Microgrid Demonstration Villages across selected mining-affected Gram Panchayats of Mandu Block, integrating reliable electricity with household energy access, livelihood promotion, community infrastructure, and productive energy use.



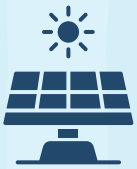
A strategic focus on developing a Solar Didi Skill Development and Certification Programme would create a cadre of certified women solar technicians and entrepreneurs capable of providing installation, operation, maintenance, billing, and community energy management services.



Promotion of solar-powered women enterprise clusters, particularly in tailoring, food processing, dairy, irrigation services, digital service centres, and other green livelihood sectors, could strengthen livelihood diversification and women's economic participation.



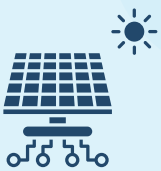
Strengthening community-led governance mechanisms, including Village Energy Management Committees, would enhance local ownership, accountability, and long-term sustainability of decentralized energy systems.



Development of affordable and inclusive financing mechanisms, including flexible tariffs, livelihood-linked payment systems, and CSR-supported financing, would improve accessibility while ensuring financial sustainability.



Greater investment in community awareness and behaviour change initiatives would build confidence in renewable energy technologies and encourage informed community participation.



Positioning renewable energy interventions within a broader Just Transition Framework would support livelihood diversification, green employment, and economic resilience in coal mining-affected communities.



Enhanced institutional convergence among JREDA, JSLPS, JSDMS, Panchayati Raj Institutions, CSR partners, and development agencies would facilitate coordinated implementation and long-term sustainability.

CHAPTER 01



Study Area, Research Design & Methodological Framework

Ramgarh district is one of Jharkhand's major coal-producing regions and plays a significant role in the state's industrial economy. The district is characterized by extensive mining operations, a growing urban-rural interface, and communities that are heavily dependent on coal-linked livelihoods. As the country advances towards cleaner energy pathways, the coal mining districts such as Ramgarh face the dual challenge of sustaining livelihoods while facilitating and inclusive transition towards alternative economic opportunities. In this context, Mandu Block was selected as the study area due to its proximity to active mining zones and the presence of communities experiencing socio-economic transitions associated with changes in the coal economy.

The study in Ramgarh district was conducted in two panchayats – Pundi and Hesagarha Panchayats of Mandu Block, one of the prominent coal mining–affected regions of Jharkhand. The block has historically depended on coal mining and mining-linked informal labour as major sources of livelihood. However, increasing uncertainty in coal-based employment and the need for livelihood diversification have created a growing demand for alternative economic opportunities.

Despite widespread electrification, many villages continue to face challenges related to unreliable electricity supply, voltage fluctuations, and power interruptions. These constraints adversely affect household well-being, productive energy use, and the growth of micro and small enterprises, particularly those led by women.

The study covered selected Gram Panchayats and villages within Mandu Block to assess the feasibility of Solar Microgrid–Enabled Women Enterprises and Solar Didi–Led Skill Development Models. The study combined quantitative household surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) to generate evidence on energy access, livelihood diversification, women's entrepreneurship, community readiness, and institutional support systems required for a just and inclusive energy transition

Study Coverage

Particulars	Coverage
District	Ramgarh
Block	Mandu
Gram Panchayats Covered	**2 (Pundi and Hesagarha)**
Villages	**Total -6 Villages** **Hesagadha Panchayat** 1. Hesagadha 2. Kashikhap 3. Toira & 4. Keribanda Pundi Panchayat 1. Pundi & 2. Bongahara
Households Surveyed	250
Focus Group Discussions	Conducted with SHGs and community members
Key Informant Interviews	Mukhiya, District Skill Mission and JSLPS officials

Study Framework: The assessment was undertaken across six key dimensions:

1. **Household and Socio-Economic Profile**
   - Understanding demographic characteristics, family composition, education levels, and economic conditions of respondents.
2. **Livelihoods and Economic Aspirations**
   - Assessing existing livelihood sources, income patterns, livelihood diversification, enterprise interests, and future economic aspirations.
3. **Energy Access and Reliability**
   - Understanding access to electricity, quality of supply, affordability, energy expenditure, and challenges faced by households and enterprises.
4. **Renewable Energy Awareness and Adoption**
   - Assessing community awareness, existing use of solar technologies, perceptions regarding renewable energy, and experiences with existing systems.
5. **Community Readiness for Solar Microgrids**
   - Examining willingness to adopt decentralized renewable energy systems, payment preferences, affordability considerations, and expected benefits.
6. **Women-led Energy Governance and Enterprise Development**
   - Exploring opportunities for Solar Didi models, women-led enterprises, local service delivery mechanisms, and women's participation in community energy management.

The feasibility study adopted a participatory mixed-methods approach combining quantitative and qualitative research techniques.to assess the potential of Solar Microgrid–Enabled Women Enterprises and Solar Didi–Led Skill Development Models in the coal mining-affected communities of Ramgarh district, Jharkhand.



Phase I:
Preparatory and Consultative Phase

Inception and Study Design

The study was initiated through consultations with SAARTHI – Jharkhand Just Transition Network and Asar Social Impact Advisors Pvt. Ltd. to develop a common understanding of the study objectives, expected outcomes, research framework, and field implementation strategy.

The consultations focused on understanding the opportunities for promoting decentralized renewable energy systems in coal mining-affected communities and assessing the feasibility of women-led Solar Didi models for operation, maintenance, and livelihood generation. A detailed study framework was developed to assess energy access, livelihood systems, enterprise opportunities, women's participation, renewable energy awareness, and institutional readiness for decentralized energy interventions

Secondary Literature Review

An extensive review of relevant literature, policy documents, reports, and case studies was undertaken to understand:

- Decentralized solar energy systems and solar microgrid models.
- Women-led renewable energy enterprises across India.
- Solar Didi and community energy service models.
- Livelihood transition challenges in coal-dependent regions.
- Just transition frameworks and community resilience approaches.

The findings from the review informed the development of the study framework and research tools.

Development of Research Instruments

Based on the study objectives, a set of quantitative and qualitative tools were developed, including:

- In-Depth Interview (IDI) Schedule
- Focus Group Discussion (FGD) Guide
- Key Informant Interview (KII) Schedule

The tools were designed to capture information related to energy access, electricity reliability, energy expenditure, livelihood sources, women's economic participation, willingness to pay for reliable electricity services, and perceptions regarding decentralized renewable energy solutions.

Recruitment and Training of Field Team

Field data collection was facilitated through the support of **Asmita Organisation**, Ramgarh, which played a critical role in community mobilisation, identification of respondents, coordination of village-level consultations, and logistical support during fieldwork.

A team of trained facilitators and enumerators from **Asmita Organisation** was engaged for the study. Prior to data collection, the field team underwent orientation and training on:

- Study objectives and expected outcomes
- Survey administration techniques

- Conducting FGDs and KIIs
- Ethical research practices and informed consent
- Data quality assurance protocols
- Community engagement and facilitation skills

Mock interviews and field simulations were conducted to ensure consistency and accuracy in data collection.



Phase II:
Field Survey and Data Collection

Study Area Coverage

The study was conducted in 2 Gram Panchayats of Mandu Block, Ramgarh district, namely:

- Pundi Panchayat
- Hesagarha Panchayat

The villages selected under these two Panchayats were 1. Hesagadha 2. Kashikhap 3. Toira 4. Keribanda of Hesagarha Panchayat and 1. Pundi 2. Bongahara of Pundi Panchayat because of their proximity to coal mining activities, dependence on mining-linked livelihoods, and the emerging need for livelihood diversification and sustainable energy solutions.

1. **In-Depth Interviews (IDIs)**

   Households were selected through a purposive-cum-random sampling approach to ensure representation across different socio-economic groups, livelihood categories, women-headed households, Self-Help Group members, and households located in varying proximity to mining activities. A total of 250 In Depth Interviews (IDI) were conducted across the all 6 villages using a structured questionnaire. The survey generated information on:

   - Demographic and socio-economic profile
   - Sources of livelihood and income
   - Access to electricity and quality of power supply
   - Existing use of solar technologies
   - Household energy expenditure
   - Awareness and perceptions of renewable energy
   - Enterprise aspirations and energy needs
   - Willingness to pay for reliable electricity services
   - Perceptions regarding future coal-based livelihoods
   - Interest in Solar Didi and women-led energy enterprises

2. **Focus Group Discussions (FGDs)**

   In addition to IDI, the study engaged a diverse range of stakeholders to understand institutional capacities, community perspectives, and opportunities for promoting women-led renewable energy initiatives. A total of **six Focus Group Discussions (FGDs)** were conducted across the 6 villages of the study area (one FGD in each village), covering 108 participants including women, Self-Help Group members, youth, farmers, and community leaders. The FGDs explored:

   These interactions helped assess existing support systems, skill development opportunities and the feasibility of Solar Didi-led models within the local context.

3. **Key Informant Interviews (KIIs)**

   Key Informant Interviews were conducted with;

   - Panchayat Mukhiya of both the Panchayats
   - District Programme Manager (DPM) from Jharkhand State Livelihood Promotion Society (JSLPS)
   - District Skill Officer (DSO) of District Skill Development Mission

These consultations provided important insights into local governance mechanisms, skill ecosystems, livelihood opportunities, and support structures for women-led renewable energy enterprises. These interviews helped to understand governance support, livelihood opportunities, skill development requirements, and community acceptance of women-led renewable energy initiatives.

4. **Data Quality Assurance**

   Several measures were adopted to ensure the quality and reliability of data collected:

   - Daily review of completed survey schedules
   - Field supervision and spot verification
   - Cross-checking of survey responses
   - Regular debriefing sessions with enumerators
   - Validation of quantitative and qualitative data
   - Continuous monitoring by the study coordination team



Phase III: Data Analysis and Reporting

Quantitative data were analysed using descriptive statistical techniques, cross-tabulations, and trend analysis to identify patterns related to energy access, livelihood dependence, enterprise aspirations, and willingness to pay. Qualitative data from FGDs and KIIs were subjected to thematic analysis to capture community perceptions, institutional perspectives, opportunities, and barriers related to renewable energy adoption and women-led enterprise development.

1. **Data Processing and Analysis**

   The quantitative data were cleaned, coded, and analysed using descriptive statistical techniques. Qualitative data from FGDs and KIIs were compiled and analysed through thematic analysis to identify recurring patterns, opportunities, concerns, and stakeholder perspectives.

2. **Triangulation of Findings**

   Findings from household surveys, FGDs, and KIIs were triangulated to validate observations and generate a comprehensive understanding of:

   - Energy access and reliability
   - Livelihood vulnerabilities and opportunities
   - Women's participation in economic activities
   - Demand for decentralized renewable energy systems
   - Feasibility of Solar Didi-led service delivery mode
   - Community willingness to adopt and sustain solar-based interventions

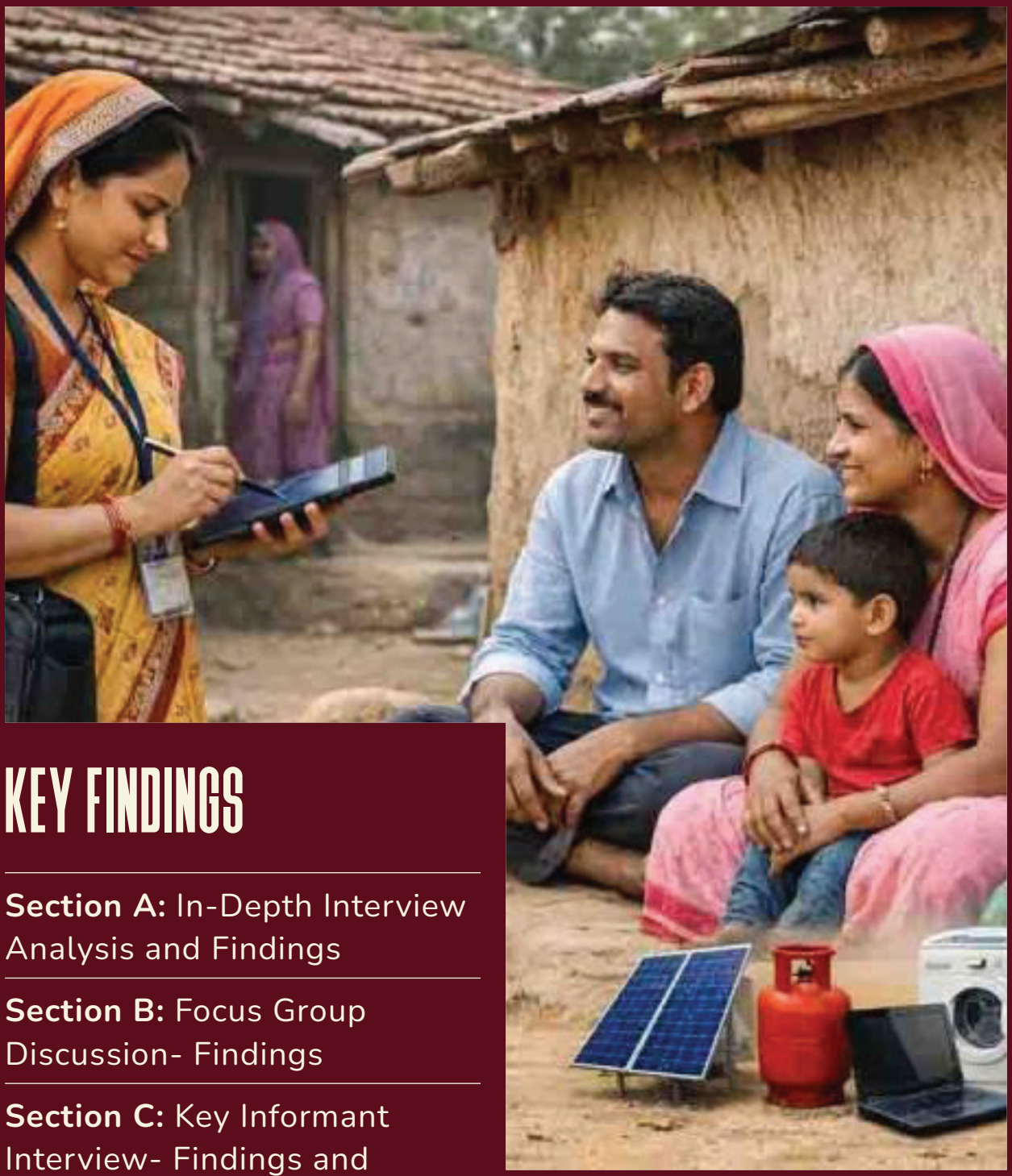
3. **Report Preparation**

   The final report synthesizes quantitative evidence, qualitative insights, field observations, and stakeholder perspectives to provide practical recommendations for promoting Solar Microgrid–Enabled Women Enterprises and Solar Didi–Led Skill Development Models as part of a broader just transition strategy in Ramgarh district.

4. **Study Limitation**

   The study represents findings from selected villages and stakeholder groups within Mandu Block and therefore should be interpreted as indicative rather than representative of the entire district. Seasonal variations in livelihoods and energy demand may also influence community perceptions and enterprise opportunities.

CHAPTER 02



KEY FINDINGS

Section A: In-Depth Interview Analysis and Findings

Section B: Focus Group Discussion- Findings

Section C: Key Informant Interview- Findings and Recommendations

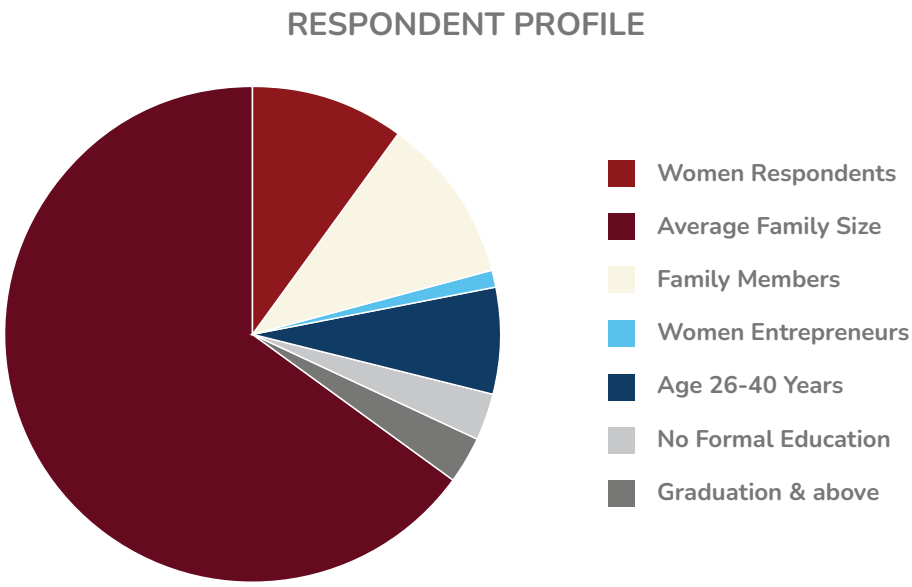
This chapter has three sections: Analysis of In-depth Interviews, findings of Focus Group Discussions and Key Informant Interviews. With the analysis, each section also has brief implications mentioned with recommendations.

Section 1 - In-Depth Interviews (IDIs)

A total of 250 household-level In-Depth Interviews (IDIs) were conducted across Pundi and Hesagarha Gram Panchayats, two neighbouring Panchayats located in the Mandu Block of Ramgarh district, Jharkhand. The survey was undertaken as part of the feasibility study on **Solar Microgrid–Enabled Women Entrepreneurship and Solar Didi–Led Skill Development Models** in mining-affected rural communities. The IDIs were designed to capture detailed household-level perspectives on electricity access, energy challenges, livelihood systems, women's economic participation, awareness and acceptance of renewable energy technologies, and the feasibility of decentralized solar interventions.

1. Profile of Respondent:

Figure 1: Respondent Profile



A total of 250 household-level respondents from Pundi and Hesagarha Gram Panchayats participated in the survey. The respondent profile was dominated by women (85.6%), reflecting their central role in household energy management, livelihood activities, and community institutions. Most respondents (91.6%) were household members, while a smaller proportion comprised women entrepreneurs (7.2%).

The survey largely captured the views of the economically active population, with 55.2% respondents belonging to the 26–40 years age group and 23.6% in the 41–55 years category. This provides valuable insights from individuals directly involved in household decision-making and livelihood generation.

Educational attainment was mixed. While 29.6% of respondents had no formal education, 25.2% had completed graduation or higher education. The remaining respondents possessed primary, secondary, or higher secondary education, indicating varying levels of literacy and awareness within the community.

The average household size was 5.54 members, reflecting medium-to-large rural families with shared livelihood and energy requirements. The respondent profile therefore represents households that are likely to be directly affected by changes in electricity access, livelihood opportunities, and renewable energy interventions.

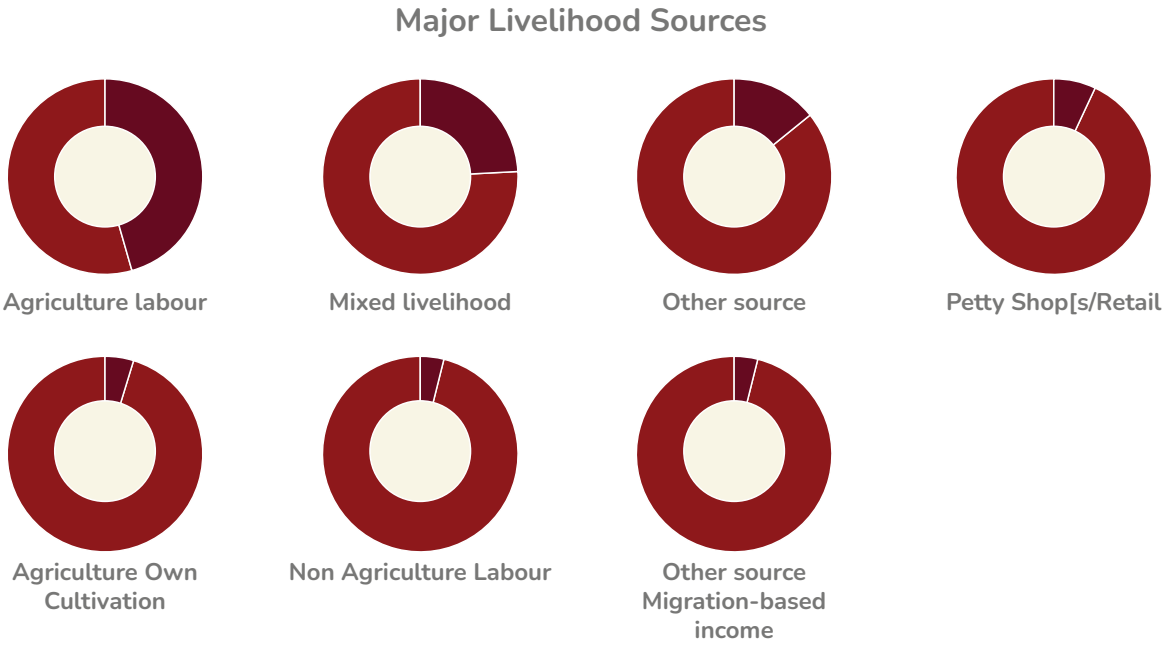
Key Findings

- Women constituted 85.6% of respondents.
- Family members accounted for 91.6% of respondents, while women entrepreneurs represented 7.2%.
- More than half (55.2%) belonged to the 26–40 years age group.
- Nearly one-third (29.6%) had no formal education, while 25.2% were graduates or above.
- Average family size was 5.54 members per household.

2. Livelihoods, Income and Economic Transition

The livelihood profile of surveyed households reflects a predominantly labour-dependent and diversified rural economy. Agricultural labour emerged as the primary livelihood source, reported by 103 households (41.2%), indicating continued dependence on wage-based employment for income generation. This suggests that a large proportion of households rely on seasonal and daily wage opportunities rather than cultivation on their own land.

Figure 2 Livelihood Sources



Nearly one-fourth of households (24.4%) reported mixed livelihood strategies, combining multiple income sources such as agricultural labour, daily wage work, coal collection, mining-related activities, transportation, petty trade, and other informal occupations. Discussions with respondents indicate that in several cases mining-linked work forms an important supplementary source of income, even where it is not reported as the primary livelihood. This highlights the indirect influence of the coal economy on local livelihoods and household income systems.

A further 14.4% of households reported other livelihood sources, which include mine and coal-related work, driving, tailoring, masonry, poultry rearing, service-sector employment, and small-scale enterprises. While direct dependence on coal mining may be limited, the findings suggest that a significant number of households remain economically connected to mining and allied sectors through casual labour, transportation, loading and unloading, coal collection, and local service activities.

The relatively low proportion of households dependent on own cultivation (4.8%) indicates limited land-based livelihood security, while migration-based employment (4.0%) reflects the need for some households to seek income opportunities outside the local area. The prevalence of mixed livelihood strategies demonstrates that households actively diversify income sources to cope with economic uncertainty and livelihood risks.

The income profile reflects limited economic resilience. More than two-thirds of households (70.8%) reported monthly family incomes between ₹5,000 and ₹10,000, while only 10% earned above ₹20,000 per month. This indicates modest purchasing power and continued dependence on seasonal, informal, and wage-based employment opportunities.

Figure 3 Income Profile

Estimated Monthly Family Income

Income Range	Number of Respondents	Percentage
Less than ₹5,000	15	6.0%
₹5,000 – ₹10,000	177	70.8%
₹10,000 – ₹20,000	33	13.2%
More than ₹20,000	25	10.0%
Total	250	100%

Overall, the findings portray a rural economy characterized by dependence on wage labour, limited farm-based income, and indirect linkages with the mining economy. While agriculture remains important, mining and coal-related activities continue to influence local livelihoods, either directly or through supplementary income opportunities. This livelihood pattern highlights the importance of developing alternative and sustainable livelihood options as part of the region's long-term economic transition.

Economic Transition Readiness

While direct dependence on coal-based livelihoods was reported by 15.2% of households, the influence of the coal economy extends beyond primary occupations through mixed livelihood strategies and allied economic activities. The findings reveal widespread awareness of the uncertain future of coal-based employment, with nearly 90% of respondents anticipating a decline in such opportunities. At the same time, an overwhelming majority expressed interest in alternative livelihoods supported by reliable electricity, indicating strong community readiness for economic diversification and transition.

Figure 4 Coal Livelihood and alternatives



Key Findings

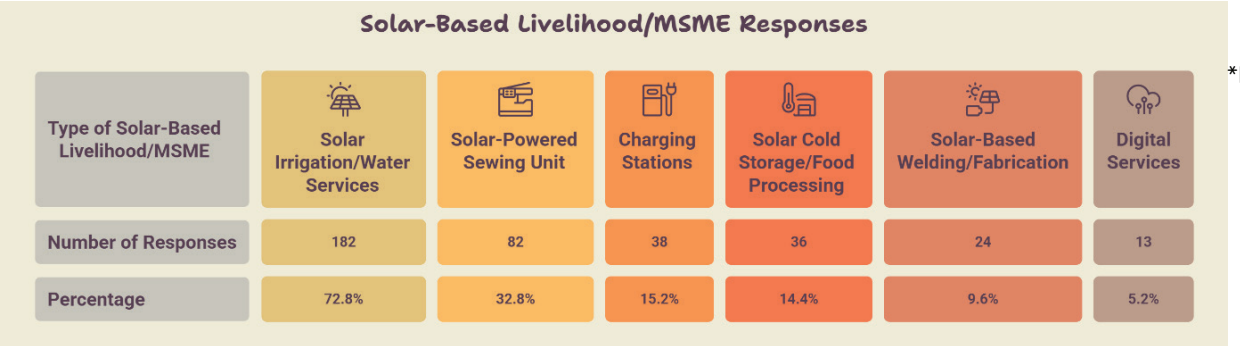
- Agricultural labour is the dominant livelihood source.
- Livelihoods are highly diversified, including mining-related work, wage labour, petty trade, tailoring, driving, and service-sector activities.
- 70.8% of households earn between ₹5,000 and ₹10,000 per month.
- Only a limited proportion of households depend directly on coal-based livelihoods.
- 89.6% of respondents believe coal-based livelihoods are likely to decline in the future.
- 95.2% expressed interest in alternative livelihoods supported by reliable electricity.
- Communities demonstrate strong readiness for livelihood diversification and renewable energy-linked enterprises.
- Direct dependence on coal mining is limited, mining and coal-related activities continue to contribute to household incomes through mixed livelihood strategies and allied economic activities.

The findings indicate strong community readiness for livelihood diversification. Reliable electricity is viewed not only as a household necessity but also as a catalyst for enterprise development, agricultural productivity, and self-employment. This creates favourable conditions for introducing solar-powered livelihood models and Solar Didi-led entrepreneurship initiatives in the project area.



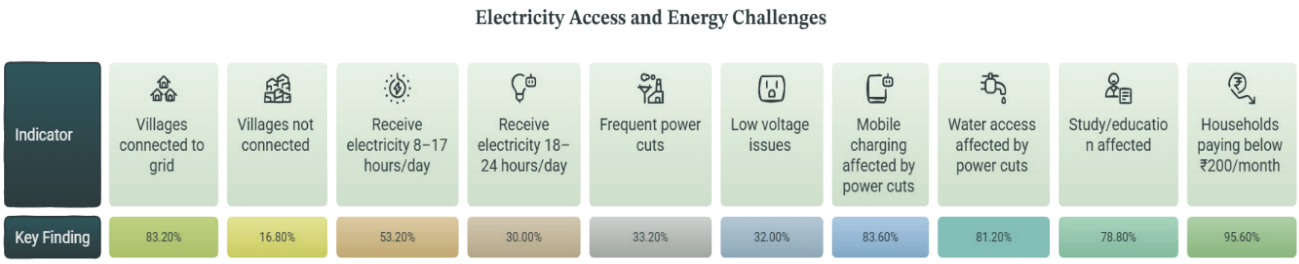
3. Electricity Access, Energy Challenges and Productive Energy Demand

Figure 5 Preferred types of solar based livelihoods/MSMEs



*Note: Multiple responses were allowed; therefore, percentages exceed 100%.

Figure 6 Energy Access and Energy Challenges



The findings indicate that a majority of households in the study area have access to grid electricity, with 83.2% of respondents reporting connectivity. However, access does not necessarily translate into reliable service. More than half of the respondents receive electricity for only 8–17 hours per day, while a significant proportion continue to face frequent power cuts and low-voltage conditions.

The findings indicate that while basic electrification infrastructure has reached a majority of households, access to reliable electricity remains a significant challenge. About 83.2% of respondents reported grid connectivity; however, 16.8% remain unconnected. Among connected households, more than half (53.2%) receive electricity for only 8–17 hours per day, while only 30.0% reported near-continuous supply. These findings suggest that most households continue to experience partial and inconsistent electricity access.

In addition to limited supply hours, respondents reported operational challenges such as frequent power cuts and low voltage, which affect both household activities and productive uses of electricity. The impacts of power interruptions extend beyond lighting, with mobile charging (83.6%), water access (81.2%), and children's education (78.8%) emerging as the most affected areas. This highlights the growing dependence of rural households on electricity for communication, access to basic services, and daily household functioning.

Despite these challenges, electricity expenditure remains relatively low, with 95.6% of households paying less than ₹200 per month. While this reflects affordability, it also suggests limited electricity consumption and restricted use of energy for productive purposes. Overall, the findings indicate that communities require not only electricity access but also reliable and quality power supply capable of supporting household needs, livelihood activities, and enterprise development.

Key Findings

- 83.2% of respondents reported grid connectivity.
- Most households receive electricity for only 8–17 hours daily.
- Frequent power cuts and low voltage remain major concerns.
- Mobile charging, water access, and education are the most affected by power interruptions.
- 95.6% of households pay less than ₹200 per month for electricity.
- Solar irrigation and water services emerged as the most preferred solar-based livelihood opportunity.
- Communities view reliable electricity as a key enabler of livelihood diversification and enterprise development.

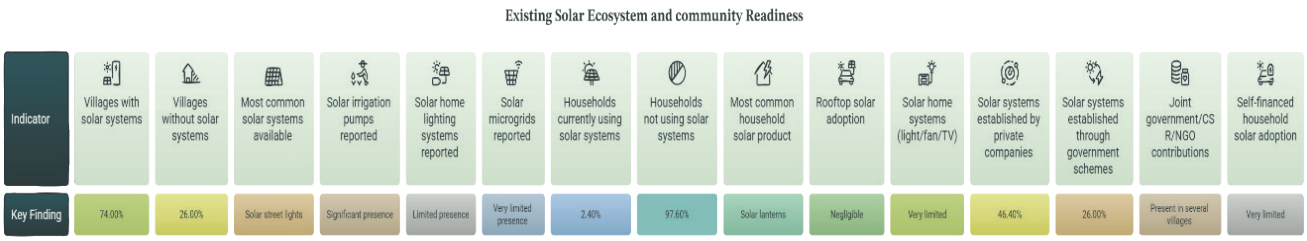
The strong demand for productive energy applications, coupled with persistent electricity challenges, creates a favourable environment for decentralized renewable energy solutions such as solar microgrids, solar-powered livelihood enterprises, and Solar Didi-led service models.

4. Existing Solar Ecosystem and Community Readiness

The findings in the Figure below, indicate that solar energy technologies are already visible within many villages of the study area. Nearly three-fourths of respondents (74.0%) reported the presence of solar systems in their villages, reflecting growing exposure to renewable energy solutions. Solar street lights and solar irrigation pumps were the most commonly reported installations, suggesting that solar deployment has largely focused on community infrastructure and agricultural applications.

Despite this visibility, household-level adoption remains extremely limited. Only 2.4% of respondents reported using any form of solar system at the household level, while the vast majority (97.6%) had no direct experience of owning or operating solar technologies. Existing household usage is largely restricted to basic applications such as solar lanterns and small lighting systems.

Figure 7 Existing Solar Ecosystem and Community Readiness



The findings reveal a significant gap between awareness and adoption. While communities are familiar with solar technologies through village-level infrastructure, household ownership remains constrained by factors such as affordability, limited financing options, inadequate technical support, and concerns regarding maintenance and after-sales service.

The establishment of solar systems has largely been driven by external agencies, particularly private companies, government programmes, and CSR-supported initiatives. Self-financed adoption by households remains negligible, indicating continued dependence on institutional support for renewable energy access.

Overall, the findings suggest that the study area possesses a favourable foundation for future renewable energy interventions. Communities are already familiar with solar technologies, but significant opportunities exist to expand household adoption, strengthen local maintenance systems, improve financing mechanisms, and promote livelihood-oriented renewable energy models.

Figure 8 : Community Satisfaction with existing system

Satisfaction Level	Percentage
Very satisfied	2.8%
Satisfied to some extent	79.6%
Dissatisfied	17.2%

Community perceptions of existing solar systems are generally positive, with 79.6% of respondents reporting satisfaction to some extent. However, only a very small proportion (2.8%) expressed high levels of satisfaction, while 17.2% reported dissatisfaction.

Discussions with respondents suggest that dissatisfaction is primarily linked to inadequate maintenance and repair services, irregular system functioning, limited technical support, and delays in addressing operational issues. While communities recognize the benefits of solar energy, the absence of accessible local technicians and dependable after-sales support has affected long-term user confidence and system performance.

The findings indicate that future renewable energy interventions should focus not only on installation of infrastructure but also on establishing reliable maintenance mechanisms, local technical capacity, and community-based service delivery systems. Strengthening these aspects could significantly improve user satisfaction and long-term sustainability of solar investments.

Key Findings

- 74.0% of respondents reported the presence of solar systems in their villages.
- Solar street lights and solar irrigation pumps are the most common solar installations.
- Household-level solar adoption remains extremely low (2.4%).
- Communities are familiar with solar technologies but have limited direct ownership.
- Solar infrastructure has largely been established through government, CSR, and private sector initiatives.
- Most respondents expressed moderate satisfaction with existing solar systems.
- Maintenance and after-sales service remain important concerns.
- Significant potential exists for expanding household and livelihood-oriented solar solutions.

While communities are familiar with solar technologies and generally perceive them positively, dissatisfaction is largely associated with inadequate maintenance and technical support. This creates a strong opportunity for Solar Didi-led service models that combine energy access with local installation, troubleshooting, repair, and customer support services. Such an approach can address existing gaps in system maintenance while simultaneously creating livelihood opportunities for women and youth.

5. Enterprise Energy Demand and Feasibility of Solar Microgrids

The survey findings indicate the presence of women-led and household-based enterprises within the study area, primarily engaged in small-scale livelihood activities. These enterprises largely operate using conventional electricity sources and, in some cases, continue to face challenges arising from unreliable power supply. Limited access to dependable electricity affects enterprise productivity, operating hours, and opportunities for business expansion.

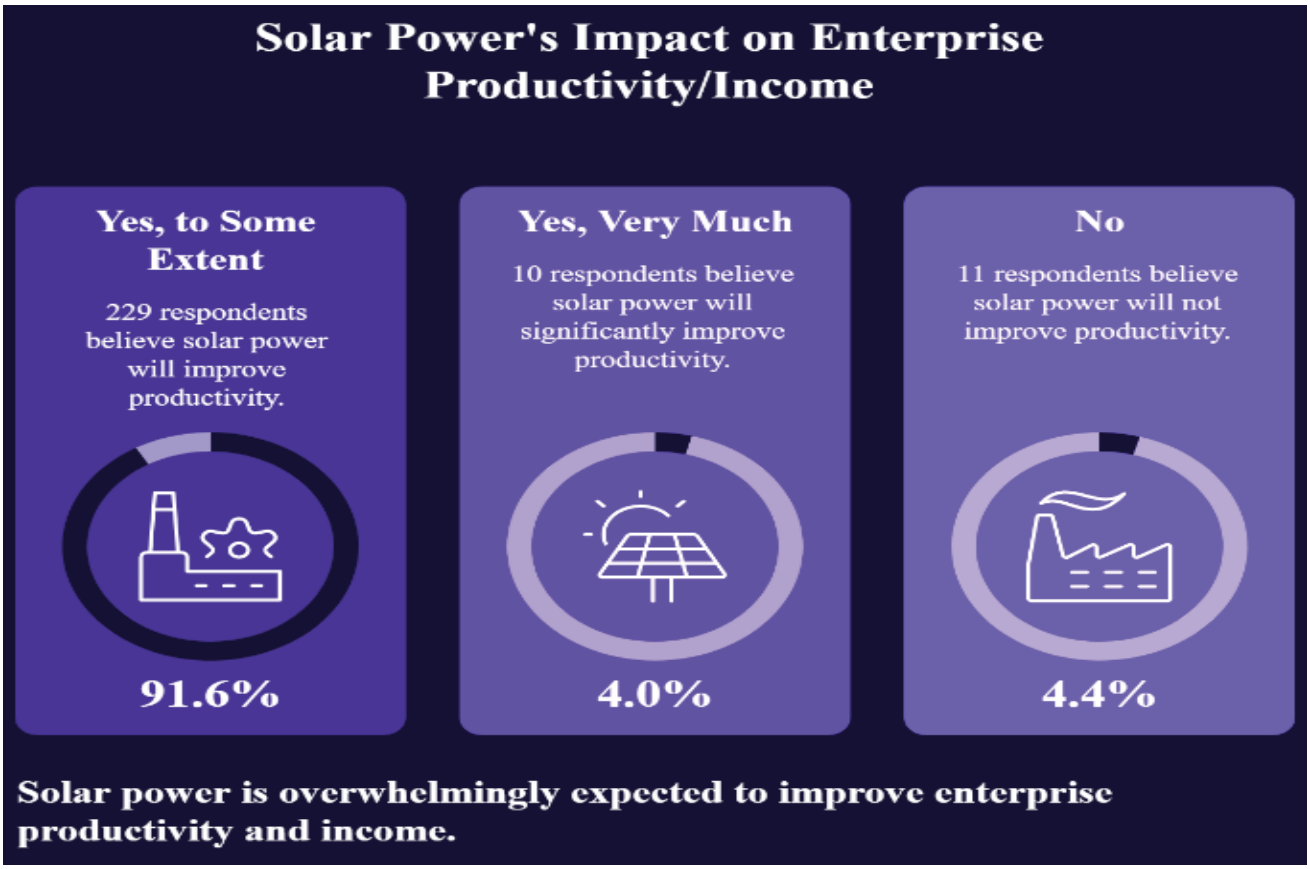
Respondents widely recognized the potential of solar energy to support enterprise development. A majority perceived that reliable solar power could improve productivity, reduce disruptions caused by power outages, enhance operational efficiency, and contribute to increased household incomes. The findings suggest that communities increasingly view renewable energy not merely as a source of electricity but as an enabling factor for livelihood enhancement and local economic development.

The proposed Solar Microgrid model received positive responses from respondents, with a substantial proportion expressing willingness to obtain a connection if reliable and affordable services are provided. Expected benefits included uninterrupted electricity supply, improved enterprise operations, reduced dependence on unreliable grid power, enhanced opportunities for income generation, and better access to energy for productive uses.

At the same time, respondents highlighted affordability as a key consideration in deciding whether to subscribe to Solar Microgrid services. While willingness to pay exists, households emphasized the importance of reasonable monthly charges aligned with their income levels. Perceived obstacles to payment included limited household incomes, irregular earnings from seasonal livelihoods, financial uncertainty, and concerns regarding service reliability.

Overall, the findings demonstrate strong community interest in reliable renewable energy solutions, particularly when linked to livelihood enhancement and enterprise development. The results indicate favourable conditions for introducing Solar Didi-led energy services and Solar Microgrid models, provided that interventions address affordability, maintenance support, and long-term service reliability.

Figure 9 : Perception on Whether Solar Power Can Improve Enterprise Productivity and Income



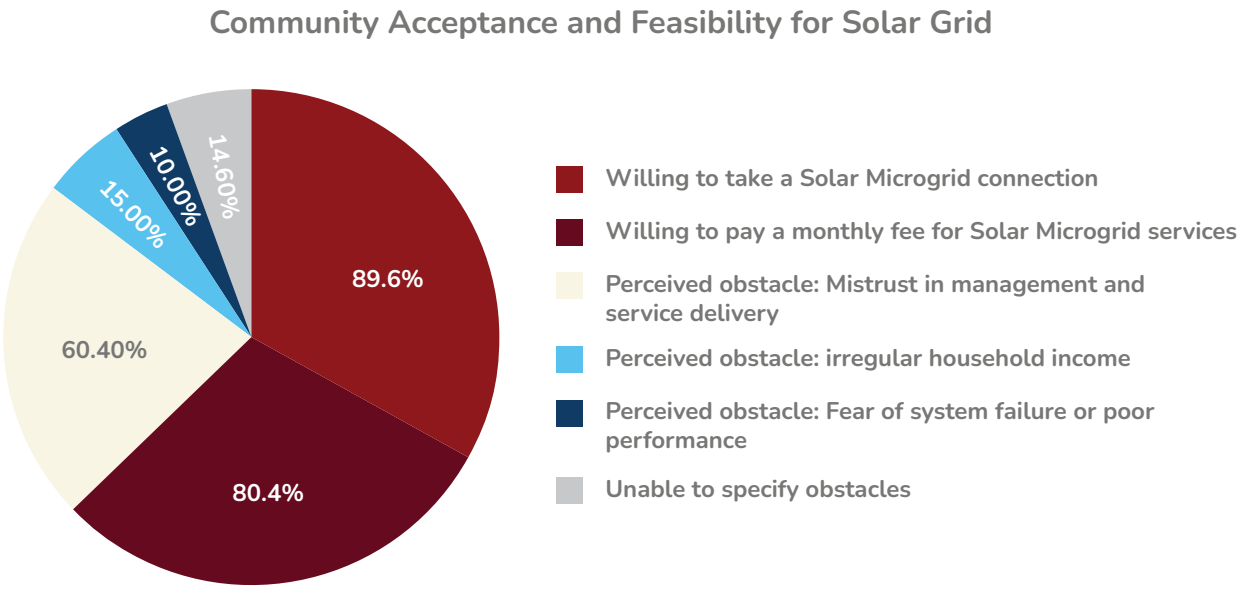
The findings indicate a highly positive perception of solar energy as a driver of enterprise growth and income enhancement. An overwhelming majority of respondents believe that reliable solar power can improve enterprise productivity and contribute to higher incomes. This reflects a strong understanding among community members that dependable energy access is essential for operating businesses efficiently, reducing disruptions caused by power outages, and expanding livelihood opportunities.

The positive perception is closely linked to earlier findings showing strong interest in solar-powered livelihood activities, dependence of enterprises on electricity, and dissatisfaction with unreliable grid power. Respondents increasingly view solar energy not merely as an alternative source of electricity but as an enabling factor for enterprise development, self-employment, and local economic growth.

Overall, the findings demonstrate strong community confidence in the potential of solar-powered enterprises and provide encouraging evidence for promoting Solar Didi-led businesses, renewable energy-based livelihoods, and decentralized energy solutions in the project area.

The near-universal belief that solar energy can improve enterprise productivity and income indicates a favourable environment for introducing livelihood-oriented renewable energy interventions and community-managed solar enterprises.

Figure 10: Community Acceptance and Feasibility



The findings demonstrate strong community acceptance of the proposed Solar Microgrid model. Nearly nine out of ten respondents (89.6%) expressed willingness to obtain a connection if reliable solar-powered electricity services are made available. This indicates a substantial unmet demand for dependable energy access and reflects community recognition of the limitations of existing electricity supply systems.

The financial viability of the model is also supported by the findings, with 80.4% of respondents indicating their willingness to pay a monthly fee for Solar Microgrid services. This suggests that households are prepared to contribute financially towards improved electricity services, particularly when such services are perceived to be reliable and beneficial for household needs, livelihoods, and enterprise activities.

Among those willing to pay, the preferred payment range is concentrated at the lower end of the tariff spectrum. Nearly 77.6 percent of all respondents indicated a willingness to pay between ₹100 and ₹200 per month. Only 2.4 percent preferred a tariff between ₹201 and ₹300, while 0.4 percent were willing to pay between ₹301 and ₹500. These findings provide an important indication of the affordability threshold for designing a community-based solar microgrid business model. The data suggest that a tariff structure exceeding ₹200 per month may face resistance from a large proportion of households.

Respondents showed a strong preference for flexible and usage-linked payment systems. The most preferred payment method was Pay-As-You-Go, selected by 78.0 percent of respondents. In contrast, only 14.8 percent preferred a fixed monthly fee, while 0.4 percent preferred SHG or group-based payment arrangements.

The preference for Pay-As-You-Go systems suggests that households favour payment mechanisms that align with fluctuating incomes and provide greater flexibility in managing energy expenditures.

However, the findings also highlight important concerns that require attention during project design and implementation. The most significant barrier identified by respondents was mistrust in management and service delivery mechanisms, reported by 60.4% of respondents. This suggests that community confidence in governance, transparency, accountability, and long-term maintenance arrangements will be critical determinants of adoption and sustained participation.

Affordability-related concerns also remain relevant. About 15.0% of respondents cited irregular household incomes as a potential challenge in making regular payments, reflecting the seasonal and uncertain nature of many rural livelihoods. A further 10.0% expressed concerns regarding system failure and service reliability, indicating the importance of establishing effective maintenance and technical support mechanisms.

Overall, the findings suggest that while demand for Solar Microgrid services is high and willingness to pay is encouraging, the long-term success of the model will depend on transparent management structures, reliable service delivery, responsive maintenance systems, and community trust-building measures. These findings provide strong evidence for the feasibility of decentralized renewable energy solutions in the study area, provided that institutional and operational concerns are adequately addressed.

Key Findings

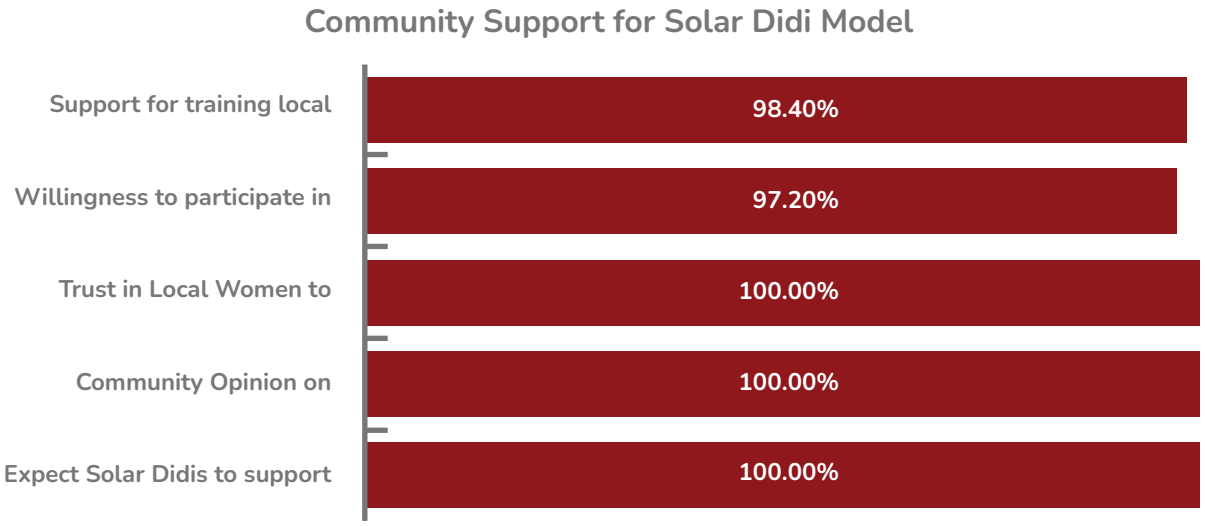
- 89.6% of respondents expressed willingness to take a Solar Microgrid connection.
- 80.4% indicated willingness to pay a monthly fee for services.
- Community demand for reliable electricity is high.
- Trust in management emerged as the most significant concern (60.4%).
- Irregular incomes may affect payment regularity for some households.
- Concerns regarding system performance and maintenance remain important.
- Strong potential exists for community-managed and locally supported renewable energy systems.
- Transparency, accountability, and effective after-sales service will be critical for long-term sustainability.

The findings indicate a favourable environment for introducing Solar Microgrid services in the study area. High willingness to connect and pay demonstrates strong market demand, while concerns regarding management and system reliability highlight the need for community-centred governance mechanisms.

Solar Didi-led models can play an important role in addressing these concerns by providing local customer support, routine maintenance, grievance redressal, and community engagement, thereby strengthening trust and improving long-term sustainability of the intervention.

6. Community Support for Solar Didi and Women-Led Energy Enterprises

Figure 11 Community Support



The findings demonstrate exceptionally strong community support for the proposed Solar Didi model. Nearly all respondents (98.4%) supported the idea of training local women as Solar Didis, while 97.2% expressed willingness to participate in related training and capacity-building initiatives.

This reflects a high level of community readiness for women-led renewable energy interventions and indicates broad acceptance of localized energy management systems.

A particularly significant finding is the universal trust placed in local women to manage solar systems and undertake fee collection responsibilities. All respondents expressed confidence in local women performing these functions, highlighting strong social acceptance of women as community-based service providers and leaders. This level of trust is especially important in the context of earlier findings where mistrust in management emerged as a major concern regarding Solar Microgrid services.

Respondents envisioned Solar Didis as multifunctional community energy workers rather than merely technicians. The most frequently identified role was minor repairs and maintenance, cited by 90.8 percent of respondents. This reflects widespread concern regarding the lack of local repair services, which emerged earlier as one of the major challenges affecting existing solar systems.

A large proportion of respondents (82.4 percent) also expected Solar Didis to undertake meter reading and billing-related responsibilities, indicating trust in their ability to manage operational aspects of a community energy system. Additionally, 43.6 percent viewed Solar Didis as responsible for user support and awareness generation, while 24.4 percent expected them to assist in fee collection and community coordination. The findings reveal that communities perceive Solar Didis as a bridge between technology, service delivery, and community engagement.

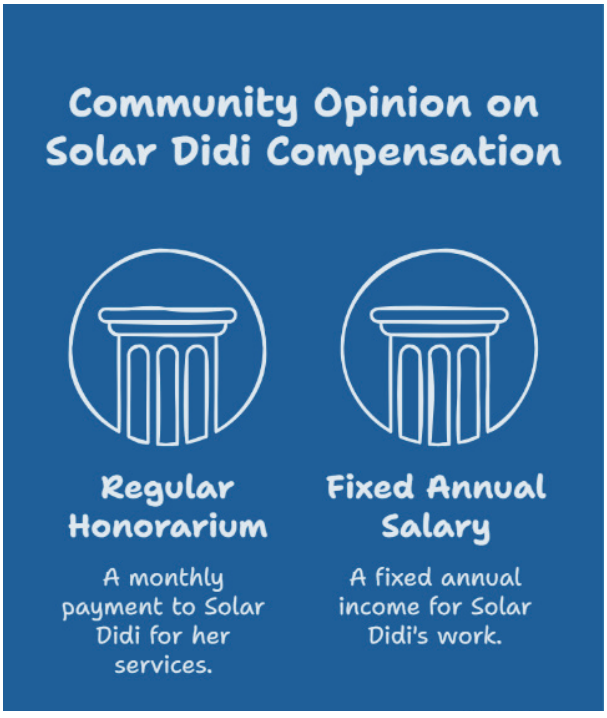
One of the most significant findings of the study relates to community trust. Every respondent surveyed (100 percent) expressed willingness to trust a local woman with the management of solar systems and associated financial transactions.

This remarkable level of confidence reflects the credibility and social acceptance already enjoyed by women through self-help groups, community institutions, and grassroots leadership roles. It also indicates that women can play a central role in ensuring transparency, accountability, and community ownership within decentralized energy systems.

Key Findings

- 98.4% supported training local women as Solar Didis.
- 97.2% expressed willingness to be a solar didi
- 100% trusted local women to manage solar systems and fee collection.
- 100% supported providing regular honorarium or salary to Solar Didis.
- 100% believed Solar Didis could support livelihood enterprises.
- Communities perceive Solar Didis as both energy service providers and livelihood facilitators.
- Strong community trust significantly enhances the feasibility of decentralized energy management systems.
- The findings indicate favourable conditions for scaling women-led renewable energy enterprises in the project area.

Figure 12: Community Opinion on Providing Regular Honorarium/Salary to Solar Didis



The findings reveal unanimous community support for providing regular financial compensation to Solar Didis for their services. All respondents agreed that women managing solar systems, supporting maintenance activities, facilitating fee collection, and assisting community members should receive a regular honorarium or salary.

This reflects strong community recognition of the value and responsibilities associated with the Solar Didi role. The survey also explored perceptions regarding compensation for Solar Didis. Every respondent (100 percent) agreed that Solar Didis should receive a regular honorarium or salary for their services.

The findings provide compelling evidence for the feasibility of a Solar Didi–led energy service model in Ramgarh. Community acceptance is exceptionally high, women are perceived as willing and capable of taking up the role, and respondents demonstrate strong trust in women-led management systems. The expectation that Solar Didis should handle repairs, maintenance, billing, awareness generation, and community coordination directly addresses many of the challenges identified in earlier sections of the study, particularly the lack of local repair services and concerns regarding system sustainability.

Most importantly, the unanimous support for remunerating Solar Didis indicates the potential for developing a structured, livelihood-oriented model that combines renewable energy access with women's economic empowerment. The findings strongly position the Solar Didi approach as a viable and community-endorsed mechanism for ensuring the sustainability, reliability, and local ownership of future solar microgrid interventions.

7. Analysis of Open-Ended Responses

In addition to the structured survey questions, several open-ended questions were included in the study to capture respondents' perceptions, expectations, concerns, and aspirations regarding solar energy, solar microgrids, women-led renewable energy enterprises, and the Solar Didi model. These qualitative responses provided deeper insights into community realities that could not be fully reflected through quantitative data alone. The narratives helped understand local priorities, perceived benefits, implementation challenges, social acceptance, livelihood opportunities, and institutional concerns associated with decentralized renewable energy systems.

The thematic analysis presented in the following sections synthesizes these responses into key observations, offering a nuanced understanding of community perspectives and informing the design of context-specific and socially responsive interventions.

Community Perspectives on Solar Didi Implementation

1. **Expectations from Solar Didis: Respondents commonly expected Solar Didis to:**

- Support operation and maintenance of solar systems.
- Facilitate timely repairs and troubleshooting.
- Assist households in accessing solar services.
- Support livelihood enterprises dependent on reliable electricity.
- Act as a local point of contact between communities and service providers.

2. **Perceived Benefits of the Solar Didi Model: Respondents believed the model could:**

- Improve reliability of solar systems
- Create employment opportunities for local women
- Strengthen community ownership of energy systems
- Improve access to technical support within villages
- Support income-generating activities and local enterprises

3. **Conditions for Long-Term Success: Community members emphasized:**

- Regular training and refresher support
- Transparent fee collection mechanisms
- Adequate honorarium or salary for Solar Didis
- Reliable technical backup from implementing agencies
- Community participation in monitoring and oversight

The qualitative responses strongly reinforce the quantitative findings presented throughout the study. Community members demonstrated high levels of confidence in the Solar Didi concept and viewed local women as capable of managing renewable energy systems, supporting maintenance services, and facilitating community engagement. Respondents consistently highlighted the need for reliable technical support, transparent management practices, and adequate remuneration for Solar Didis to ensure long-term sustainability.

The findings further indicate that communities perceive the Solar Didi model as more than an energy intervention. It is viewed as an opportunity for women's economic empowerment, local employment generation, improved service delivery, and support for livelihood enterprises. Overall, the qualitative evidence suggests strong community ownership and favourable social conditions for implementing women-led renewable energy initiatives in the project area.

Section B: FOCUS GROUP DISCUSSION (FGD) REPORT

1. Introduction

As part of the feasibility assessment on decentralized renewable energy systems and women-led solar livelihood models in mining-affected and rural communities of Jharkhand, a series of Focus Group Discussions (FGDs) were conducted across selected villages of Ramgarh district.

The FGDs aimed to understand:

- the present status of rural electricity access,
- community perception towards solar energy systems,
- women's livelihood aspirations,
- readiness for decentralized solar microgrids,
- willingness to adopt paid renewable energy services,
- and the feasibility of implementing the "Solar Didi" model at the grassroots level.

A total of two panchayats covering six villages were included under the Focus Group Discussion (FGD) process in Ramgarh district. Overall, six FGDs were conducted involving one hundred and eight participants comprising women participants, Self-Help Group (SHG) members, adolescent girls, Anganwadi workers, Panchayat representatives, and local community members from multiple villages across selected Panchayats of Ramgarh district.

Sl. No.	Panchayat	Village	Number of Participants	Participant Profile
	Hesagarha	Hesagarha	13	Women and adolescent girls
2	Hesagarha	Kasikhap	12	Women participants and CRP
3	Hesagarha	Keribanda	10	SHG women members
4	Pundi	Pundi	20	Women participants and Anganwadi workers
5	Pundi	Toera	32	Women participants and community leaders
6	Pundi	Bongahara	21	Panchayat representatives and community members

2. Consolidated key findings from the FGDs

The Focus Group Discussions conducted across the selected villages of Hesagarha and Pundi Panchayats in Ramgarh district provided important insights into the existing rural energy situation, community perceptions toward renewable energy systems, women's livelihood aspirations, and the feasibility of decentralized solar interventions. The discussions reflected strong community interest in reliable electricity systems, particularly solar microgrids, as a means to improve household well-being, agricultural productivity, livelihood opportunities, and women's economic participation. The findings also highlighted existing challenges related to irregular electricity supply, weak infrastructure, limited livelihood opportunities, and the need for localized technical support and community-centered implementation mechanisms. The consolidated key findings from the FGD are given below.

2.1 Rural Electricity Access Remains Unstable and Inadequate

Across all villages, participants consistently reported that despite electricity connectivity being available, the quality and reliability of supply remain highly inadequate. Communities continue to experience:

- Frequent power cuts,
- Low voltage,
- Seasonal electricity disruptions,
- Unpredictable outages.

The issue becomes particularly severe during summer months and adverse weather conditions. In several villages, the voltage remains too weak to operate productive machinery, irrigation systems, or household appliances effectively.

These electricity challenges significantly affect:

- Children's education,
- Domestic work,
- Cooking and water access,
- Communication and mobile charging,
- Irrigation systems,
- Small livelihood activities.

The FGDs clearly indicate that existing grid infrastructure is insufficient for supporting long-term socio-economic development in these rural communities.

2.2 Strong Community Demand for Reliable Solar Energy Systems

A major finding across all FGDs was the strong grassroots-level interest in decentralized renewable energy systems, particularly solar microgrids.

Participants widely perceived solar energy as:

- Reliable,
- Practical,
- Environmentally sustainable,
- Economically beneficial.

Communities strongly believe that decentralized solar systems can address the persistent failures of conventional grid electricity and provide uninterrupted power for domestic, agricultural, and livelihood purposes.

Although baseline exposure to solar technology varies across villages, overall community perception toward solar energy remains highly positive.

2.3 High Readiness for Solar Microgrid Adoption

The FGDs demonstrated strong community readiness to adopt village-level solar microgrid systems. Participants emphasized that solar microgrids could:

- Improve household electricity access,
- Strengthen irrigation systems,
- Support small businesses,
- Reduce dependency on unstable grid supply,
- Improve overall quality of life.

Villagers particularly highlighted the importance of uninterrupted electricity for:

- Tailoring and sewing enterprises,
- Leaf plate and handicraft production,
- Agricultural processing,
- Water pumping,
- Food preparation,
- Digital services.

The discussions clearly reflected that communities increasingly view energy access as a foundation for local economic development.

2.4 Women's Strong Aspiration for Livelihood Diversification

A significant finding emerging from all six FGDs was the strong aspiration among rural women to participate in income-generating activities and self-employment opportunities. Women participants expressed interest in establishing:

- Sewing and tailoring enterprises,
- Soap-making units,
- Incense stick production,
- Leaf plate (pattal) manufacturing,
- Food processing,
- Textile production,
- Mechanized agricultural activities.

Many participants indicated that unreliable electricity has been one of the major barriers preventing women from initiating or scaling livelihood activities.

The findings strongly suggest that access to reliable solar-powered infrastructure could substantially improve women's economic participation and household income generation.

2.5 Strong Community Acceptance of the "Solar Didi" Model

One of the most important cross-cutting findings was the overwhelming community support for the **"Solar Didi"** model. Participants across villages strongly endorsed the idea of training local women in:

- Solar system operation,
- Maintenance and troubleshooting,
- Technical management,
- Community energy governance.

Communities viewed the model as an important intervention capable of:

- Generating local employment,
- Strengthening women's leadership,
- Ensuring faster maintenance services,
- Increasing community trust,
- Improving long-term sustainability of solar systems.

Several villages also recommended training multiple women operators rather than a single individual to **ensure continuity, shared responsibility, and operational resilience.**

2.6 Willingness to Pay for Reliable Electricity

A particularly important finding from the FGDs was the strong willingness among communities to transition from unreliable or free electricity systems toward paid but dependable solar electricity services. Even in villages receiving free electricity supply, participants expressed readiness to pay monthly user charges if:

- Electricity becomes reliable,
- Voltage improves,
- And outages reduce significantly.

Participants preferred:

- Affordable tariffs,
- Transparent billing systems,
- Usage-based payment models,
- Flexible community-managed pricing systems.

This reflects a growing **"reliability premium"** within rural communities, where households prioritize **stable service quality over free but unreliable supply**.

2.7 Need for Technical Training and Long-Term Support Systems

While communities demonstrated strong interest in solar systems, participants also emphasized the importance of:

- Structured technical training,
- Continuous maintenance support,
- Spare-part availability,
- Institutional handholding,
- Community awareness programmes.

Participants highlighted that the long-term success of decentralized renewable energy systems will depend heavily on strong operational support mechanisms and locally available technical expertise.

2.8 Existing Livelihood Vulnerabilities and Economic Dependence

The FGDs revealed that many households remain dependent on:

- Daily wage labour,
- Subsistence agriculture,
- Seasonal farming,
- Livestock activities,
- Informal work.

Women participants repeatedly expressed the need for localized, home-based, and electricity-enabled enterprises that could reduce dependence on unstable wage labour systems.

The discussions strongly reflected that decentralized renewable energy systems possess the **potential to become catalysts for sustainable rural livelihood transformation.**

Conclusion

The consolidated Focus Group Discussions conducted across six villages of Hesagarha and Pundi Panchayats in Ramgarh district reveal strong grassroots readiness for decentralized renewable energy systems and women-led solar livelihood models.

The findings demonstrate that rural communities are actively seeking reliable and sustainable energy alternatives due to persistent problems associated with unstable grid electricity, low voltage, and unreliable supply systems. Across all villages, women participants expressed strong aspirations for financial independence, livelihood diversification, and participation in localized enterprise systems supported by reliable electricity access.

The discussions further highlighted **overwhelming community support for solar microgrids and the Solar Didi model**, with participants recognizing the potential of women-led technical systems to strengthen local maintenance, community ownership, and livelihood generation.

Importantly, the FGDs revealed that communities are willing to financially contribute toward reliable solar electricity services, reflecting a strong demand for quality energy infrastructure capable of improving household well-being, agricultural productivity, and local economic opportunities.

Overall, the findings strongly indicate that decentralized solar microgrids combined with women-led technical and enterprise models possess significant potential to support inclusive, climate-resilient, and community-driven rural development in Ramgarh district.













SECTION C: Key Informant Interview (KII) Report, Ramgarh District, Jharkhand

To gain deeper insights into the feasibility of Solar Microgrid–Enabled Women Enterprises and the Solar Didi–Led Skill Development Model in Ramgarh district, Key Informant Interviews (KIIs) were conducted with key stakeholders representing government institutions and local governance structures. The interviews included the District Program Manager, Jharkhand State Livelihood Promotion Society (JSLPS), the District Skill Officer, and elected Panchayati Raj representatives, namely Shri Etwa Manjhi, Mukhiya of Hesagarha Gram Panchayat, and Smt. Roopan Devi, Mukhiya of Pundi Gram Panchayat. The discussions explored existing livelihood opportunities, energy access challenges, women's participation in economic activities, skill development prospects, and the potential for community-led renewable energy interventions. The insights generated through these interviews provide valuable perspectives on local needs, institutional readiness, implementation challenges, and opportunities for promoting a just and inclusive energy transition in the district.

1. Interview Profile

Name: Ms Reeta Singh
Designation: District Program Manager (DPM) , JSLPS
Organisation: Jharkhand State Livelihood Promotion Society
Location: Ramgarh District, Jharkhand

The District Programme Manager highlighted that JSLPS has established a strong network of Self-Help Groups (SHGs), Village Organizations (VOs), and Cluster Level Federations (CLFs) across Ramgarh district, serving as important platforms for women's economic empowerment. Through these institutions, women are being supported in agriculture, livestock rearing, poultry, goatery, collective farming, small enterprises, and financial inclusion initiatives. Access to Community Investment Funds (CIF), bank linkages, and capacity-building support has enabled many SHG members to diversify household income sources and reduce dependence on traditional livelihood systems.

Particular emphasis is being placed on strengthening farm-based livelihoods, integrated farming systems, and producer collectives as sustainable alternatives in mining-affected regions where dependence on coal-related employment continues to pose long-term livelihood risks.

Livelihood Diversification in Mining-Affected Areas

The DPM expressed that uncertainty surrounding future coal-based employment necessitates proactive efforts toward livelihood diversification. Agriculture, livestock, horticulture, small-scale processing, and community enterprises were identified as potential sectors capable of generating sustainable income opportunities for rural households. However, challenges such as limited market access, low value addition, inadequate enterprise management skills, and financial vulnerability continue to restrict the growth of these livelihood options.

The DPM further emphasized that livelihood planning in mining-affected regions should focus not only on income generation but also on building climate-resilient and sustainable economic systems capable of supporting communities during the transition away from extractive industries.

Skills, Enterprise Development and Women's Economic Participation

According to the DPM, technical skills alone are insufficient for successful entrepreneurship. Women entrepreneurs require a combination of enterprise management, financial literacy, bookkeeping, market linkage facilitation, negotiation skills, and digital literacy. Existing SHG platforms provide a strong foundation for promoting women-led enterprises; however, continuous handholding and mentoring support remain critical for ensuring enterprise sustainability.
The DPM acknowledged that women have demonstrated significant leadership potential across JSLPS interventions and can successfully take up non-traditional livelihood roles when supported through appropriate training and institutional mechanisms.

Green Skills and Renewable Energy Opportunities

The DPM indicated that while JSLPS has extensive experience in livelihood promotion and women's institution-building, dedicated interventions related to renewable energy-based livelihoods, solar enterprises, or women solar technicians have not yet been systematically implemented in the district. However, she expressed strong interest in exploring innovative livelihood models linked to renewable energy, particularly where such interventions can be integrated with SHGs and existing community institutions.

The proposed Solar Didi model was viewed as a promising opportunity to create new livelihood avenues for women while simultaneously addressing the growing need for local maintenance and service support for solar infrastructure in rural areas.

Institutional Convergence and Support Potential

The DPM emphasized that successful implementation of solar-based livelihood models would require convergence among JSLPS, Panchayati Raj Institutions, Skill Development Department, banking institutions, and implementing agencies. JSLPS could potentially contribute through community mobilization, identification of interested women, institution strengthening, enterprise development support, and facilitation of financial inclusion mechanisms.

Key Challenges Identified

Ms Reeta identified several structural challenges affecting community resilience and sustainable development, including:

- High financial vulnerability,
- Limited institutional funding,
- Weak market linkages,
- Need for stronger convergence mechanisms,
- Requirement for feasibility-based planning,
- Lack of long-term technical support systems.

2. Interview Profile

Name: Mr. Anil Ranjan
Designation: District Skill Officer (DSO)
Organisation: Skill Development Department
Location: Ramgarh District, Jharkhand

Current Skill Development Ecosystem in Ramgarh

The District Skill Officer highlighted that various skill development programmes are being implemented in Ramgarh district to enhance employability among youth and women. Training programmes are primarily focused on sectors such as construction, automotive services, apparel, retail, electrical trades, and other market-oriented occupations. The department seeks to align training interventions with evolving industry requirements and employment opportunities available both within and outside the district.

However, despite ongoing efforts, challenges persist in ensuring long-term placement, retention, and sustainable self-employment outcomes, particularly among rural youth and women.

Challenges in Skill Development for Mining-Affected Communities

The DSO noted that many youth from mining-affected areas continue to face barriers related to limited exposure, low awareness of emerging employment opportunities, and inadequate access to specialized skill training. As the economic landscape evolves and dependence on coal-based employment gradually declines, there is a growing need to equip young people with future-oriented skills that support livelihood diversification.

The officer emphasized that skill development strategies must increasingly focus on local economic opportunities and self-employment pathways rather than relying solely on wage employment models.

Training Needs Assessment and Localized Skill Planning

According to the DSO, effective skill development interventions should be based on local demand assessments and labour market requirements. Training programmes must reflect community aspirations, local economic potential, and sector-specific opportunities. Particular importance was placed on decentralized and community-based training approaches that improve participation among women and vulnerable groups.

The DSO also emphasized the value of technology-enabled learning systems, digital content, and blended learning approaches for expanding access to quality skill training in remote locations.

Green Skills and Renewable Energy Sector Opportunities

The District Skill Officer acknowledged that renewable energy represents an emerging sector with significant employment potential. The increasing adoption of solar technologies is expected to create demand for skilled personnel in areas such as:

- Solar installation and maintenance
- Solar technicians
- Off-grid energy system operators
- Energy service providers
- Renewable energy entrepreneurs
- Drone and technology-enabled service providers

The District Skill Officer acknowledged that renewable energy and solar technologies are emerging sectors with significant future employment potential, particularly in the context of India's transition towards clean energy and Net Zero goals. The DSO observed that the growing deployment of solar infrastructure is likely to create demand for skilled personnel in installation, operation, maintenance, and repair services. However, a structured ecosystem for training local youth and women in renewable energy-related skills is currently absent in the district. The officer therefore recognized the potential relevance of introducing specialized solar technician and Solar Didi training programmes to prepare local communities for emerging green economy opportunities while addressing existing technical service gaps.

Feasibility of the Solar Didi Model

The DSO viewed the proposed Solar Didi concept as a practical and innovative approach that combines skill development with livelihood generation. Training local women as solar technicians and service providers could address two critical challenges simultaneously: **creating employment opportunities for women and improving maintenance support for decentralized solar infrastructure.**

The officer emphasized that successful implementation would require structured curricula, practical exposure, certification, post-training handholding, and institutional partnerships with technical agencies and renewable energy organizations.

Convergence and Institutional Support

The DSO highlighted the importance of convergence among Skill Development Department, JSLPS, Panchayats, renewable energy agencies, and private sector partners. Such collaboration could facilitate beneficiary mobilization, technical training, certification, placement support, and entrepreneurship promotion. The department expressed willingness to explore partnerships that contribute to building a skilled local workforce capable of supporting the emerging green economy in Ramgarh district.

3. Interview Profile

Name: Mr. Etwa Manjhi	**Name**: Ms. Roopan Devi
Designation: Mukhiya, Hesagarah Gram Panchayat	**Designation:** Mukhiya, Pundi Gram Panchayat
Organisation: Panchayati Raj Department	**Organisation:** Panchayati Raj Department
Location: Mandu Block, Ramgarh District, Jharkhand	**Location:** Mandu Block, Ramgarh District, Jharkhand

Both Panchayat representatives expressed strong support for the proposed Solar Didi and Solar Microgrid models and indicated their willingness to facilitate implementation at the community level. They acknowledged that renewable energy interventions could contribute significantly to improving energy access, supporting livelihoods, and strengthening local economic development.

While neither Panchayat has yet integrated such initiatives into Gram Panchayat Development Plans (GPDPs), both representatives expressed openness to incorporating renewable energy-based livelihood interventions in future planning processes. Ms. Roopan Devi further noted that limited availability of dedicated financial resources at the Panchayat level may affect implementation unless external support mechanisms are established.

Community Acceptance of Renewable Energy

The interviews revealed a generally positive perception of renewable energy among community members. Both Panchayat representatives observed that villagers tend to trust government-supported development initiatives and are likely to support solar-based interventions if tangible benefits are demonstrated.

Mr. Etwa Manjhi emphasized that communities often prefer to observe the outcomes of new initiatives before actively participating, highlighting the importance of pilot demonstrations and trust-building efforts. Similarly, Ms. Roopan Devi stated that awareness campaigns and community mobilization activities would be important for ensuring widespread participation and ownership.

Women's Participation in Technical and Enterprise Roles

Both representatives strongly supported the idea of women undertaking technical responsibilities related to solar systems. They believed that local women can effectively participate in installation support, operation, maintenance, and minor repair activities if appropriate training and institutional support are provided.

Ms. Roopan Devi particularly emphasized that women in her Panchayat would face minimal social resistance in taking up technical roles, provided family support and adequate training opportunities are available. Both representatives viewed the proposed Solar Didi model as a practical mechanism for promoting women's economic empowerment while simultaneously addressing local maintenance needs.



Existing Solar Systems and Maintenance Challenges

A major concern raised by both Panchayat representatives was the poor maintenance of government-installed solar infrastructure. Several solar systems installed in their respective Panchayats were reported to be non-functional due to inadequate maintenance arrangements, delayed repair services, and the absence of locally available technical support.

Mr. Etwa Manjhi explained that villagers often seek assistance from local technicians for minor repairs; however, major repair costs frequently result in systems remaining non-operational for extended periods. Ms. Roopan Devi similarly reported that weak maintenance systems and the high cost of repairs have reduced the effectiveness of existing solar infrastructure. Both representatives felt that the presence of trained local Solar Didis could significantly improve maintenance efficiency and long-term sustainability.

Livelihood Diversification and Economic Transition

Both Panchayats are actively promoting alternative livelihood opportunities in response to uncertainties surrounding mining-based employment. Livestock rearing, agriculture, and small-scale enterprises were identified as important livelihood options capable of reducing dependence on coal-linked income sources.

Mr. Etwa Manjhi highlighted ongoing efforts to promote tailoring, candle-making, livestock rearing, and linkages with government livelihood schemes. Ms. Roopan Devi emphasized bamboo and basket-making activities, organic vegetable cultivation, and strengthening access to government programmes as important livelihood diversification strategies within Pundi Panchayat.

The discussions reflected a common understanding that future livelihood security will depend upon creating sustainable and diversified economic opportunities beyond the mining sector.

Solar-Powered Women Enterprises

Both Panchayat representatives viewed solar energy as a potential catalyst for women-led enterprise development. Tailoring units, food processing enterprises, and other small-scale production activities were identified as suitable sectors that could benefit from reliable and affordable solar-powered electricity.

The representatives emphasized that access to dependable energy could improve productivity, reduce operating costs, and create new economic opportunities for women and rural households.

Land Availability and Infrastructure Considerations

The interviews highlighted certain practical considerations related to the establishment of solar infrastructure. Mr. Etwa Manjhi identified land availability as a potential challenge, noting that community members may be reluctant to allocate land unless clear benefits and incentives are demonstrated.

Ms. Roopan Devi suggested that abandoned or closed coal mining areas could potentially be explored for future solar infrastructure development, thereby supporting both renewable energy expansion and post-mining land utilization.

Community Willingness to Pay for Reliable Electricity

Both Panchayat representatives indicated that households would likely be willing to pay for reliable electricity services if consistent supply and quality could be ensured. However, affordability considerations would remain important, particularly for economically vulnerable families.

Ms. Roopan Devi emphasized the importance of flexible payment mechanisms and subsidized pricing arrangements to ensure equitable access, while Mr. Etwa Manjhi highlighted the need to demonstrate service reliability before expecting widespread community investment.

4. Key Findings from Key Informant Interviews4.1 Strong Need for Livelihood Diversification in Mining-Affected Areas

Finding: All stakeholders acknowledged the growing uncertainty associated with coal mining-based livelihoods and emphasized the need to create alternative income opportunities for rural households.

Recommendation: Future interventions should prioritize livelihood diversification through women-led enterprises, agriculture-based value chains, and renewable energy-linked income generation opportunities to reduce dependence on mining-related livelihoods.

4.2 Renewable Energy Viewed as a Development and Livelihood Opportunity

Key Finding: Stakeholders viewed decentralized solar systems not only as an energy solution but also as a potential driver of local economic development.

Recommendation: Pilot Solar Microgrid models should be designed to support productive energy use, particularly for women-led enterprises and micro-businesses.

4.3 High Potential for Women-Led Solar Enterprises

Finding: Stakeholders expressed confidence that women can successfully manage solar enterprises and technical responsibilities if appropriate support is provided.

Recommendation: Dedicated capacity-building programmes should be developed for women, combining technical skills, enterprise development, financial literacy, and market linkage support. Convergence of JSLPS and Jharkhand Skill Development Mission is Recommended.

4.4 Absence of Dedicated Green Skill Programmes

Finding: The District Skill Officer reported that no dedicated green skill or solar technician training programme is currently being implemented in Ramgarh district, despite growing future demand for renewable energy-related skills.

Recommendation: The proposed Solar Didi model can fill this institutional gap by creating a structured pathway for training local women and youth as solar technicians and renewable energy service providers.

4.5 Existing Solar Systems Face Serious Maintenance Challenges

Finding: Several government-installed solar systems were reported to be non-functional due to weak maintenance arrangements and lack of local technical support.

Recommendation: A village-level Solar Didi cadre may be piloted to observe first-line maintenance service and troubleshooting

4.6 Local Technical Capacity Remains Limited

Finding: The interviews highlighted a significant shortage of trained solar technicians and local repair service providers.

Recommendations: A long-term sustainability of renewable energy interventions can be experimented by building village-level technical capacities and establishing accessible maintenance support mechanisms.

4.7 Skill Development Systems Need to Align with Emerging Green Economy Opportunities

Finding: District-level stakeholders emphasized the growing importance of green skills in sectors such as solar energy, off-grid systems, maintenance services, and energy-related enterprises.

Recommendation: A localised demand-driven, and community-oriented training models is recommended that can prepare youth and women for future employment opportunities.

4.8 Institutional Convergence Will Be Essential for Success

The interviews highlighted the importance of coordinated action among government departments, Panchayati Raj Institutions, livelihood missions, skill development agencies, and community organizations. Stakeholders emphasized that successful implementation of solar-based livelihood models will require strong institutional convergence, community mobilization, and sustained support systems.

4.9 Financial and Structural Constraints Need to be Addressed

Finding: Several challenges were identified that could affect implementation, including financial vulnerability of households, limited access to capital, weak market linkages, subsidy dependency, land availability concerns for solar infrastructure, and the absence of dedicated funding mechanisms at the Panchayat level.

Recommendation: The GP facilitation team can support the panchayat to propose Solar Didi Skill training program under GPDP on a pilot basis.

Convergence of Services and Resources: JSLPS and JSDM can converge the resources for solor based micro grid micro enterprises and also develop solor didi cadre.

4.10 Panchayats Demonstrated Readiness to Support Renewable Energy Initiatives

Both Panchayat representatives expressed willingness to support and integrate solar-based interventions within local development processes. Stakeholders indicated that renewable energy initiatives could be incorporated into village-level planning mechanisms, provided adequate technical guidance, financial resources, and institutional support are available.

Collectively, the interviews indicate a favourable ecosystem for piloting Solar Microgrid–Enabled Women Enterprises and Solar Didi–Led Skill Development Models in Ramgarh district.

CHAPTER 03



Strategic Recommendations

The feasibility assessment undertaken across five Gram Panchayats of Mandu Block in Ramgarh district presents compelling evidence that decentralized renewable energy can play a transformative role in addressing the intertwined challenges of energy insecurity, livelihood vulnerability, women's economic exclusion, and the emerging uncertainties associated with coal-dependent economies. The findings from household surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) reveal a convergence of community aspirations around reliable electricity, sustainable livelihoods, improved service delivery, and enhanced opportunities for women and youth.

The study demonstrates that while electrification has reached most households, access to reliable and quality power remains a significant challenge. Frequent power interruptions, voltage fluctuations, inadequate maintenance services, and the absence of localized technical support continue to constrain both household well-being and productive economic activities. Simultaneously, the district is witnessing increasing concern regarding the long-term sustainability of coal-based livelihoods, creating an urgent need for alternative economic pathways that are socially inclusive, environmentally sustainable, and economically viable.

Against this backdrop, the proposed Solar Microgrid-Enabled Women Enterprise and Solar Didi-Led Skill Development Model emerges as a promising intervention that addresses multiple development objectives simultaneously. It offers an opportunity to strengthen energy access, promote green livelihoods, create local technical capacities, and position women as active agents in the district's transition towards a more resilient and diversified rural economy.

The **recommendations** presented below are grounded in field evidence and designed to inform policymakers, development partners, funding agencies, local governance institutions, and implementation agencies seeking to promote a just, community-centered energy transition in Ramgarh district.

1. Establish 10 Pilot Solar Microgrid Demonstration Villages as Models for Just Energy Transition

The feasibility assessment demonstrates a high level of community readiness for decentralized renewable energy systems. The overwhelming willingness of respondents to adopt reliable community-based electricity systems, coupled with strong demand for productive energy use, provides a compelling case for moving from assessment to implementation.

The next phase should therefore establish **10 Pilot Solar Microgrid Demonstration Villages** across strategically selected mining-affected Gram Panchayats of Ramgarh district. These pilot villages should serve as integrated demonstration sites where decentralized renewable energy is linked with livelihood enhancement, enterprise development, women's leadership, and community-based energy governance.

Each demonstration village should integrate:

- Reliable electricity supply for households.
- Solar-powered irrigation and drinking water systems.
- Energy-enabled livelihood and MSME clusters.
- Solar-powered community infrastructure including schools, health centres and common facilities.
- Community Energy Management Committees.
- Solar Didi-led operation and maintenance services.
- Digital metering, payment and monitoring systems.

Rather than functioning as isolated infrastructure projects, these demonstration villages should become learning laboratories capable of generating technical, financial and social evidence for replication across other mining and rural districts of Jharkhand.

2. Establish a Solar Didi Skill Development and Certification Programme as a Green Skills

One of the strongest findings emerging from the household survey, FGDs and KIIs is the overwhelming community acceptance of women-led energy management systems. Respondents expressed high levels of trust in local women managing solar infrastructure, while Panchayat representatives and district stakeholders recognised the opportunity to create a cadre of locally available renewable energy professionals.

Accordingly, a structured Solar Didi Skill Development and Certification Programme should be established to develop village-level women technicians, entrepreneurs and energy service providers. The programme should be linked with nationally recognised skill certification frameworks and implemented in convergence with JSDMS, JSLPS, JREDA, technical institutions and CSR partners.

Beyond technical competencies, the curriculum should include:

- Solar PV installation and commissioning.
- Preventive maintenance and troubleshooting.
- Battery and inverter management.
- Meter reading and digital billing.
- Customer service and grievance handling.
- Enterprise management.
- Financial literacy and bookkeeping.
- Occupational health and safety.
- Leadership, communication and community mobilisation.

The programme should also create pathways for Solar Didis to establish micro-enterprises providing installation, maintenance and after-sales services, thereby generating sustainable green employment while strengthening long-term functionality of decentralized renewable energy systems.

3. Create Solar-Powered Women's Enterprise Clusters

The study reveals that women's entrepreneurship in Ramgarh remains largely informal, home-based, and concentrated in low-investment activities such as tailoring, food processing, livestock rearing, petty trade, and household production systems. However, there exists considerable latent demand for livelihood diversification and self-employment opportunities.

Future interventions should support the development of Solar Enterprise Clusters that combine reliable energy access with skill development, business incubation, market linkage support, and financial inclusion services. Potential sectors include:

- Tailoring and garment production units
- Food processing and value addition enterprises
- Solar-powered irrigation and water services
- Dairy and livestock enterprises
- Digital service centres
- Rural retail and service businesses
- Bamboo and traditional craft-based enterprises

The objective should be to create an ecosystem where energy access directly translates into income generation and enterprise growth.

4. Strengthen Community Ownership and Governance Systems

The sustainability of decentralized energy systems depends as much on governance arrangements as on technology. Experiences shared during FGDs and KIIs indicate that several existing solar installations became non-functional due to weak accountability structures and the absence of local ownership mechanisms.

Village-level Solar Energy Management Committees should therefore be established under Panchayat leadership with representation from:

- Self-Help Groups
- Solar Didis
- Panchayat representatives
- Youth groups
- Community leaders
- Beneficiary households

These committees should oversee operations, maintenance planning, user engagement, grievance redressal, tariff collection, and infrastructure protection.

5. Develop Affordable and Inclusive Financing Models

While willingness to pay for reliable electricity is high, affordability remains a critical consideration, particularly for vulnerable households and communities currently benefiting from subsidized electricity arrangements. A one-size-fits-all tariff structure may limit adoption and long-term sustainability. Flexible financing mechanisms should therefore be explored, including:

- Tiered tariff systems
- Pay-as-you-use models
- Community contribution mechanisms
- Cross-subsidization for vulnerable households
- Livelihood-linked payment systems
- Blended finance and CSR-supported models
- Affordability must be balanced with long-term operational sustainability.

6. Invest in Community Awareness and Behaviour Change Campaigns

The study highlights that awareness gaps, misconceptions regarding solar technology, and concerns arising from previous non-functional installations continue to influence community perceptions. Successful implementation will require sustained investment in awareness-building and confidence generation. A district-wide awareness strategy should focus on:

- Demonstration sites and pilot installations
- Community meetings and Gram Sabha engagements
- SHG-led awareness campaigns
- Exposure visits
- Village-level renewable energy champions
- IEC materials in local languages

Awareness efforts should particularly target women, youth, and local institutions to build long-term ownership.

7. Integrate Solar Interventions within the Just Transition Agenda

A significant finding emerging from the study is the widespread perception that coal-dependent livelihoods may become increasingly uncertain in the future. Respondents expressed concerns regarding employment security, livelihood stability, and future economic opportunities. Solar interventions should therefore be positioned within a broader Just Transition framework that seeks to:

- Reduce economic vulnerability in mining-affected communities
- Create green jobs and local enterprises
- Promote livelihood diversification
- Strengthen community resilience
- Enhance women's economic participation
- Build future-ready skills among rural youth

Such an approach aligns climate action with social justice and economic inclusion.

8. Strengthen Institutional Convergence for Scale and Sustainability

The feasibility assessment demonstrates significant opportunities for collaboration among government agencies, Panchayati Raj Institutions, livelihood missions, skill development programmes, CSR initiatives, and development partners.Future implementation should actively leverage convergence with:

- Jharkhand State Livelihood Promotion Society (JSLPS)
- Jharkhand Skill Development Mission Society (JSDMS)
- Panchayati Raj Institutions
- Jharkhand Renewable Energy Development Agency (JREDA)
- CSR initiatives operating in mining regions
- Women's Self-Help Group federations

Institutional convergence will improve resource efficiency, reduce duplication, and enhance long-term sustainability.

Way Forward

The evidence generated through this study provides a strong foundation for transitioning from feasibility assessment to pilot implementation. A phased approach beginning with **10 Pilot Solar Microgrid Demonstration Villages,** supported by **Solar Didi Skill Development and Certification Programme,** offers an opportunity to test an integrated model that combines decentralized renewable energy, livelihood enhancement, women's economic empowerment, community governance and local enterprise development. These demonstration sites should function as innovation and learning hubs capable of generating evidence for technical performance, financial sustainability, livelihood outcomes and institutional scalability, thereby informing future expansion across Ramgarh and other mining-affected districts of Jharkhand.

The next phase should focus on implementing **a demonstration model** in selected Panchayats that integrates solar microgrids, Solar Didi training, enterprise development support, and community governance mechanisms within a single implementation framework. Such pilots should be designed as learning laboratories capable of generating evidence on technical performance, financial viability, social acceptance, livelihood outcomes, and institutional sustainability.

If implemented effectively, the proposed model can evolve beyond an energy intervention and become a scalable framework for promoting inclusive rural development, women's leadership, green employment, and community resilience in coal mining-affected regions. The transition underway in Ramgarh presents not merely a challenge, but a strategic opportunity to build a locally grounded, economically resilient, and socially just development pathway powered by renewable energy and community ownership.

The study concludes that the feasibility of **Solar Microgrid-Enabled Women Enterprises and Solar Didi-Led Skill Development Models in Ramgarh** is not merely **technical or financial; it is fundamentally social, institutional, and developmental**. The communities surveyed have articulated a clear demand for reliable energy, sustainable livelihoods, localized technical support, and greater economic opportunities for women. By responding to these aspirations through an integrated and participatory approach, stakeholders can create a model that simultaneously advances energy access, livelihood security, gender empowerment, and just transition objectives. The success of such an initiative will depend on sustained community engagement, strong institutional partnerships, and a long-term commitment to building local capacities and ownership. The findings therefore provide a strong evidence base for moving from feasibility assessment to pilot implementation and eventual scale-up across mining-affected regions of Jharkhand.