Progress Report, July 2024

# Support to Ashoka Centre for a People-centric Energy Transition (ACPET)

**Project I: Transitioning Mining Communities to Sustainable Lives and Livelihoods**

**&**

**Project II: Energy Transition Financing**

Submitted to:

HSBC India

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# Project I: Transitioning Mining Communities to Sustainable Lives and Livelihoods

## Project objective

**The Ashoka Centre for a People-centric Energy Transition (ACPET)** is working on a project titled "**Transitioning Mining Communities to Sustainable Lives and Livelihoods (Trans-Mine)**" to aid mining communities in India in moving toward sustainable futures. The project focuses on several key areas, which include:

- analyzing current mine closure practices,
- understanding the impacts of coal mine closures,
- evaluating community readiness and aspirations for development, including earning opportunities and careers,
- suggesting policy actions around the people-centric transition requirements and providing support.

The project emphasizes community-specific strategies to ensure economic viability, social responsibility, and environmental sustainability in transitioning from coal mining, aligning with India's commitment to balanced energy transition, economic growth, and social equity. The '**Trans-Mine'** project seeks to engage with a wide range of stakeholders and affected groups to

- Understand impact pathways around mine closure;
- Analyze current mine closure strategies and policies;
- Map possible people-centric mine closure approaches and interventions;
- Draw out aspirations and expectations of communities at one mine site;
- Co-design (with affected groups and other stakeholders) detailed plans and initiating interventions in the selected mining site;
- Inform policy based on all of the above.

The 'Trans-Mine' Project has two phases.

**Phase 1** will focus on selecting a recently abandoned/discontinued mine site for the project, conducting stakeholder consultations with representatives of organizations that will have a close bearing on the mine closure actions and policies, conducting qualitative and quantitative surveys on the ground with impacted communities, feeding into relevant mine closure plans and frameworks, and co-designing interventions that could be demonstrated on the ground.

**Phase 2** will include facilitating (and/or demonstrating) on-ground pilots towards a people-centric mine closure linked to the impacted community's livelihoods, skilling/re-skilling, and experience-sharing workshops, all in cognizance and/or collaboration with the mining R&R (Rehabilitation and Resettlement), CSR (Corporate Social Responsibility), District development administration, State energy transition task force, etc.

**Site selection - Identifying an "abandoned mine":**

For identifying a field site, ACPET conducted various meetings with concerned officials of the Ministry of Coal (Project Adviser), Coal Controller Organization (Coal Controller), World Bank (Consultant & Adviser), Coal mine planning & design Company (CMPDIL), Central coalfield limited (CCL) and State authorities (Jharkhand Taskforce), etc. Considering the outcome and thorough discussions of the meetings above, mine site selection parameters are established. After multiple field visits, site evaluations (both Govt. & private-owned mines), and considering the alignment with the project requirements, the team selected the Rajhara colliery/ coal mine site of CCL in Jharkhand. The rationale for site selection is attached in Annexure: 1

**Field Survey** - The project team forged a strategic partnership with a survey agency, Athena Infonomics, to facilitate comprehensive data collection at the identified field site.

# Methodology

The study employed a mixed-method design, combining qualitative interviews with quantitative surveys to comprehensively analyze the impact of coal mine closure on mine adjacent communities. The study covered habitations whose community was mostly involved directly and indirectly on coal mine dependent incomes (located round the mine periphery), instead of surveying full revenue villages, which will have part of its area impacted by mine discontinuity. Through structured interviews with households affected directly and indirectly by the mine discontinuity, and qualitative methods such as Focus Group Discussions (FGDs) and Key-Informant Interviews (KIIs), with other village stakeholders and village representatives, diverse stakeholder perspectives were captured. A formative visit preceded primary data collection. The purpose was, to understand the multi-dimensional impact of coal mine discontinuity, and to identify the groups impacted directly and indirectly in consultation with the community; in order to understand key indicators and list issues and questions to be included in the designing of the survey tools.

Focused on the discontinued Rajhara Coal mines in Jharkhand's Palamu district, the study assessed post-discontinuation impacts, emphasizing the unique circumstances surrounding Rajhara's mine discontinuity first in 2010 and then again in 2022, after a brief period of mining operations in a part of the mine complex during 2019-2022. The impact of mine discontinuity was more discernible in Rajhara, due to its isolated setting – not amidst a mine cluster, as in the case of other mining areas, which buffer the impact of closure for a group of mines, as part of the employment loss is absorbed.

In each of the impacted habitations, a list of impacted households (direct and indirect) was generated in discussion with community members and village representatives. A systematic random sampling approach was undertaken to select the households from this list. A total of 201 households were covered across 5 study hamlets/habitations – about 40 households in each habitation. The study habitations were a part of two revenue villages – Rajhara and Pandwa, and discussions with PRI members were undertaken for these two villages respectively to get the village level contextual information. Additionally, 10 FGDs were conducted with the community members. In-depth interviews were undertaken with representatives from Central Coalfields Limited (CCL) and various relevant government officials at district and state level.

# Evidence-based suggestions: for field-level intervention/s

The project team has undertaken a primary survey to understand the impact of Coal Mine Closure and transitioning mining communities to sustainable lives. The study employed a mixed-method design, combining qualitative interviews with quantitative surveys to comprehensively analyze the impact of coal mine closure on mine adjacent communities. The study covered habitations whose communities were directly and indirectly involved in coal mine-dependent incomes (located around the mine periphery) instead of surveying entire revenue villages, which will have part of their area impacted by mine discontinuity. Through structured interviews with households affected directly and indirectly by the mine discontinuity, and qualitative methods such as Focus Group Discussions (FGDs) and Key-Informant Interviews (KIIs), diverse stakeholder perspectives were captured with other village stakeholders and village representatives.

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A list of impacted households (direct and indirect) was generated in discussion with community members and village representatives in each of the impacted habitations. A systematic random sampling approach was undertaken to select the households from this list. Two hundred-one households were covered across 5 study hamlets/habitations – about 40 households in each habitation. The study habitations were part of two revenue villages – Rajhara and Pandwa, and discussions with PRI members were undertaken for these two villages, respectively, to get the village-level contextual information. Additionally, 10 FGDs were conducted with the community members. In-depth interviews were undertaken with Central Coalfields Limited (CCL) representatives and various relevant government officials at district and state levels.

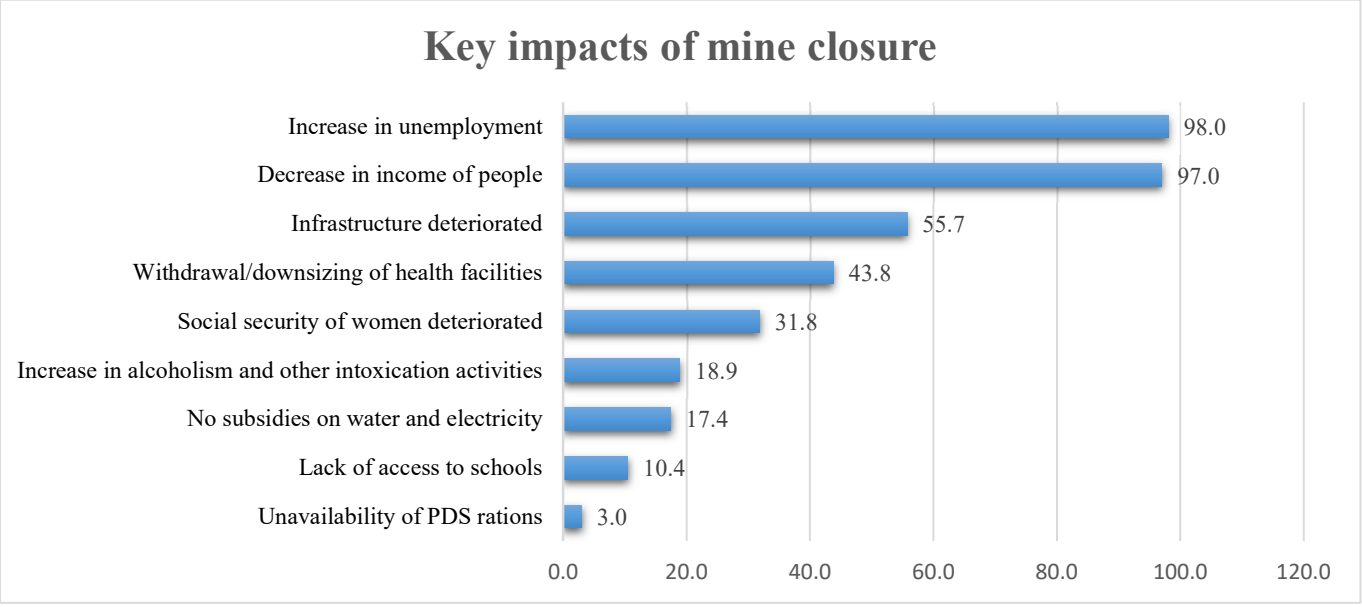


*Figure 1: Graphical representation of key impact*

*The survey conducted between Jan-Feb 2024 at Rajhara Colliery of CCL, captures the following insights and put forth specific recommendations –*

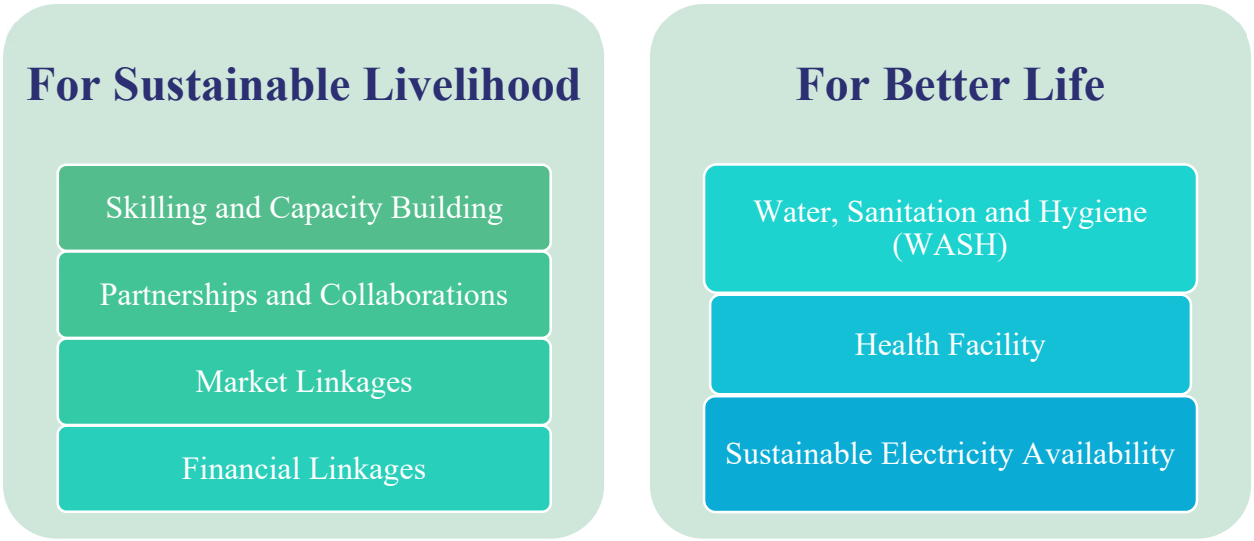


*Figure 2: Life and livelihood bucket list*

# For Sustainable Livelihood

## *Skilling and Capacity Building*

### Evidence:

- *Only 3% of households reported any members enrolled in skills training programs. Despite this, 89% expressed keen interest in pursuing additional or alternative livelihoods.*
- *78% of households reported that women did not engage in income-generating activities. Among the remaining families, most women worked as unskilled, non-agricultural labourers.*
- *28% of households own animals. However, 91% only use animal products for self-consumption.*

### Recommendations:

*Community Engagement and Awareness Campaigns:*

- Engage with community leaders to identify and reach potential candidates for skilling programs, leveraging their influence and to encourage participation etc.
- Conduct targeted awareness campaigns to inform residents about available skilling schemes, highlighting the benefits and enrolment process to maximize participation and uptake.

*Strengthening SHGs:*

- Strengthen existing SHGs in the village by providing comprehensive training programs to empower women within these groups.
- Offer training sessions covering financial literacy, entrepreneurship, and basic business management to equip women with essential skills for effectively managing group enterprises.
- Conduct skill development workshops focused on locally viable income-generating activities, enabling women to explore alternative livelihood options and enhance their economic resilience.
- Facilitate the formation of Farmers Producers Organisation (FPO's) by engaging SHG members, local NGO's, farmers etc (can include agriculture and animal husbandry-based enterprises). The purpose of an FPO is to maximizing opportunities for income generation.

*Improved Animal Husbandry*

- Provide comprehensive training and resources on improved animal management practices, covering feeding, breeding, healthcare, and disease prevention.
- Address existing knowledge gaps among farmers to foster sustainable livestock-rearing practices and enhance economic prospects for the community.

*Agriculture Revival*

- Explore educational initiatives to empower farmers with knowledge of comprehensive regenerative agricultural practices, including effective land preparation techniques, soil health management, and weed management strategies.
- Provide training and technical support on holistic farming methods to enhance crop productivity, resilience to environmental challenges, and overall agricultural sustainability.
- Introduce efficient irrigation methods such as drip irrigation, sprinkler systems, and mulching to optimize water use and enable cultivation in areas with limited water resources.
- Enhance water efficiency in agriculture, ensuring sustainable water management practices to mitigate the impact of water scarcity on crop production.

## *Partnerships and Collaborations*

### Evidence:

- According to district records, the nearest Industrial Training Institute (ITI) is approximately 10 km from Rajhara, while the closest Pradhan Mantri Kaushal Kendra (PMKK) center is less than 10 km away. Currently, three skilling schemes are operational in the district – Saksham Jharkhand Kaushal Vikas Yojana (SJKVY), Deen Dayal Upadhyay Kaushal Kendra (DDUKK), and Block Level Institute for Rural Skill Acquisition (BIRSA). However, none of these schemes have candidates registered from Rajhara Colliery.
- District records indicate that 381 households are linked to Self-Help Groups (SHGs), with 32 active groups in Rajhara Colliery. However, women often utilize loans for personal consumption rather than income-generating activities.
- 90% of farmers can be categorized as marginal or tiny, yet none are covered under the PM-Kisan Scheme.

### Recommendations:

*Linking people to relevant government schemes:*

- Link eligible candidates to the nearest ITI and PMKK center to facilitate access to existing training programs.
- Link farmers and SHG groups to relevant government schemes (many of which have been listed in the report) to facilitate income-generating activities.

*Collaboration with domain experts:*

- Initiatives in animal husbandry and agriculture promotion need to be carried out in collaboration with specialized agencies that are experts in the domain.
- Collaborate with government agencies, NGOs, and other stakeholders to provide support and resources for SHG capacity building and enterprise development.

*Collaboration with relevant government departments:*

- Animal husbandry and agriculture promotion should also involve the agriculture department and Kisan Seva Kendras to ensure comprehensive support and guidance for farmers.

## *Market Linkages*

### Evidence:

- For any produce in the vicinity of Rajhara Colliery, there needs to be market linkage and a well-structured supply chain.
- Moreover, initiatives regarding market linkages need to be documented from any source, given the absence of specific income-generation activities identified in the area.

### Recommendations:

*Establishment of Designated Supply Chain:*

- Establish a designated supply chain for agricultural produce, dairy, and poultry collection to streamline distribution and maximize market access.
- Raise awareness among the population about the importance of the supply chain, emphasizing its role in improving income generation opportunities and promoting economic growth in the community.

*Thorough Market Mapping:*

- Conduct thorough market mapping before engaging in any income-generating activity, identifying key stakeholders, market dynamics, and relevant factors.
- Assess the viability of income derived from each product through market research and analysis, ensuring informed decision-making and maximizing returns on investment.

*Implementation Strategy:*

- Develop a comprehensive implementation strategy for establishing the designated supply chain and conducting market mapping activities.
- Engage local stakeholders, including farmers, producers, traders, and relevant government agencies, to collaborate on the implementation process and ensure its success.

*Capacity Building:*

- Provide training and capacity-building programs to local entrepreneurs and producers on market linkages, value chain development, and business management.
- Equip participants with the skills and knowledge necessary to navigate the market effectively and capitalize on income-generating opportunities.

## *Financial Linkages*

### Recommendations:

*Access to finance and credit:*

- Enable access to microfinance schemes and credit for investment for farmers, SHGs, and other households (for income-generating activities).

*Support for small-scale enterprises:*

- Provide support for infrastructure development, such as the construction of low-cost shelters and feeding troughs, to encourage the establishment of small-scale livestock enterprises.
- Empower farmers to diversify their income sources and increase resilience by developing sustainable livestock businesses.
- Facilitate access to financial resources for infrastructure development and investment in agricultural enterprises.

*Value addition:*

- Facilitate value addition (in terms of packaging and products – like ghee, paneer, curd, khoya) and marketing initiatives to increase livestock product profitability and improve farmers' income generation opportunities.
- Enhance on-farm value addition within the village to optimize profitability and livelihood opportunities.

# For Better Life

## *Water, Sanitation and Hygiene (WASH)*

### Evidence:

- ***The majority of households (45.3%) rely on tubewells/boreholes for drinking water, while 42% depend on public taps.***
- ***24% of households possess agricultural land, with only 3 out of 49 farmers having some irrigation systems.***
- There is acute water scarcity, especially during warmer seasons, with reliance on a nearby river that often dries up.
- The mining company (occasionally) supplies water for agriculture to a large area within its lease boundary. Hence a huge dependency on mining company by the neighbouring communities for watering fields.
- The Jal Jeevan Mission (JJM) has yet to reach households in Rajhara Colliery.
- ***Among the sampled households, 51% possessed toilet facilities.*** However, even within this subset, a significant majority continued to resort to open defecation. Reasons for this preference included inadequate maintenance of existing toilets, lack of water supply, and entrenched habits favoring open defecation.
- The study area needs more sewage systems and waste disposal mechanisms. Due to the absence of proper waste management infrastructure, household waste is often indiscriminately disposed of in agricultural fields and nearby open areas.

### Recommendations:

*Collaboration with Government Authorities:*

- Forge strategic partnerships with pertinent government agencies to spearhead the implementation of a comprehensive piped water supply system that aligns with the objectives outlined in the JJM.
- Coordinate closely with local municipalities, water boards, and regulatory bodies to ensure regulatory compliance, streamline permitting processes, and optimize resource allocation for efficient project execution.

*Promotion of Rainwater Harvesting Systems:*

- Facilitate the design, installation, and maintenance of rainwater harvesting infrastructure in households, public institutions, and community spaces, leveraging local expertise and resources.
- Create a self-sustainable “water management system” in partnership with coal company, local administration etc and align the grants under PM KUSUM scheme/s, DMF etc
- Provide technical assistance and financial incentives to incentivize rainwater harvesting and storage adoption, empowering residents to harness this untapped water resource for domestic use, storage for some months, groundwater replenishment, and agricultural irrigation.

*Promotion of Watershed Management:*

- Prioritize the restoration and protection of groundwater sources to ensure their long-term sustainability for drinking and domestic purposes. Implement rainwater harvesting and contour bunding, and check dams and percolation tanks to recharge the ground-level aquifer, enhancing groundwater resources.

- Implement integrated land and water management practices such as crop rotation, crop diversification, soil treatment, and rotational grazing to improve soil fertility and water retention.
- Facilitate community-based initiatives for afforestation and sustainable water resource management to promote holistic watershed conservation.
- Provide training and capacity-building programs to empower communities with the knowledge and skills needed to manage their watershed resources sustainably.
- Explore the feasibility of establishing water ATMs.

*Toilet Construction and Behaviour Change Campaign:*

- Roll out a comprehensive program under the Swachh Bharat Mission to ensure the construction of good quality toilets in all households, addressing the pressing need for improved sanitation facilities. Encourage households to upgrade their existing toilets and to get them into use.
- Launch a behaviour change communication campaign targeting community members, emphasizing the importance of using toilets and adopting proper sanitation practices to mitigate health risks associated with open defecation.
- To effectively engage and mobilize residents towards behavior change, utilize a mix of traditional and innovative communication channels, including community meetings, door-to-door outreach, and multimedia campaigns.

*Waste Management Infrastructure and Promotional Initiatives:*

- Establish designated waste collection points with segregation bins for biodegradable, non-biodegradable, and recyclable waste, promoting responsible waste disposal practices and facilitating efficient waste management.
- Implement community-led initiatives to promote waste segregation at the source and reduce littering practices, fostering a culture of environmental stewardship and sustainable waste management.
- Install community composting units to facilitate organic waste recycling, turn waste into valuable compost for agricultural use, and promote circular economy principles.

## *Health Facility*

### Evidence:

- ***Approximately 44% of respondents indicated that health facilities were reduced or downsized after the coal mines were discontinued.***
- They reported a low incidence of respiratory illnesses in households (6.5%).
- The nearest Community Health Center (CHC) is 15 km away in Patan, the block headquarters. Primary Health Centers (PHC) and Health and Wellness Centers (HWC) are located at 12 km and 10 km, respectively.
- In emergency situations, residents are compelled to travel to Daltonganj through private or public transport, as only three ambulances are available at the CHC, one of which is designated for 108 emergency services.
- More specific efforts must be made regarding menstrual hygiene, anemia, nutrition, or coverage under the Aayushman Bharat scheme.
- Although iron and vitamin A tablets are distributed, awareness and consumption records must be more adequately maintained.
- The Janani Shishu Suraksha Karyakram (JSSK) has limited coverage in the Rajhara area. Child health initiatives such as the Rashtriya Kishor Swasthya Karyakram (RKSK) and Mission Indradhanush also need more coverage.

## Recommendations:

*Establishment of Health and Wellness Centers:*

- Collaborate with relevant government departments to establish a sub-centre or Health and Wellness Centre (HWC) in the vicinity. This would ensure convenient access to essential medical services for residents and promote overall well-being.
- Ensure these facilities are well-equipped with diagnostic services for respiratory illnesses (which can investigate and ascertain that there is no damage from coal dust and other pollutants) and other common ailments, enabling timely and accurate diagnosis and treatment.

*Operationalizing Mobile Medical Units:*

- Operationalize a mobile medical unit, either under a government scheme or through collaboration with a non-governmental organization (NGO), to facilitate healthcare delivery in underserved areas lacking fixed healthcare infrastructure.
- Mobilize medical assistance directly to communities, ensuring accessibility and inclusivity in healthcare delivery.

*Capacity Building for Frontline Workers:*

- Capacitate frontline workers to conduct regular check-ups and screenings, identify women and children at risk of nutritional deficiencies and provide appropriate interventions and referrals.
- Provide training on menstrual hygiene, anemia prevention, nutrition, and the benefits of Aayushman Bharat coverage to frontline workers, ensuring effective dissemination of vital health information to the community.

*Awareness Initiatives:*

- Initiate awareness campaigns on chronic obstructive pulmonary diseases (COPDs), educating residents about symptoms, treatment options, and timely medical care.

### *Sustainable Electricity Availability*

#### Evidence:

- Solar power adoption needs to be improved, as schemes like PM-Kusum are deemed inapplicable.
- Solar rooftops are limited to specific facilities such as block offices, schools, staff quarters, and CHCs/PHCs.
- Additionally, the solar grid is situated 80 km away, contributing to the absence of solar streetlights in the area.

#### Recommendations:

*Assessing Feasibility and Collaboration:*

- Collaborate with local authorities and energy companies to conduct a feasibility study on establishing local solar grids or mini-grids in the area.
- Assess such systems' technical, economic, and environmental viability to determine their suitability for reducing dependency on distant solar grids and enhancing energy access in the community.

*Implementation of Solar Infrastructure:*

- Implement local solar grids or mini-grids to reduce reliance on distant solar grids and provide the community with reliable and sustainable electricity access.
- Install solar streetlights and other community solar projects to enhance lighting infrastructure and improve safety and security in the area.

*Community Engagement and Empowerment:*

- Engage community members in planning and implementing solar energy projects, ensuring their participation and ownership in decision-making processes.
- Provide training and capacity-building programs to empower community members to maintain and operate solar infrastructure, promoting sustainability and self-reliance in energy management.

# Statutory provisions for mine closure:

## *Introduction*

Minerals & fossil fuels are located within the earth's crust and discovered through systematic exploration by drilling, seismic surveying, or other geophysical means. In each case, the deposit of such minerals is specific, and various mining techniques are used to win them from the lap of the mother earth at the specified location. Mining is a temporary business as the reserves are limited (limited by its extent, mineable potential, and techno-financial viability). Every mining operation is bound to face closure after resource exhaustion or a change in the economics of mining.

A country's development is largely dependent on the availability of raw materials and energy sources. The mining industry provides the necessary fossil fuels and minerals for the growing energy demands and the metals required for sustaining modern civilization. In general, most of the mines are located in remote areas or villages of economically and opportunity-deprived communities.

Opening a new mine in a remote area brings many social changes in the vicinity. The people cope with the changes and start living a new lifestyle, and the neighbouring community becomes dependent on the mining operations. Therefore, mine closure can induce a high level of social stress on the community and, if not adequately addressed in time, can lead to social unrest, agitations, and even terrorism. Hence, it is essential that mine closure is planned and effective to avoid social risks and reduce the post-closure liabilities and economic burden of the mining company and the government.

Managing the environmental impacts of mining and rehabilitation of mine land after closure have been major concerns for governments and mining companies.

In most countries, mining companies must prepare rehabilitation and reclamation plans before starting mining operations, and financial surety is required to ensure reclamation. However, such stringent regulations have yet to be imposed to address the local social and economic impacts of mine closure. The stresses induced by mine closure on the people living in the mining areas and their impacts on quality of life need to be addressed adequately.

## *Mine Closure Guidelines*

**Mine Closure Rule under Mineral Concession (Amendment) Rules, 2020 & Guidelines for preparation, formulation, submission, processing, scrutiny, approval and revision of Mining Plan for the coal & lignite blocks, 2020**

In line with the amendment in the Mineral Concession Rules (MCR) 2003, the Ministry of Coal, vide Office Memorandum dated 27 August 2009, published initial guidelines for approval of the Mine Closure Plan (MCP), which was later superseded by the Ministry of Coal, Office Memorandum dated 16 December 2019. Subsequently, the Ministry of Coal, vide Office Memorandum dated 20 May 2020, published comprehensive guidelines for approval of the Mining Plan and Mine Closure Plan (MCP), wherein the Mine Closure Plan (along with the Final Mine Closure Plan (FMCP)) becomes an integral part of the Mining Plan. The separate approval of MCP/ FMCP has been done away with.

Mine Closure Plans will have two components, viz. i) Progressive or Concurrent Mine Closure Plan (PMCP) and ii) Final Mine Closure Plan (FMCP). PMCP would include various land use activities that are to be done continuously and sequentially during the entire period of the mining operations. In contrast, the Final Mine Closure activities would start towards the end of the mine life and may continue even after the reserves are exhausted. Mining is discontinued till the mining area is restored to an acceptable level. The mine closure details of the Mining Plan should be oriented toward restoring the land to its original as far as practicable or further improved condition. Mining is to be carried out in a phased manner, along with reclamation and afforestation work in the mined-out area.

PMCP shall be prepared for a period of every five years from the beginning of the mining operations. These plans would be examined periodically every five years and be subjected to third-party monitoring by the agencies approved by the

Central Government, like Central Mine Planning and Design Institute Ltd. (CMPDIL), National Environmental Engineering Research Institute (NEERI), Indian Institute of Technology (IIT- ISM) or any other institutes/ organizations/ agencies specified from time to time for the purpose.

Various project-specific activities must be ensured in the PMCP/ FMCP, viz.

- Mined-out Land & Overburden (OB) dump details & their technical and biological restoration plan, & its post-closure land use plan,
- Air & water quality management,
- Waste management,
- Topsoil management,
- Filling of Void – Re-handling of Crown Dump,
- Dump stability management,
- Infrastructure to be retained and demolished,
- disposal of mining machinery,
- Post-closure activities like
  - ✓ Entrepreneurship development (vocational/skill development training for sustainable income of affected people),
  - ✓ Retrenchment benefits to mine employees, if practicable, provide jobs in other mines of the company,
  - ✓ One-time financial grant to societies/institutions/organizations which is dependent upon the project,
  - ✓ Continuation of other services like running of schools, etc.
- Closure cost & financial assurance etc.

Where the backfilling of the mine void is being carried out as part of regular mining operations, it shall not be included in the progressive mine closure activities list. However, in the case where the backfilling of the mine void is to be carried out specifically for the closure of the mine, the quantum of such overburden and the mine closure fund earmarked for the purpose must be included in the list of activities to be taken up for mine closure in the mining plan at the time of submission itself.

Implementation of the approved MCP will be the sole responsibility of the mine owner. The same is to be monitored & certified by the Coal Controller whether such activities are in line with the approved MCP/FMCP annually. The Mining Company/ Mine Owner, as a part of Financial Assurance, will open a Fixed Deposit Escrow account, with the Coal Controller Organization (on behalf of the Central Government) as the exclusive beneficiary before the commencement of any activities on the land/project area of the mine and shall submit the same to Coal Controller Organization (CCO) before the permission is given for opening the mine. A financial assurance (based date: 01.04.2019) of Rs. 9 lakh per hectare in OC and Rs. 1.50 lakh per hectare for UG Mine has been fixed, which will vary based on the variation in the WPI indices. The financial assurance may also change occasionally, as specified by the government of India. The funds so generated are allocated to security to cover the cost of closure in case the mine owner fails to complete the relevant closure activities. The prime responsibility of mine closure shall always lie with the mine owner. In case these funds are found to be insufficient to cover the cost of final mine closure, the mine owner shall undertake to provide the additional fund equivalent to the gap in funding before five years of Mine Closure, failing which such other methods may recover it as the competent authority may deem fit in this regard.

The details of the Mining Plan (covering the Final Mine Closure Plan envisaging the details of the updated cost estimates for various mine closure activities and the Escrow Account already set up, shall be submitted to the approving authority for approval at least five years before the intended final closure of the mine.

The Action plan for carrying out all abandonment operations (progressive and final mine closure) should be furnished for the period of life of the mine plus the post-closure period. The closure period shall be taken as three years for Underground (UG) mines and Opencast (OC) mines having a stripping ratio lesser than 6 $Mm^3$ per tonne, & 5 years for mines having a stripping ratio more than 6 $Mm^3$ per tonne.

The mine owner must submit an annual report (before 1 July of every year) setting forth the extent of protective and rehabilitative works carried out as mentioned in the mine closure plans.

- Physical stability: All structures, such as buildings, waste dumps, etc., remaining after mine closure should be physically stable and have no hazard to public health and safety.
- Chemical Stability: The resources within the mine site should be chemically stable. If the pollutant discharged is likely to cause adverse impacts, appropriate mitigation measures should be planned.
- Biological Stability: The mine owner should ensure stabilizing soil cover, preventing erosion/wash off, leaching, etc. This requires revegetating the disturbed land, specifically through native flora, as much as practicable.
- Environment monitoring is required to meet the abandonment/closure objectives.

## Analysis of statutory provisions for mine closure

No mining company in India is a signatory of the International Council on Mining and Metals (ICMM). By incorporating ICMM guidelines India can make mine closure more effective and mining business more sustainable and attractive. While most of the rules and regulations are theoretically incorporated into India's mining framework, the real implementation (on ground) necessitates comprehensive scrutiny and evaluation.

A typical Mine closure framework in India has 4 pillars:

a) Technical closure,
b) Environmental closure,
c) Financial closure, &
d) People-centric closure.

The mine closure guidelines and manual are primarily focused on fulfilling the technical, environmental, and financial mine closure requirements. These guidelines have a huge scope to improve the social, just, and people-centric closure.

As the object of the study is to emphasise the need for adequately addressing the "people centric mine closure" issues. The section below will highlight the gaps in addressing the people centric closure issues first and thereby suggest possible recommendations to address the gaps.

### *People-centric aspect of Mine Closure*

Following are the activities from the guidelines & manuals published by the Ministry of Coal & IBM (on behalf of the Ministry of Mines), which are guided towards managing the financial repercussions of the closure of mine and workforce retrenchment issues:

- ✓ Golden handshake/ retrenchment benefits to mine employees; if practicable, provide jobs in other mines of the company,
- ✓ Socio-economic repercussions and remedial measures consequent to the closure of mines,
- ✓ Entrepreneurship development (vocational/ skill development training for sustainable income of affected people),
- ✓ One-time financial grant to societies/institutions/organizations that are dependent upon the project,
- ✓ Continuation of other services like running of schools, etc.

Even though specific social directives are listed, the main essence is towards retrenchment benefits to the mine employee only and, where practicable, substitute provision of jobs in other mines/establishments of the mining company. As such, no assertive measures are being imposed to ensure the sustainable lives and livelihoods of the communities (over and above the mine workforce) affected by the closure.

**Existing gaps in People Centric/ Just Mine closure is highlighted below -**

**Need for adequate consideration of socio-cultural dimensions -** attention needs to be given to the intricate relationships between indigenous communities and mined lands, as well as to other institutional effects on the local economy, such as the outward migration of people and demographic changes.

Mining activities and subsequent mine closure impact communities, their livelihoods, and the broader social fabric. However, the emphasis tends to be primarily placed on physical and environmental concerns, neglecting the socio-economic, political, cultural, and human well-being. The intricate relationships between indigenous communities, mined lands and other institutional effects on the local economy, such as the outward migration of people and demographic changes, need more attention. This lack of holistic consideration leads to long-term social and economic stagnation for decades after ceasing mining operations.

**Need for addressing social transition aspects of mine closure:** efforts to transition the community, including its workforce, towards the closure of a mining operation should be an integral part of the "Mining Plan". The economic repercussions of mine closure, workforce reductions, and compensation to the employees are enumerated in the FMCP Manual. But gap exists in providing alternative, sustainable livelihood opportunities aimed at the holistic well-being of the community in a post-mining economy.

The government must investigate the social issues associated with mine closures for an effective people-centric closure. A committee of members from different ministries and departments, as well as civil society and academia, can be formed to monitor and evaluate the mining companies' implementation of the mine closure.

**Need for sustaining a minimum livelihood for impacted community: t**here had been discussions about transferring employees (workforce/human resources) to other projects where the previous mine workers/ employees can use their skills. The government guidelines also suggest that a particular focus should be on youths, specifically regarding their retraining and redeployment. There are also guidelines for continuing with the infrastructures that were built during the mining process, such as schools, hospitals, roads, etc., as they benefit the larger community.

But most ground reports show the dismay of people evicted from their land. A general mistrust exists. A "Social Impact Assessment" is required to implement a systematic closure in its true spirit. This will enable the implementing bodies and monitoring institutions determine whether closure plans are aligned with the needs and demands of the affected communities and how well they are equipped to deal with its closure. The following measures are anticipated for the same:

- A complete assessment of the mine workers' profiles and skills will be necessary to establish a plan of action regarding their future employment.
- Institutions should be responsible for maintaining community infrastructure. Infrastructures such as schools and hospitals should be brought under (if not already) local institutional bodies so that they remain a more significant community asset.
- Appropriate government agencies should transition mine workers to other forms of employment.
- A social understanding of the relations between people who owned the mining land in pre-mining times and those who migrated and settled to work on the mines is necessary. This will enable the figuring out of ways of mitigating conflicts between communities and creating a more holistic post-mining community.
- A social mapping will help us understand the demands and aspirations of the local population, not just the coal mine employees but also those who are indirectly or informally related to the mining process. This will make my closure genuinely participative.
- Consistent support from the coal company CSR (Corporate Social Responsibility) fund and the District Mineral Fund will be needed.

## Policy recommendations for a People-centric Mine Closure

*Land Repurposing -*

- Establish a ***Centre of Excellence (CoE) or National Knowledge Network*** (NKN) comprising a consortium of institutions that evaluates and recommends tailored land repurposing strategies for each mine site.
- ***The mine closure guidelines need to include*** a plan for repurposing the land. The plan needs to be specific to the use case — agricultural, pisciculture, horticulture, rainwater harvesting, pits for irrigation, etc.
- Establish community-based organizations (CBOs) or village-level organizations (VLOs) to facilitate implementing and maintaining these plans.
- ***Preserve and maintain existing infrastructure*** that could be further utilized for implementing welfare schemes and programs.

*Inter-departmental Coordination and Stakeholder Engagement –*

- Strong institutional support, multiple stakeholder engagement, industry-government collaboration, effective monitoring, and evaluation are prerequisites for executing environmentally and socially responsible mine closures in a time-bound and strategic manner.
- Much of state, centre sponsored schemes already exist in mining areas which needs to be integrated together with the demand of the impacted communities. Hence, we propose an ***"Integrated Dashboard"*** system to facilitate real-time monitoring and coordination among all stakeholders, covering environmental, technical, financial, and social aspects of mine closure.

*Social restoration –*

- Allocate a ***specified %age of mine closure funds towards social restoration*** initiatives.
- Establish a *dedicated* ***'Social Transition' team*** composed of multidisciplinary experts from government, academia, CBOs, and other relevant domains to evaluate the social and inclusive communication processes and campaigns.
- Creation of specialised Institutes of Repute (IoR) with domain expertise in water management, health, agriculture, animal husbandry, and related fields to guide the implementation of specific interventions.

*Financial support for Just Closure –*

- Advocate for the inclusion of mine closure issues in the agenda of the ***16th Finance Commission,*** urging the allocation of funds to facilitate a 'just transition' for affected communities.
- Creation of a ***'Just Mine Closure Fund'*** to garner support, technical assistance, and financial resources for a people-centric transition. This fund will tap international grant capital for the closure.
- Foster ***collaboration and engagement with financial institutions***, private equity/ venture capitalists (VCs), MDB, and similar stakeholders to enhance investments for effective mine closure and subsequent repurposing of valuable land.
- Mining states shall create budgetary provisions to support the social transition toward mine closure.

*Misc recommendations*

- If a mine is ***non-producing/ discontinued or abandoned for > 5 years, it must be deemed closed,*** if not made operational within the next 12 months.
- ***Revise the methodology for calculating the cost of mine closure*** to incorporate factors such as the depth of the pit, stripping ratio, and other relevant parameters.

The identified gaps in Technical, Financial and Environmental mine closure guidelines are highlighted in the Annexure: 2

## Next Steps -

*Under Phase 2 of the project (FY 24-25) the following activities are under different stages of its design and delivery –*

1. *Field Demonstration*
    a. *Water Management System*
    b. *Skill Building and FPO*
2. *Impact Evaluation/s – will start in the final quarter of the project.*
3. *Revised recommendation to Ministry of Coal: Mine Closure Guidelines – after the impact evaluation report.*

**Sustainable Water Management System**

Water availability for both drinking and agriculture is a rising issue in India. Over exploitation of resources, excessive mining business and negligence towards water management and conservation have resulted in serious water crisis in various pockets of Jharkhand. The Ministry of Coal in its annual report highlights the need for water management as one of the core areas to be considered by the mining company.

The Rajhara colliery is a significant water stress area. The mine owners supplied water - on ad hoc basis - to some neighbouring farmlands for cultivation. There is a need to co-design a workable and self-sustainable water management program for the community.

*Figure 3: Pictures above showcase multiple water bodies within the coal bearing area of CCL Rajhara*

In Phase 2 of the project the idea is to hire a water management expert for a short-term who can co-ordinate with various stakeholders and design an implementable DPR (detailed project report). This DPR will have a “technical feasibility” as well as a “financially” implementable project for a workable “agro-pumping and irrigation facility”, to be managed and operated by the local community.

The project must be self-sustainable such that minimum impact takes place once the mining company moves out. Hence special emphasis to be given for solarization of pumping infra and improvement of existing irrigation technologies. The focus should also be given to financial independence by -

- Dovetailing resources from government schemes such as PM KUSUM
- Exploring additional funding for asset creation from DMF, CSR, etc.

Institutions like TRIF, PRADAN, SHG’s, IEEFA etc will be engaged in this exercise.

**Skill building and FPO**

The project team is currently evaluating the skill gaps from field findings together with the existing programs and institutional arrangements on going at the central, state or district level. The evolving learning suggest to co-design a "multi skilling program" structured around existing natural resources, mapping with existing knowledge base of the local community. These skilling needs could be around:

- drought prone agricultural cropping practices
- multi-layer cropping practice
- effective horticulture practices
- scientific animal husbandry practices, e.g. goat rearing, pig rearing, poultry etc

The team is also evaluating the collaboration with PanIIT Foundation for skilling the youth of Rajahara coal mine region. PanIIT offers the following programs to enhance skills and employability in the rural regions of Jharkhand, Rajasthan, Odisha, Madhya Pradesh etc.

1. Kalyan Gurukul - this program provides short-term, market-driven skill training for dropout students. Duration: 2 to 3 months
    a. Courses: Mobile assembling, car wire harnessing, sewing machine operations, CNC operations, and Manlift operations
    b. Affiliations: Sector skill councils
    c. Placement: 100% assurance through partnerships with placement agencies
    d. Financing: Student loans of ₹10,000 for two-month courses and ₹18,000 for three-month courses, repayable post-placement
    e. Impact: Over 60,000 youths trained in the past decade
    f. Success rate: 90%+ retention and repayment rate
    g. Reach: 32 Kalyan Gurukul centers operating in Jharkhand

2. Kaushal College - this initiative focuses on degree-level education exclusively for girls from Jharkhand. This includes 8 nursing colleges and 1 ITI college in Jharkhand.
    a. Placement: 100% record for ANM graduate
    b. Fee structure: ANM course: ₹1.5 lakh; One-year ITI course: ₹75,000

3. Polytechnic - this program expands technical education opportunities: 8 polytechnic colleges; Capacity: Over 3,500 candidates

**Farmer Producer Organizations** (FPO) - The team is also working towards creating a FPO through a Cluster-Based Business Organizations (CBBOs), at the Cluster level to empower farmers, particularly small landholders, by providing them access to better financial resources, markets, and technology. An FPO can also help in reducing the overall transaction costs and enhance farmers' bargaining power as a collective.

ACPET is exploring the possibility of partnering with the following institutions for designing and delivering a successful FPO for the vulnerable community in Rajhara:

a) Government bodies:
- Jharkhand State Livelihood Promotion Society (JSLPS)
- Central Colliery Limited
- Local administration, District Collector

b) Civil Society Grassroot Organisation/s:
- PRADAN for on ground coordination support
- TRIF for district and block-level coordination support
- Community-Based Organizations for capacity building, community mobilization and facilitation support (with assistance from Vikas Bazar Net),

c) Global Research Organization:
- IEEFA (Institute for Energy Economics and Financial Analysis) for establishing market linkages and innovative financial arrangements.

d) Other potential partners could include:

- NABARD (National Bank for Agriculture and Rural Development)
- Small Farmers' Agribusiness Consortium (SFAC)
- State government's specific department, e.g. Agriculture.

**FPO Governance**

The FPO will be managed by its member farmers. The FPO members may include all women farmers or all male farmers. Since JSLPS is actively engaged in FPO formation in Jharkhand, women farmers may be preferred here. A Director elected from among the members who will oversee the operations. Professional managers may be hired for day-to-day operations.

Legal Provisions:

- FPOs can be registered under the Companies Act or the Cooperative Societies Act.
- They are guided by the Companies Act of 2013 if registered as Producer Companies.
- The government has introduced a Central Sector Scheme for FPOs, providing legal and policy framework support.

# Project II: Energy Transition Financing in India

## Background

India has given a commitment to reach a net zero economy by 2070. To attain that the Government submitted its updated Intended Nationally Determined Contribution demonstrating higher ambition as a part of its climate action policies. The updated INDC goals include reducing the emissions intensity of its GDP by 45% by 2030 compared to 2005 levels; getting about 50% of its cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030; creating an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through more forest and tree cover by 2030; and promoting a healthy and sustainable way of life based on traditions and values of conservation and moderation.

The transition towards the net zero economy will mean adoption of new clean energy choices across the various demand sectors like Agriculture, Industry, Transport, Services. However, the transition can only happen with the availability of finance and various technology choices for the demand sectors. Clean Energy Transition finance in India is also determined by the structure and role of markets, renewable energy supply and demand contracts and the granularities in the Power Purchase Agreements facilitating renewable energy power supply and demand from various demand segments.

While all these are important, the clean energy transition financing paradigm also needs to ensure that the supply and flow of finance for this clean energy transition is people centric and is sensitive to equity considerations. It can only happen once the financial flows towards the demand side of the clean energy choice adoption are integrated with the larger development, quality of life and wellbeing paradigm of people who are the end users of the derived energy choices. Hence, it will be crucial to see what is the amount of financial flow that get translated into the various end consumers of clean energy choices. These consumers can be from the agriculture, industry, manufacturing, service, rural and urban household sectors. Finally, if it is assumed that there is an adequate amount of flow of domestic finance for clean energy transition, then the larger question is how it will be prioritised in terms of distribution across the various end users considering their different SDG positioning across the districts in states of India.

### *Pointers from preliminary literature review*

Literature suggests that annually, India will be requiring USD 200 billion to transit towards clean energy for attaining the 2070 goal of net zero economy[1]. However, at a downscaled level of villages, the actual financial flow of the same amount can be scaled down largely based on the institutional and implementation efficiencies of the instruments based on which the macro level finance finally flows to the states of India.

The literature of the scale of the volume of the flow of clean energy transition finance is substantiated from the Notes on Demand for Grants, 2023-2024 document of Ministry of Finance, Government of India, which illustrates budget allocation of Ministry of New and Renewable Energy (MNRE) towards new and renewable energy has increased year on year since 2020 (Exhibit 1). Besides, energy source wise fund allocation distribution figures illustrate that around 71.69% of total budget estimate of 2023-24, which is 102.22 billion (INR. 10222 crores) have been considered for solar energy installation and storage programmes. Other major noticeable allocations include 12. 17 % towards wind energy and 2.91 % towards Hydrogen source of energy (Exhibit 2).

However, what is important to decipher is assuming that domestically if USD 200 billion becomes available each year, how will it be prioritised to be distributed across the districts and states of India considering their different developmental paradigms. If India has to reach the goal of a net zero economy by 2070 through clean energy financing, it also has to be in sync with its three transition goals viz. a) Clean Rural, Urban, Peri Urban Energy Access, b) Rural – Urban Transition, c) Technology Growth Led Digitalisation of the Society, d) Zero Carbon Transition without compromising on the Growth and Developmental Goals. If India, can reach a net zero carbon economy by mid-century, it will also emanate a positive signal for the global climate ambition and goals which will thereafter create positive feedback effects on global flows of finance for clean energy transition.

[1] https://assets.cdcgroup.com/wp-content/uploads/2021/07/09130404/Towards-a-just-transition-finance-roadmap-for-India_July-2021.pdf?id=1

However, the clean energy transition financing for India cannot be in dissonance with the objectives of the goals of just, equitable, clean energy transition. Therefore, such a just transition framework will need to have a well-crafted framework which balances the SDG 7 (affordable and clean energy), SDG 8 (decent work and economic growth), and in the process, SDG 1 (eliminating poverty) and SDG 10 (reducing inequality). The SDGs, however, which are often defined in terms of desirable economic outcomes, can often be agnostic to clean energy transition process and hence a delicate balance of clean energy transition financing must be worked out. The balance can be worked out by a framework which can be creating a finer balance between energy and other policies which do have an integrated impact on various SDGs in the various state level contexts of India.

Such a framework of clean energy transition finance will be a starting point for evaluating and addressing four dimensions of social risk arising from the net zero transition: ***to livelihoods, energy access, public finance, and human development, which will have to be a part of a clean energy transition finance framework***. The financial system for clean energy transition financing has to be responsive to such an evolving framework.

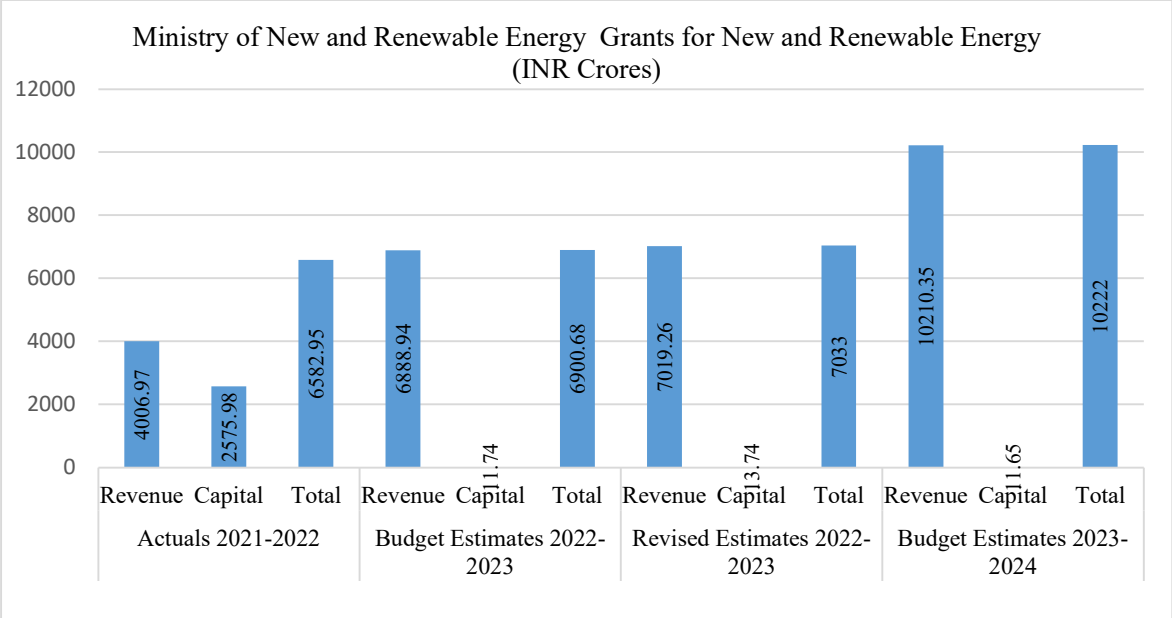


*Figure 4: Demand for Grants of MNRE, 2023-2024, Ministry of Finance, Government of India*

Programme Wise Financial Resource Allocation (INR Crores and Percentage)

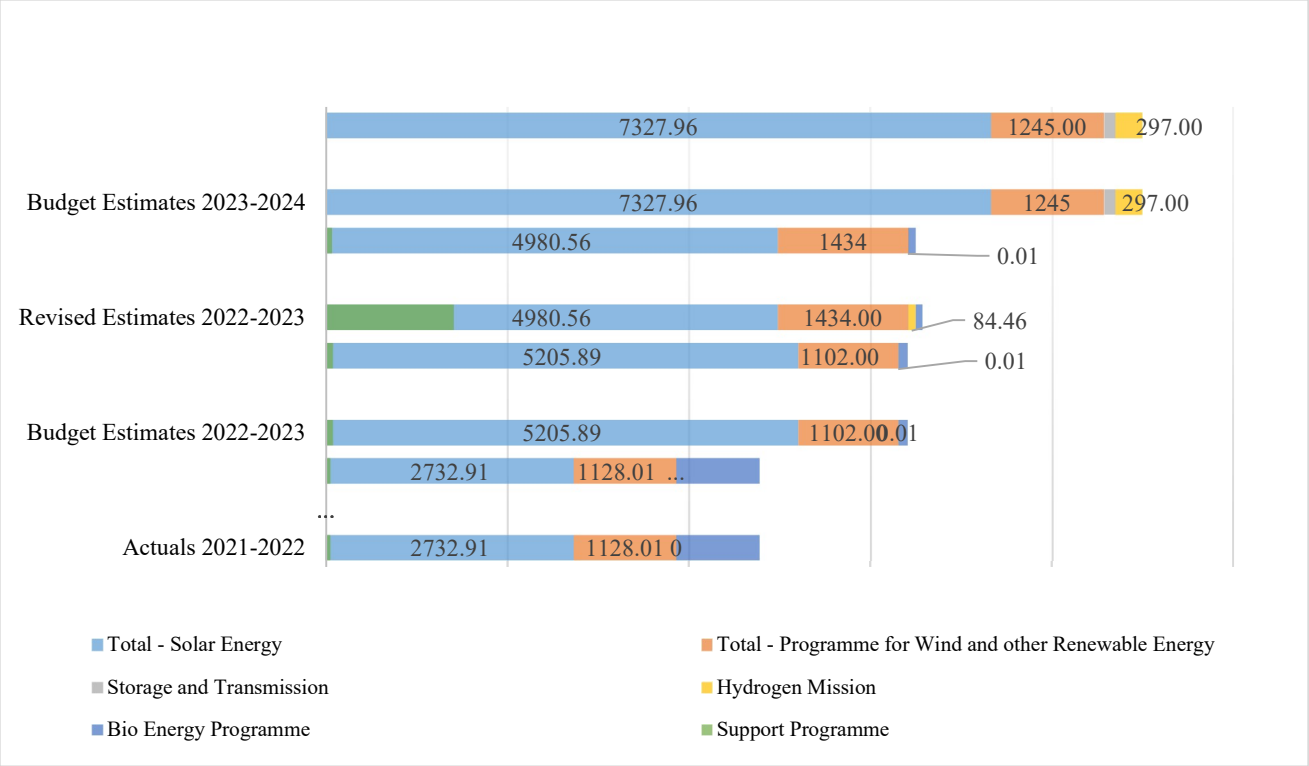


*Figure 5: Notes on Demand for Grants of Ministry of New and Renewable Energy, 2023-2024, Ministry of Finance, Government of India*

Today, India's financial system is being cognisant to the changing international and national dynamics of clean energy transition finance. This is buttressed by the fact that The Reserve Bank of India (RBI) has already joined the Network for Greening the Financial System in April 2021. Environmental, Social and Governance (ESG) reporting are being introduced on voluntary basis, in the form of Business Responsibility Reporting. However, the just, people centric, energy transition financing framework set forth for India can be used in two ways.

Firstly, it will provide a direction to the decision makers, policy makers, change and action agents of the country about how to prioritise their clean energy transition finance in different districts of India. Secondly, it will indicate, what strategies can be created to enable and facilitate an implementation of a clean energy transition finance in different districts of India while addressing the social, developmental gaps and risks in those districts of India. Hence, it will show us a way that given that the flow of finance or capital is already there for clean energy, how and in what volume it can be prioritised in districts of the states of India by being aligned to different development goals.

## Introducing the project

Against the backdrop of this, the Ashoka Centre For A People-centric Energy Transition has embarked upon the project – "Energy Transition Financing" to create a framework which will show us a way that given that the flow of finance or capital is already there for clean energy, how and in what volume it can be prioritised in districts of the states of India by being aligned to different development goals and preparedness of the states in terms of their capacity to deploy available capital for clean energy transition financing. In a larger sense, the project will therefore create a schematic framework to understand what the gaps in such prioritisation at present are and how in future such gaps can be reduced through effective policies, actions and decision making in districts of India considering their preparedness and developmental capabilities and capacities.

## *Goal and objectives*

With support from HSBC, ACPET is undertaking this project with the following goals and objectives:

### Goal:

- The goal is to build and create an energy transition finance framework that elucidates the manner and extent to which the allocation of financial resources for clean energy can be prioritised in Indian state districts, while aligning with other development objectives and preparedness in terms of their developmental capacities and capabilities.

### Objectives:

- To explore and comprehend the current state of the art of the distribution of financial flows of energy transition finance across the districts of India by being in sync with the developmental paradigms, capacities, capabilities, preparedness of the districts of India along with their equity considerations.
- To comprehend and assess the gap between the flow and the distribution of the financial flow across the districts for effective, prioritised future decision and policy making for districts of India.

## *Scope*

Given the project context of India's energy transition, the project will focus on few chosen states of India. Further, the districts of the chosen states will be analysed to address the above objectives of the project.

## *Duration*

The duration of the project is 21 months from July 2023 to March 2025.

# Evolving research framework

In order to address the objectives, scope and attain the project outcome with key project deliverables, the project will follow the below mentioned framework **(Exhibit 3)**.

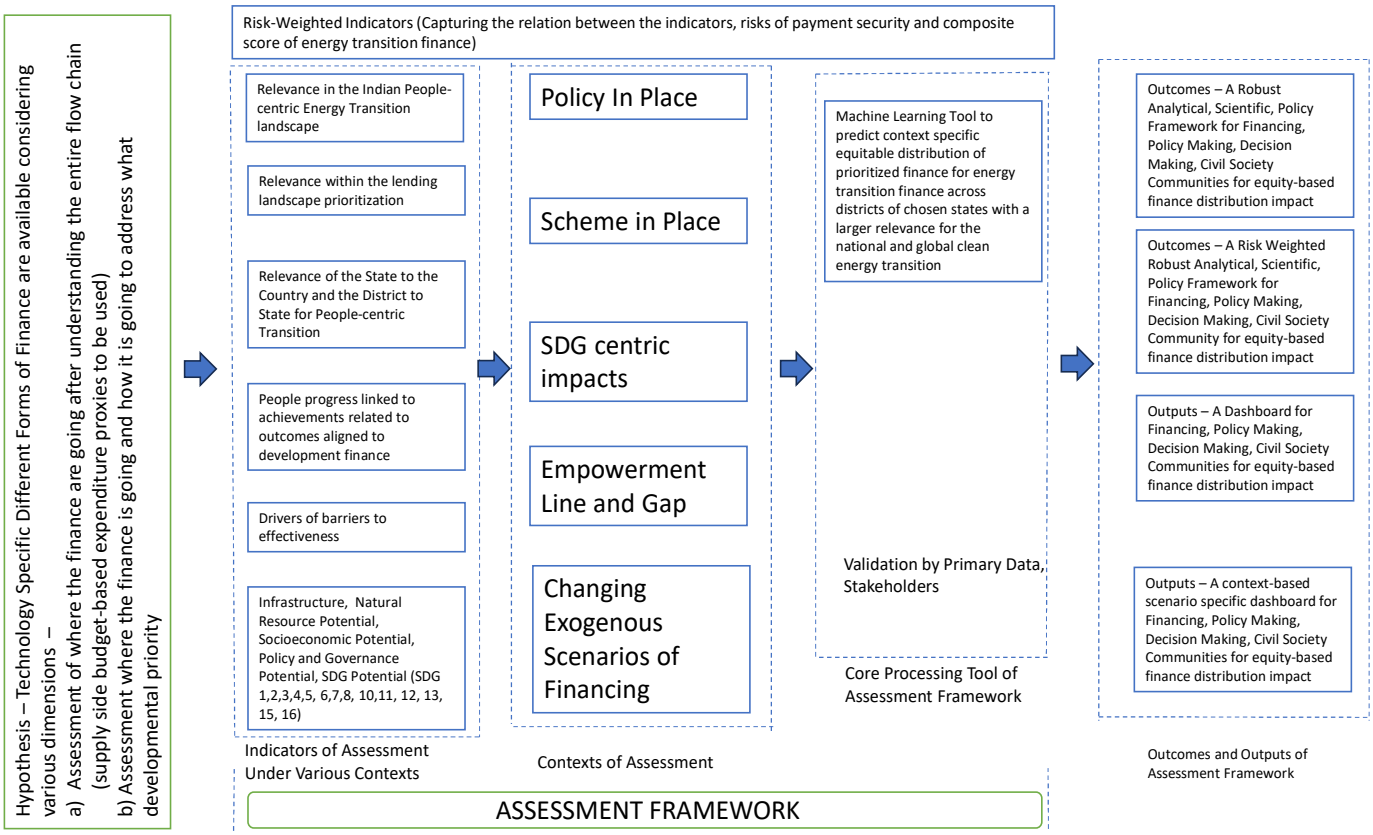


*Figure 6: A Framework of Clean Energy Transition Finance*

As a part of the framework, the project will follow the below mentioned approach and methodology **(Exhibit 4):**

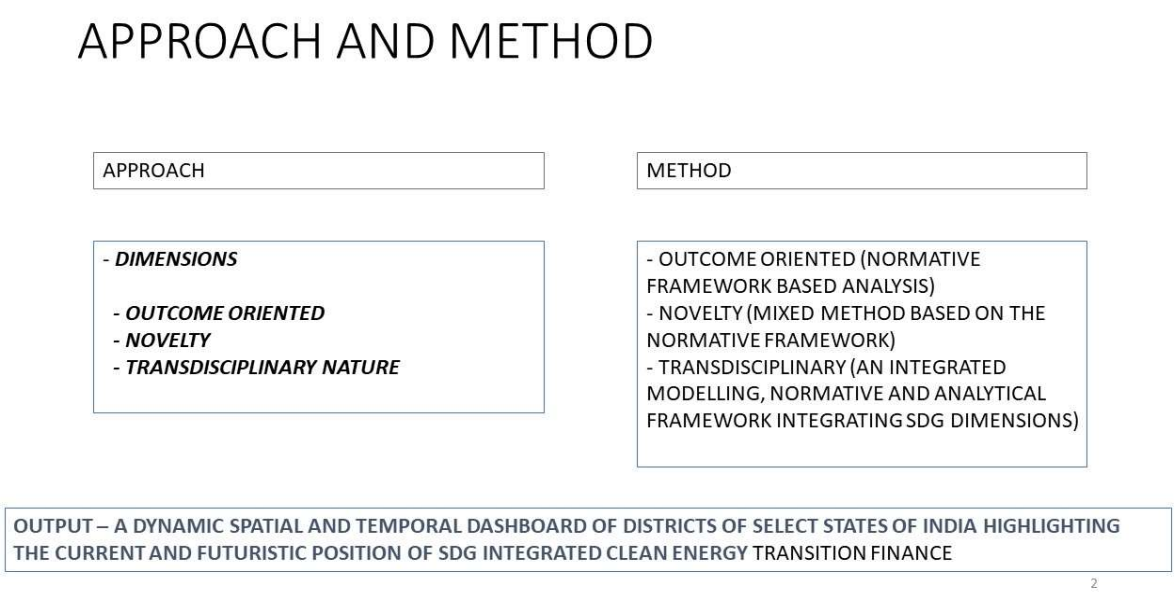


*Figure 7: Approach and Methodology of The Project*

The project, upon adhering to the framework and undergoing stakeholder validation in the field, will thereafter demonstrate varying district positions and their potential for securing financing for a transition to clean energy in the future. To do this, an initial selection of states has been performed. The states under consideration include Uttar Pradesh (UP), Bihar, Jharkhand, Rajasthan, and Chhattisgarh. The states of Chhattisgarh, Manipur, and Meghalaya are being discussed. The states have been determined using a prioritisation framework for Sustainable Development Goals (SDGs), as shown in Exhibit 5.

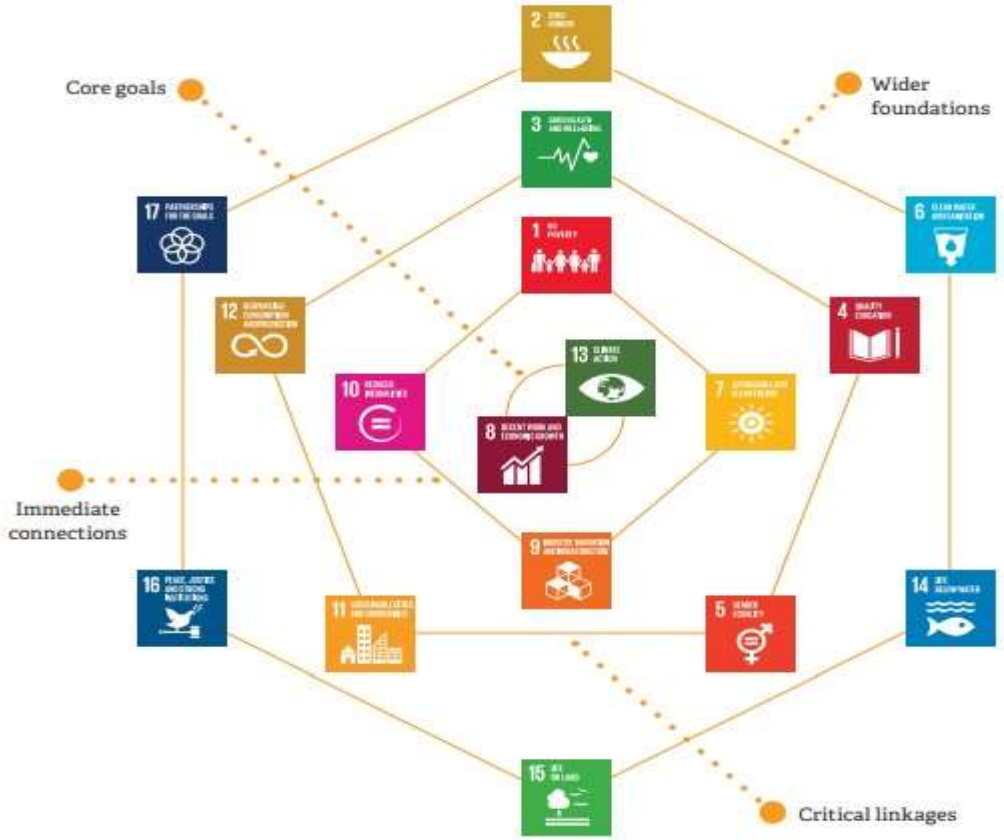


*Figure 8: A Prioritization Framework of District and State Identification for Clean Energy Transition Finance*

*Source: Adapted from Towards a Just Transition Finance Roadmap for India: Laying the foundations for practical action by Suranjali Tandon, National Institute of Public Finance and Policy; Annapurna Mitra, IMF, formerly Observer Research Foundation; Nick Robins, Grantham Research Institute at the LSE.*

Hence while prioritising the states, the core, immediate, critical linkages between the SDGs in districts of the chosen states have been explored (**as indicated above in the Exhibit 5**). Moreover, while doing this identification and scoping of the states, it was important to understand what the demand pattern is and how does demand arise for clean energy from different perspectives of the people in different districts. It was understood through the following framework (**Exhibit 6)**.

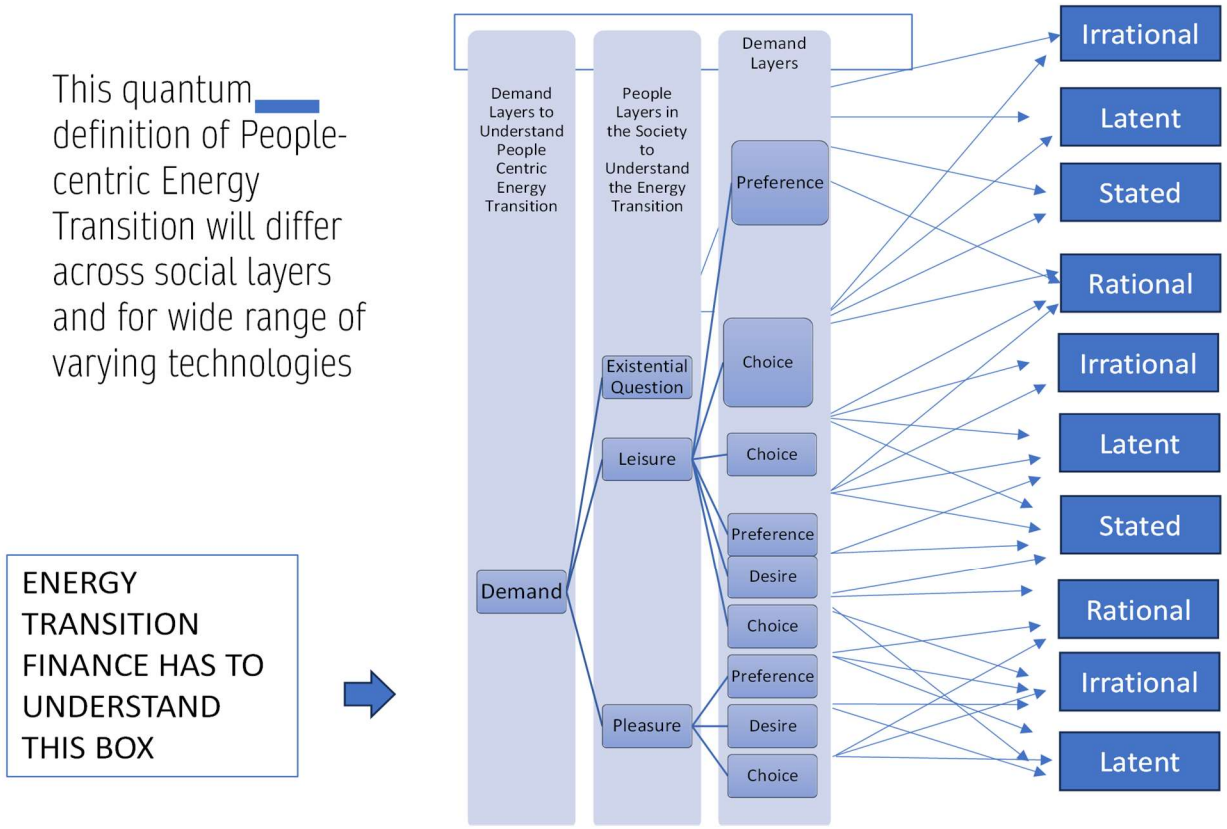


*Figure 9: A Mapping of Demand Side for Clean Energy Transition Finance*

Following the completion of the aforementioned task, an empirical investigation was conducted at the district level in the state of Jharkhand in order to ascertain the feasibility of financing the transition towards clean energy in said districts. The research is conducted using comprehensive secondary data at both the district and state levels. The preliminary findings from the experimental investigation conducted for the interim report are presented in Exhibit 7.

## Activities and activity plan

The project involves two core output sets around which the activities are anchored:

1. Reports that document and decode clean energy transition finance and its distribution amongst districts of select states of India, considering the developmental paradigms and priorities of equity and people-centric energy transition.

2. A framework of clean energy transition finance through which prioritised decision-making, and distribution of clean energy transition finance can happen in the future is complemented by a data-based, machine-learning-oriented dashboard highlighting the future possibilities of clean energy transition finance for districts in select states of India.

## *Activity 1: Literature review*

There is a need for in-depth literature review for decoding energy transition finance distribution across the districts of states of India considering the following paradigms:

a) Policy, regulatory, governance, developmental and operational implications
b) Supply and Demand Side Gaps with a consideration of social and developmental risks associated with clean energy transition for India.

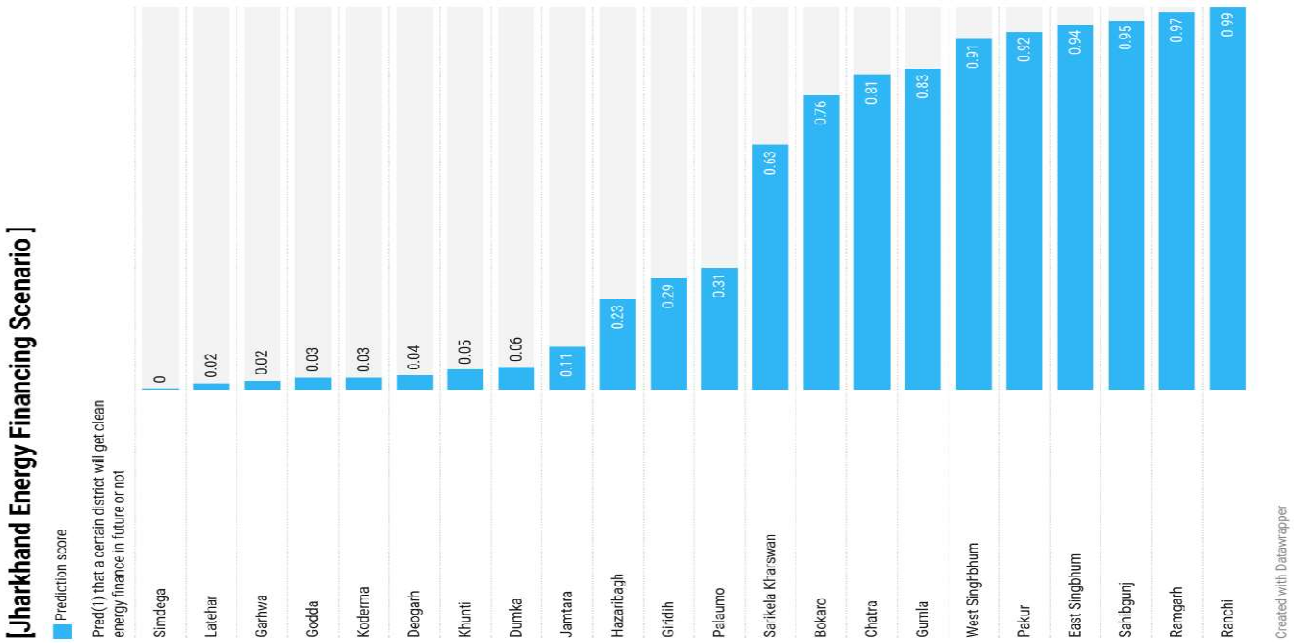


*Figure 10: An Experimental Result of Probabilities of Getting Clean Energy Transition Finance of States of India in Future*

## *Activity 2: Engagement with stakeholders*

The project, given its futuristic and holistic nature, will have to draw upon different stakeholder groups. The following is an indicative mapping of stakeholders to be consulted during the preparatory phase (till end of 2023).

In later phases of the project, stakeholder and community engagement will be through:

- One-on-meetings / consultations with stakeholders
- Quantitative and qualitative surveys with key stakeholders (small samples of about 20 respondents representing various categories, fewer for qualitative surveys)
- Roundtables / small-ground consultations with stakeholders (four roundtables are planned at the centre and state levels)
- Dissemination event in Delhi / Ranchi / Patna/Lucknow for larger stakeholder consultation

## *Activity 3: Co-designing and implementing the framework*

Consultations with stakeholders will help the team learn more about how the project's outcome framework can be used by different groups of people in different settings. Awareness-raising, trust-establishing, capability-expanding, and participation-fostering initiatives will supplement this rollout. Activity 4: Documentation of the project

This is an important activity - to record the baseline, the ongoing efforts, and then show how the ACPET project is adding value / making a difference. Project outputs in the form of papers, articles, discussion papers, policy briefs and films will help document and disseminate project learnings.

## *Quarter-wise activity phasing and deliverables (Table 1)*

**Planned Project Outputs, Collaborations, Expected Project Outputs and Outcomes, partnerships**

### Planned Project Outputs

Two types of outputs are planned, and these will feed into each other **(Exhibit 8)**:

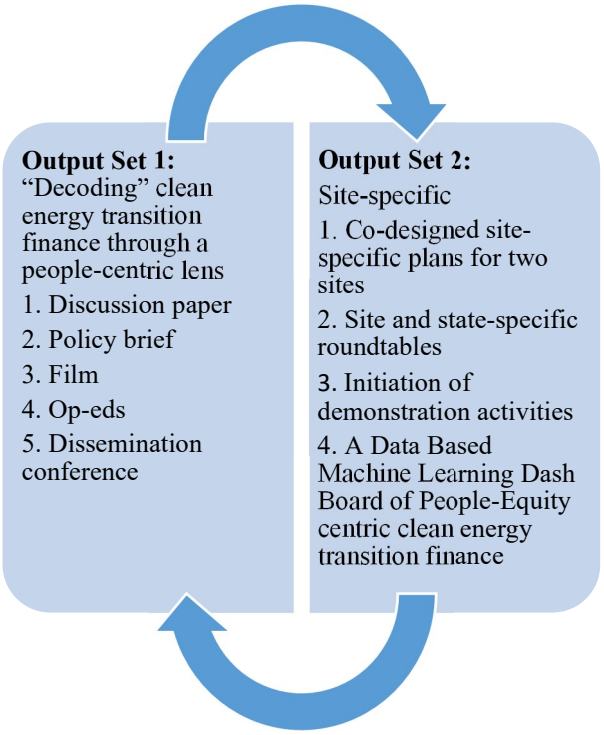


*Figure 11: Project Outputs*

Specifically, outputs planned from the project are as follows:

- Document and research paper (s)
- Discussion Papers/Policy Briefs
- Film on Clean Energy Transition Finance
- Roundtables and dissemination conference for outreach

**Policy Brief (and associated op-eds, publications)** on Clean Energy Transition Finance

*Table 1: Quarter-wise activity phasing and deliverables*

| Sl. | Name of Project | Energy Transition Financing |
|---|---|---|
| 1 | Publications | |
| | 02 OPEDs | https://www.ideasforindia.in/topics/productivity-innovation/a-brighter-future-harnessing-solar-energy-in-a-jharkhand-village.html |
| | | https://www.pioneeredge.in/clean-energy-transition-financing-is-it-for-energy-or-social-transition/ |
| | 02 News | https://bnnbreaking.com/tech/lighting-the-path-indias-leap-towards-renewable-energy-and-just-transition |
| | | https://www.apnnews.com/hsbc-bank-and-acpet-discuss-financing-indias-just-energy-transition/?__cf_chl_tk=HZWrOFPKsS9cyHKXc491ZLJvQbLTj2JkSeBCqz_lXDM-1712216864-0.0.1.1-1642 |
| 2 | Communication | https://www.youtube.com/watch?v=OKjFlBRqp6k |
| 3 | Photo stories: 04 | Completed |
| | Videos: 02 | Completed and uploaded in the meta site |
| 4 | Research Finding Booklet | Completed |
| 5 | Infographics: Survey finding / Fact sheet | Completed |

*Table 2: Quarter-wise activity phasing and deliverables (II)*

| Quarters | Phase / main activities | Deliverable/milestone at the end of the quarter | Status |
|---|---|---|---|
| 1. July-Sept 2023 | Scoping phase | Inception report | Completed |
| | - Quick scan to understand the baseline situation | | |
| | - Mapping of stakeholders | | |
| 2. Oct-Dec 2023 | Deep learning and connecting phase | Preliminary draft of framework for clean energy transition finance | Completed |
| | - Review of global practices, best practices, comparison with India | | |
| | - Meetings with state-level stakeholders | | |
| | - Meetings with and review of current plans | | |
| | - Preliminary understanding of development of the framework | | |
| | - Contracts and project initiation with partners | | |
| | - Site visits in select states | | |
| 3. Jan-March 2024 | Primary surveys (core team and / or partners) and Consultations | Survey update report | Completed |
| | · Questionnaire based survey design data collection | | |
| | · Field surveys in two states | | |
| | · Baseline Understanding | | |
| 4. April-June 2024 | Surveys continued and survey results analysis, | Draft survey findings report | Completed and validated with Additional Secretary, MNRE |
| | verification / documentation, discussion with stakeholders, co-designing and consensus building | Two Site roundtables | |
| 5. July – Sept 2024 | Initiate execution of demo activities | Final Report / audio-visual drafting | 3 Audio Visual Completed, 1 booklet completed, 4 photo stories completed, 2 OPEDs completed, 1 paper communicated |
| | | Co-designed Plan including demo activity details | |
| 6. Oct-Dec 2024 | Demo activities continued | Report on Demo activity | To be initiated |
| | Finalisation of framework and model building, analysis | Two state roundtables | |
| 7. Jan – March 2025 | Documentation phase | Film / multi-media documentation, media outreach | |
| | | dissemination conference | |


*Figure 12: Collaborative and Identified Partners*

# Key Learning Outcomes:

*Table 3: Framework of Learning Questions*

| Demand-Side | | | |
|---|---|---|---|
| **SN** | **Areas of Enquiry** | **Learning Questions** | **Data Source** |
| **1** | **Access and Awareness** | • What is the level of awareness among different demographic groups about energy transition financing options?<br>• What are the perceptions about the value that clean energy brings to customers? – Reduction of atmospheric pollution/greenhouse gases? Reduction of smoke and grime in the house? Reduction of cost for electricity services? Others?<br>• How accessible are clean energy options to various communities and regions? What challenges do they face? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• Village questionnaire<br>• FGD |
| **2** | **Demand for Renewable Energy** | • What is the current demand for renewable energy technologies and services among households, businesses, and institutions?<br>• How does this demand vary by region and income group?<br>• What is the level of interest and willingness among representative consumers to adopt renewable energy sources for their energy needs? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• FGD |
| **3** | **Financial Literacy** | • How aware are providers and potential consumers regarding energy transition financing and the actual cost of clean energy supply both in terms of capital cost and monthly operational costs?<br>• Do they understand the financial instruments such as subsidies and credit facilities under specific government schemes and policies for clean energy adoption? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• FGD<br>• Mini/micro-grid operator questionnaire |
| **4** | **Affordability and Barriers** | • How do clean energy costs compare with that of grid-based electricity? How do electricity usage patterns vary across these sources in case of dual connections?<br>• What are the key barriers to clean energy adoption? How do these barriers differ across regions and communities?<br>• What is the willingness to pay among consumers for improved quality of energy services from renewable sources as well as the main grid? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• FGD |
| **5** | **Preference for Clean Energy** | • What are the factors influencing the preference for clean energy sources over traditional fossil fuels?<br>• How does this preference vary based on demographics, income levels and cost of services?<br>• What is the role played by the village community, Panchayat, and other community-based organisations in energy transition? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• Village questionnaire<br>• FGD |

| Supply-Side | | | |
|---|---|---|---|
| **SN** | **Theme** | **Learning Question** | **Data Source** |
| **1** | **Supply of Financing** | • What are the available sources and types of financing for clean energy transition?<br>• How accessible are these sources for agencies/committees implementing and operating mini-grids and micro-grids? | • Micro/mini-grid operator questionnaire<br>• Implementing agencies (TRIF, PRADAN, Mlinda, HCL)<br>• Literature review and secondary data analysis |
| **2** | **Investment in Clean Energy** | • What are the emerging policies on investment in clean energy?<br>• What is the level of dependency of consumers on grid-based electricity systems? What is the scope of investments for expansion in the clean energy sector?<br>• What are the opportunities and infrastructure constraints in grid-based energy storage solutions?<br>• Are there specific sectors or technologies receiving more funding? | • Household questionnaire<br>• Institutional consumers questionnaire<br>• Commercial consumers questionnaire<br>• Mini/micro-grid operator questionnaire<br>• Implementing agencies (TRIF, PRADAN, Mlinda, HCL)<br>• Literature review and secondary data analysis |
| **3** | **Financial Inclusion** | • To what extent is financing for energy transition reaching underserved and marginalized communities?<br>• Are there initiatives to promote financial inclusion in clean energy projects?<br>• To what extent are local communities, including the village community, Panchayat, and other community-based organizations, involved in financial aspects related to electricity delivery, meter reading, billing, and revenue collection? | • Village questionnaire<br>• Mini/micro-grid operator<br>• District level electricity department KII<br>• Literature review and secondary data analysis |
| **4** | **Role of Financial Institutions** | • How actively are financial institutions (NBFCs, banks, microfinance, etc.) involved in providing energy transition financing?<br>• Are there partnerships or collaboration models with renewable energy companies? | • Mini/micro-grid operator<br>• Implementing agencies (TRIF, Tata Power, Tara Urja, Mlinda)<br>• Literature review and secondary data analysis |
| **5** | **Innovation and Technology** | • What innovative financing mechanisms and technologies are being used to facilitate energy transition financing?<br>• What are the prevailing financial models in the domain of energy transition? How have innovations and emerging trends affected the financing landscape, especially from the perspective of agencies operating mini-grids and micro-grids? | • Mini/micro-grid operator<br>• Implementing agencies (TRIF, Tata Power, Tara Urja, Mlinda)<br>• Literature review and secondary data analysis |

## *Districts In Which Key Learning Outcomes Have Emerged:*

*Table 4: District Framework*

| State | District | Type of district (from ACPET multi-indicator analysis) |
|---|---|---|
| **Jharkhand** | Gumla | Aspiring |
| | Simdega | Laggard |
| | Lohardaga | Laggard |
| | Khunti | Laggard |
| | Palamu | Aspiring |
| **Bihar** | Banka | Laggard |
| | Jamui | Laggard |
| | Samastipur | Aspiring |
| | Begusarai | Aspiring |
| **Uttar Pradesh** | Hardoi | Aspiring |
| | Bahraich | Laggard |
| | Shravasti | Aspiring |
| | Lakhimpur Kheri | Laggard |

*Stakeholder Reached Out Through The Project in the Aspiring and Laggard Districts of UP, Bihar and Jharkhand*

*Table 5: State and district profile*

| S.N. | Type of sample | Uttar Pradesh | Bihar | Jharkhand | Total |
|---|---|---|---|---|---|
| 1 | Districts | 4 | 4 | 5 | 13 |
| 2 | Villages | 28 | 40 | 52 | 120 |
| 3 | Community representative interviews (Village questionnaire) | 28 | 40 | 52 | 120 |
| 4 | Household interview | 463 | 818 | 1071 | 2,352 |
| 5 | Institutional consumer interview | 45 | 87 | 106 | 238 |
| 6 | Commercial consumer interview | 128 | 81 | 96 | 305 |
| 7 | Mini/micro grid operator | - | 20 | 24 | 44 |
| | | | | | |
| | **Total quantitative interviews** | | | | **3,059** |

# Progress during April 2024- May 2024

*Table 6: Task Completion Progress*

| Tasks Completed | Stakeholder Mapped | Impact Created |
|---|---|---|
| Research on Distribution Sector Reform for Clean Energy Transition Financing of DISCOMs Initiated | Stakeholder Partnerships Created with Tata Power Delhi Distribution Limited | A Simulation Model for Net Zero Transition of Delhi DISCOM has been initiated in consultation with Tata Power for its future application into the DISCOM Sector |
| Regulatory Reform Related Research for DISCOM based clean energy transition initiated | Stakeholder partnership with a think tank Trust bridge Created | Research on regulatory structure was created to understand the net zero clean transition process of select DISCOMS of India |
| Groundwork on Distribution Sector Operator Based Reforms Initiated | Collaboration created with partners in DISCOMs like Torrent Power Limited | Collaborative work to understand the applicability of DSO reforms in the specific DISCOM context has begun |
| Model Structure Created | To be applied for various DISCOMs for their clean energy transition financing needs assessment | Model framework developed with a deliberative exercise with Stakeholders |

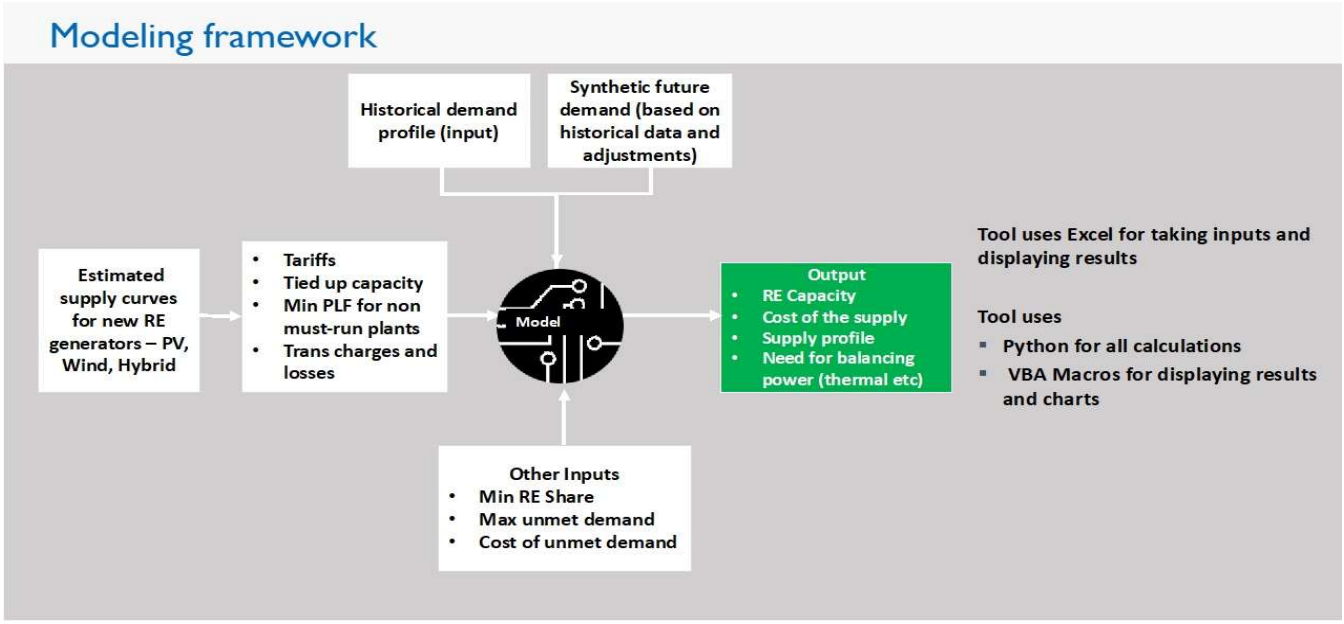


*Figure 13: Model Framework for Implementation at select DISCOMs*

# Annexure 1 – Rational for Mine Selection: Rajhara Mines, Central Colliery Limited (CCL)

The objective of the project is to engage with a wide range of stakeholders and affected groups to -

- Understand impact pathways around mine closure;
- Analyze current mine closure strategies and policies;
- Map possible people-centric mine closure approaches and interventions;
- Draw out aspirations and expectations of communities at one mine site;
- Co-design (with affected groups and other stakeholders) detailed plans and initiating interventions in the selected mining site;
- Inform policy based on all of the above.

With these basic objectives, one mine site is to be selected wherein a research study and subsequent interventions could be executed. Hence, the following parameters were considered while scrutinising a mine site/ location for the study:

- Site must be recently closed/ discontinued, or in the verge of closure (within a span of 5 years) – in case of long closed/ discontinued mines, the impacted people would have been migrated out of the mining premises, or might have got settled elsewhere;
- Site must not be in the near vicinity of operating mines in the cluster, to avoid the location affect. Hence it has to be remotely located i.e., located away from an established town/ city where impacted people can find an alternative employment and immediate impact gets diluted.
- Site is not included in any expansion plan of the mine owner/ operating company;
- Site should have mining colonies, villages/ *bastis*/ dwellings, R&R sites etc. in the near vicinity (within 5 km radius) which are/ were getting benefitted by mining operations and mine welfare measures;
- Site should have been a prominent mining site at some point in the past;
- Site infrastructure can be revived for reusing / repurposing for the benefit of the local dwellers; etc.

For this purpose, ACPET team conducted various meetings with the concerned officials of the Ministry of Coal (Joint Secretary & Project Adviser), Coal Controller Organization (Col Controller), World Bank (Consultant & Adviser), Coal Companies (CCL and CMPDIL) etc. And after reviewing, vising and analysing the existing information the team finally zeroed in Central Colliery Limited (CCL) for mine selection.

Central Colliery Limited (CCL) encompasses 9 coalfields viz. East Bokaro Coalfield, West Bokaro Coalfield, Ramgarh Coalfield, North Karanpura Coalfield, South Karanpura Coalfield, Giridih Coalfield, Hutar Coalfield, Auranga Coalfield and Daltonganj Coalfield, out of which Hutar & Auranga Coalfields are non-operative, whereas Giridih coalfield is on the verge of exhaustion of its mineable reserve.

On detailed analysis of the coal mines of CCL, following details are revealed.

*Table 7: Profiling of coalfields of CCL in Jharkhand*

| SN | Name of Coalfield | No. of operating mines | No. of non-operating mines | No. of closed/ discontinued mines | Name of closed/ discontinued mines |
|---|---|---|---|---|---|
| 1 | East Bokaro | 10 | 2 | 2 | (a) Karo Seam Incline (KSI) UG<br>(b) Karo Spl. Seam Project (KSP) UG |
| 2 | West Bokaro | 5 | 9 | 1 | Semra OC |
| 3 | Ramgarh | 2 | - | - | |
| 4 | North Karanpura | 10 | - | 2 | (a) Piparwar OC |

| SN | Name of Coalfield | No. of operating mines | No. of non-operating mines | No. of closed/ discontinued mines | Name of closed/ discontinued mines |
|---|---|---|---|---|---|
| | | | | | (b) Ray-Bachra UG |
| 5 | South Karanpura | 8 | 4 | - | |
| 6 | Giridih | 1 | 1 | 3 | (a) Bhadua OC<br>(b) Dhobidih Incline UG<br>(c) UK Incline UG |
| 7 | Hutar | - | - | 2 | (a) Hutar UG<br>(b) Hurilong UG |
| 8 | Auranga | - | - | - | |
| 9 | Daltonganj | - | - | 1 | Rajhara OC |
| | Total | 36 | 16 | 11 | |

In the light of the aforesaid assessment parameters, each of the above listed closed/ discontinued coal mines is studied and analyzed based on its present ground realities.

1. (a) Karo Seam Incline (KSI) UG mine & (b) Karo Spl. Seam Project (KSP) UG mine of East Bokaro Coalfield, Jharkhand:

   In this zone of the coalfield, upper 6 coal seams are being mined by opencast (OC) mining, whereas below 2 seams (viz. Karo Seam & Karo Special Seam) were mined by underground (UG) mining method, as these seams were found not suitable for opencast mining due to its prevailing geo-mining & techno-financial reasons. On exhaustion of the UG mineable reserves, the aforesaid two UG coal mines are discontinued by the mine authority. Both mines were low coal producing mines and loss of coal production due to closure of mines is being met up by the adjacent higher capacity Karo OC mine & Konar OC mine. Hence, both the UG mines are not suitable for impact assessment due to closure of the mines as will be required by the research study.
2. Semra OC mine of West Bokaro Coalfield, Jharkhand:

   Semra OC mine was operative before 2009 and currently closed/ discontinued since last 20 odd years. It was a small mine area/ patch which was mined by OC mining. Currently, this area is devoid of coal, but there are other coal mines both UG & OC operative in the near vicinity. Thus, the impact of mine closure cannot be assessed independently, and hence, the mine is not suitable for the research study.
3. Piparwar OC mine of North Karanpura Coalfield of Jharkhand:

   Piparwar Project (10 MTY) was one of the prestigious fully mechanized opencast coal mining projects of CCL and now due to exhaustion of its open castable coal reserve, the mine operation has been suspended. The manpower and its major infrastructures of Piparwar OC project are handed over to adjacent Ashok OC Project (10 MTY) for their suitable reuse. The mine is located in close proximity of Khelari town. Further, in the mine premises, an UG mine (viz. Piparwar UG mine) has been planned to be opened to mine lower seam, and for this an MDO (Mine Developer & Operator) has already been appointed/ selected by the mine authority (i.e., CCL). The said UG mine will start its operation very soon. Hence, it is not considered for the research project.
4. Ray-Bachra UG mine of North Karanpura Coalfield of Jharkhand:

   Ray-Bachra UG mine is a closed/ discontinued mine since last 5 years due to exhaustion of UG mineable reserve. It is located adjacent to Piparwar OC Project. Currently, CCL is contemplating to convert this UG mine to a model mine to showcase best underground mining practices of the company and in due course, it may be converted into a mine-tourism site of Jharkhand. Except few, most of its work force have been engaged/ redeployed in adjacent OC/ UG mines of the area. As the company has not shifted its colony and other infrastructures after closure of Piparwar OC mine, impact of closure of mine in this site cannot be assessed in true sense. Hence, this site is not suitable for the study project.
5. (a) Bhadua OC mine, (b) Dhobidih Incline UG mine, & (c) UK Incline UG mine of Giridih Coalfield of Jharkhand:

Coal mining activities were initiated in Giridih by private owners in 1857, making it the earliest coal mine in erstwhile Bihar/Jharkhand. East Indian Railway started organized mining in 1896. The ownership of the coalfield was handed over to the state collieries in 1936 and then transferred to National Coal Development Corporation (NCDC) in 1956. Following nationalization of the coal industry it became a part of CCL & Coal India Limited (CIL) in 1975. This coalfield was known for its semi-anthracite coal (high carbon high quality coal). All 3 mines were long closed/ discontinued mines (closed before 2009). Being an old established coalfield, Giridih town expanded to engulf the mining area. At this juncture, it is rather impracticable to segregate the mine impacted population with Giridih town dwellers. These sites are thus not considered for the impact assessment due to closure of the mines. Further, there are other operating mines in the near vicinity.

6. (a) Hutar UG mine & (b) Hurilong UG mine of Hutar Coalfield of Jharkhand: Hutar Coalfield is one of three coalfields in the valley of the North Koel River, and is located in the core/ buffer zone of Betla Reserve Forest of Jharkhand. Both coal mines were closed/ discontinued before 2009 since last 20 odd years as no EC (Environment Clearance from MoEF & CC) was granted to these mines. Since then, CCL had withdrawn all workforce from the mine and abandoned the mine premises. Current assessment of impact of mine closure in this area will be non-conclusive and hence, not suitable for the current research study.

7. Rajhara OC mine of Daltonganj Coalfield of Jharkhand:

   Rajhara Colliery/ Rajhara OC Coal Mine is a discontinued mine of Central Coalfields Limited (CCL) since 2022. It was operated by the-then M/s Bengal Coal Company and then in 1969 taken over by M/s Ram Saran Das Co. (a private company) before Nationalisation of Coal Mines in 1973. Post nationalization, the mine had produced around 3 MTY as peak production. Due to mine inundation and DGMS imposed restrictions (Section 22), coal production was suspended in 2010. After obtaining all permissions from DGMS and other statutory agencies, the mine was restarted in 2019. But, due to land acquisition issues and related local problems, mine was further discontinued since 2022.

   ACPET team visited the mine site and analyzed the information in the context of aforesaid site selection parameters. The mine site has following characteristics which form the rationale for selecting Rajhara OC mine for the said research project:

   - Rajhara Colliery of CCL is located in Daltonganj Coalfield of Jharkhand and is a remotely located isolated mine – around 200 km from the state capital Ranchi and around 25 km from district headquarters Medininagar (the-then Daltonganj) of Jharkhand.
   - In the coalfield, there is no operating mine in adjacent. The area only has this particular coal mining site unlike in Piparwar or Giridih wherein there is a cluster of mines within the same vicinity, some closed/ some operational, raising questions around evaluating the real impact of people getting impacted. However, an adjacent Coal Block has been allocated to M/s Fairmine Carbon Private Limited (FCPL), which is under clearance stage. There is an operating coal mine (viz. Kathautia) of HINDALCO (a private company) at a distance of 8-10 km from Rajhara mine of CCL. M/s Ananya Coal Co. (a private company) is also planning to operate a coal block in the coalfield.
   - The mine has limited mineable coal reserve (of 5-10 million tonne) and even if the mine could be restarted after resolving related land & rehabilitation issues, life of the mine will be less than 5 years. However, due to complicated land and rehabilitation issues, restarting of this mine may/ may not be practicable.
   - There are a number of residential areas/ bastis/ villages/ R&R sites in the vicinity of Rajhara mine, which are impacted by discontinuance of Rajhara mine. Dependency of local population on coal mining in 5 km radius of Rajhara leasehold was substantial and needs to be studied critically.
   - While (before 2010) the mine was operative, CCL used to render various welfare measures to its employees and the local dwellers, like provision/ maintenance of transport road, drinking water, electricity, medical facilities, school facilities, school bus facilities, colony maintenance & cleanliness, health & sanitation, art & cultural events etc. Due to mine discontinuance, there facilities were largely compromised, thereby impacting negatively on social, economic and cultural status of the locality. However, the existing infrastructure can be revived and reused for community development purposes.

*After considering all these parameters, the team decided to study the impact of mine closure in the locality of Rajhara and nearby area before and after 2010 & 2022.*

# Annexure 2 – Gap assessment of Technical, Financial and Environmental Closure of Mines

- **Technical Aspect of Mine Closure**

As highlighted above, the technical aspects of mine closure (for both coal & other minerals) have already been detailed. However, it lacks some basic concepts of "complete mine closure and its systematic execution. "Even though MCP (with PMCP) has been linked with the Mining Plan since its planning stage, and phase-wise execution plans are created, the mine fails to attain the specified details, particularly as planned in PMCP due to various reasons like land acquisition issues, timely statutory permission issues, poor supervision (both by mine authority and by inspecting authority).

**Need for a comprehensive mine inventory:**

India has a long history of commercial coal mining covering nearly three centuries, starting from 1774 when M/s Sumner and Heatly of East India Company was in Raniganj Coalfield along the western bank of the Damodar River. Pre- & post-independence mining leases were granted to private companies to mine coal & other minerals. Later, to prevent unscientific mining & exploitation of mine workers, public companies were formed by nationalization of existing private mines. Both the Ministry of Coal & Ministry of Mines are allocating coal/ mineral blocks to private entities through open bidding.

A significant challenge in assessing the closure status is the lack of publicly accessible information. Data on abandoned land extent, reserve status, timelines, costs, future potential, and measures by leaseholders and the state government are lacking. Improper due diligence in monitoring the abandonment of mines worsens the transparent assessment of mine closure status, hindering the formulation of far-reaching policy propositions.

Government reports on metal mines need to provide a comprehensive picture of the country's mine closure situation. Out of the 297 abandoned mine sites, IBM identified 106 (before the closure rules were enforced in April 2003) belonging to Public Sector Undertakings, major companies, and other private sector companies requiring reclamation/rehabilitation. However, detailed information must be included for the remaining 191 sites from the initial identification of 297 abandoned sites.

In the case of coal mines, during nationalization, 214 nos. of coking coal (operating in the Jharia & Raniganj Coalfields) were taken over by the Government of India on 16 October 1971 to ensure planned development of the scarce coking coal resources in the country. The coking coal mines of IISCO (now ISP-SAIL) & TISCO (now TSP) were excluded from the list. Further, the government took over the management of 711 privately-owned non-coking coal mines, which were nationalized w.e.f. 1.5.1973. The non-coking coal mines of DVC & SCCL were excluded from the list. After nationalization, in due course of time, some of the small mines were amalgamated to form bigger coal mines and some of them were discontinued/ abandoned. As of 01.04.2020, CIL was operating 352 mines, out of which 27 were non-producing, five were merged as two mines, 99 mines were profit-making & 231 mines were loss-making. NLCIL was operating one mine. SCCL was operating 44 mines, of which 27 mines were incurring loss. Losses in these mines were mainly due to the high production cost and low coal production. These coal companies planned to close 45 mines (CIL) & 10 mines (SCCL) within the next three years. It is apparent from the information above that there lies an information gap between post-nationalization & current scenario.

There is a strong need to identify these abandoned/ discontinued/ closed mines and their current status and implement systematic mine closure. If the leaseholders/ mine owners cannot be identified as of date, the Government of India will be responsible for the systematic closure of such mines.

**Need for advanced mine planning and stricter implementation:**

The primary aim of technical mine closure is to restore the post-mining land & environment as was in the pre-mining scenario. There should be a solid commitment to attain the same systematically in progress from the beginning of the mining operation till the end. It will need comprehensive, advanced planning considering planned mine development, operation, and closure. There is a need to integrate mine closure planning into the mine business plan throughout the

mine lifecycle. Descriptions of the objectives and principles of mine closure and post-closure land uses should be incorporated into the planning process in consultation with other stakeholders. This will need:

- Conceptualization of Greenfield Mining Projects at the planning stage from start to finish
  - Baseline condition mapping.
  - Mine planning to restore the land/ area to near pre-mining conditions along with a thorough mine closure plan (to be approved by competent authorities (ies) before the start of any mining activity in the area);
  - Strict vigil to each of the mining activities to attend final mine closure objective (continual check mechanism to be developed);
  - Finally, at the time of the mine's final closure, mining companies are to fulfil the commitment as per the approved final mine closure plan (considering restoration of land and water bodies, distribution of land after mining, horticulture/pisciculture/ agriculture commitments, development of infrastructure as planned, etc.) so that the mining area can be used for local employment generation and public utilization.
  - Post-closure condition mapping.

- Planning, redesigning & re-engineering of Brownfield Mining Projects
  - Considering the existing geo-mining parameters, replan & redesign the modified mine final mine closure plan (to be approved by competent authority(ies)) within a specified time;
  - Once approved, the plan is to be implemented systematically by mining companies to attend to the post-mining status before the final mine closure;
  - Finally, at the mine's final closure, mining companies must fulfil the commitment as per the approved final mine closure plan so that the mining area can be used for local employment generation and public utilization.
  - Post-closure condition mapping.

- Planning, redesigning & re-engineering of earlier Closed Mining Projects
  - Considering the existing post-mining status of the mining area, replan & redesign the modified mine final mine closure plan (to be approved by competent authorities (ies)) within a specified time;
  - Once approved, mining companies will implement the plan systematically to comply with the final mine closure directives.
  - Post-closure condition mapping.

*Mine closure within the lifecycle approach of a mine and its integration into the mine business plan needs to be improved. The existing policy is more of a statutory obligation.*

**Need for development of knowledge base:**

The mine closure plan is an integral part of the Mining Plan and is subject to review and update every five years. The mining plan consists of information on geology, mineral beneficiation, mined-out land management, air & water quality management, topsoil management, disposal of mining machinery, etc. Information on socio-economic aspects, post-mining land uses, and the means to ensure a smooth transition to the affected community in a post-mining economy must be included. This will need a repository and regular information updates, such as environmental and socio-economic settings and operational data, to help develop site-specific closure planning. This will require the creation of a dynamic knowledge base of mine.

**Need for equal weightage to both UG & OC:**

Mine closure guidelines are mainly oriented towards OC mines. In contrast, mine closure guidelines are primarily oriented towards OC mines, and the same is somewhat liberal in the case of UG mines. UG mine workings may be potentially dangerous if not systematically closed. Only measures to prevent access to surface openings to underground workings will not suffice. Guidelines only mandate that the lessee ensure fencing of any excavation endangering fall of persons/cattle etc., in Rule 26 of MCDR 2017.

For UG mine closure, guidelines need to be more elaborate. They should include measures to prevent potential hazards of strata control & surface subsidence, egress of obnoxious gases, inrush of water, chances of spontaneous heating & fire in residue coal, chances of gas/coal-dust explosion, possibility of illegal mining, ensure water management for

public use, ensure stability of land for future development, assuring availability of authentic mine working plans for any future reference, etc.

**Need for detailed land profiling/ landscaping for mine under closure.**

Mine closure guidelines specify the 'Land Degradation and Restoration Schedule'. Reclamation and land restoration stages should be given for 1st, 3rd, 5th, and subsequently every five years for the entire life of the project and three years post closure. The statute/guidelines do not specify anything about the concept of land profiling. The approving authority of such a Mining Plan (including MCP/ FMCP) needs to emphasize the degree of land restoration. The mine area should be left post closure (after necessary restoration & reclamation), maintaining an approved land profile, which may include various land usage, as agreed by the approving authority. The post-closure land profile may consist of reclaimed land for agricultural / horticulture/ fish-culture/forest/amusement parks/playgrounds/tourist spots/ infrastructure development/ repurposing to generate livelihood for the local population, etc. Technical and biological reclamation measures need to be more specific.

**Need for closure execution plan:**

The existing mine closure guidelines/ manual outlines the activities in the approved mine closure plan to be executed before legally abandoning of a mine. There is, as such, no closure execution plan. Closure Execution Plan (in Integrated Mine Closure Framework) needs to be formulated with meticulous planning of such activities. It will direct the mining authority to implement site closure by identifying specific actions to be carried out throughout the mining lifecycle in a time-bound manner.

**Need for post-closure land distribution:**

Land is a state subject. The mining companies acquire land for mining purposes through the land, which is a state subject. The mining companies acquire land for mining purposes through the Land Acquisition (LA) Act of 1894, the Coal Bearing Area (Acquisition & Development) [CBA (A&D)] Act, 1957, & the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013. Further, the Forest Department diverts the forest land (falling in the mining leasehold) with necessary approval from the Ministry of Environment, Forest & Climate Control (MoEF&CC). Govt. coal companies mainly acquire the Landfalling in coal-bearing areas through the CBA(A&D) Act, 1957, and the rest through the RFCTLARR Act, 2013, whereas private companies are to acquire the land through the RFCTLARR Act, 2013.

Post approval of the Union Cabinet dated 13 April 2022, the Ministry of Coal (vide Policy Guidelines for the use of land acquired under the CBA(A&D) Act, 1957 - ref. OM dated 22 April 2022) published the mechanism for leasing land acquired under CBA(A&D) Act for multiple purposes that are ancillary to coal mining. Land so acquired may be considered for granting on lease by the land-owning PSUs/ Coal Companies to other CPSUs, State Government (including its PSUs), and private entities for the development of coal infrastructures and other development activities without change in ownership of the lands.

As per this Policy Guidelines, only the following types of land will be considered:

- Lands that are no longer suitable or economically viable for coal mining activities or
- Lands from which coal has been mined out/ de-coaled and such land has been reclaimed.

As per the Policy Guidelines, such lands will be considered for leasing for the following mine development activities only:

- To set up Coal washeries/ Conveyor systems/ Coal Handling Plants/ Railway sidings (for max. lease period of 30 years);
- Rehabilitation & resettlement of PAFs due to acquisition of land (for max. lease period 99 years);
- To set up thermal & renewable power projects/ Coal Gasification plant/ Coal to Liquid plant (for max. lease period of 35 years);
- To set up coal development-related infrastructure, including afforestation (for a max. lease period of 99 years), hospitals (for a max. lease period of 99 years), project offices (for a max. lease period of 35 years),

- To provide a right of way (in the case of Railway & Highways - max. lease period 99 years, and in other instances, max. lease period 30 years or the life of infrastructure, whichever is lower);
- Extraction of Coal Bed Methane (CBM) (for max. lease period of 30 years, or as may be allowed by the government to the CBM Concession holder) and
- To set up or provide for energy-related infrastructure.

From the list above, it is clear that the government has no mechanism to lease out such acquired lands post-mining/ post-closure to any beneficiary, whatever. This issue may need to be addressed for successful closure of a mine.

**Need for data sharing and transparency:**

Various statutory agencies are responsible for ascertaining compliance with the mine closure activities, as per PMCP & FMCP. The CAG reports categorically mention that a significant number of mines do not comply with the Central/ State Pollution Control Board's (CPCB/ SPCB) directives like installation of continuous ambient air quality monitoring stations, submission of air/water quality reports in a time-bound manner, compliance of environmental measures, etc. Therefore, there was no scope for promptly initiating remedial measures on adverse readings. Thus, it becomes imperative to monitor and evaluate by competent authorities the extent to which Mine owners are obliged to carry out their mine closure plans.

An IoT platform needs to be created/implemented to facilitate the seamless sharing of monitoring data/ information across all departments, enabling effective monitoring of mine closure activities.

**Need for defining parameters for successful closures:**

After completing closure activities, site monitoring is essential to evaluate the effectiveness against success criteria. CCO (on behalf of the Ministry of Coal) and IBM (on behalf of the Ministry of Mines) conduct yearly inspections of mines to evaluate mining operations and progressive mine closure. IBM manual also specifies every half-yearly inspection in case of Final Mine Closure activities. However, no quantitative parameters are in place to assess successful closure activities.

- **Environmental Aspect of Mine Closure**

Environment management plays a crucial role in MCP/ FMCP, wherein the mine owner/ lessee has an important responsibility to monitor the pre- & post-closure environmental parameters.

**Need to expand the existing aspects of environmental closure/s**

The closure guidelines specify the action plan for carrying out all abandonment operations (progressive and final mine closure) for a period of life of the mine plus the post-closure period. The closure period shall be taken as three years for Underground (UG) mines and Opencast (OC) mines having a stripping ratio lesser than 6 $Mm^3$ per tonne, & 5 years for mines having a stripping ratio more than 6 $Mm^3$ per tonne.

Apart from air & water quality monitoring, waste & reject management, biological reclamation of land/ afforestation, etc., the statute must be more explicit about the post-closure environmental assessment and the monitoring target. There should be set activities and targets for mine owners/ lessees to achieve during the post-closure period to obtain the final mine closure certificate from the statutory authority. The concerned ministry (viz. Ministry of Coal & Ministry of Mines) may consult MoEF&CC and revise the guidelines accordingly.

**Need for defined afforestation for biological reclamation of degraded land:**

The mine authority systematically takes up afforestation measures annually in mine backfilled areas, static dump areas, and other non-mining areas, as mandated by the approving authority. However, the guidelines do not specify the plantation strategy, such as sapling type/ species, a combination of species, sapling density, plantation of fruit-bearing plants, watering and monitoring of planted saplings, etc.

The approving authority needs to ensure that these plants are used by the local community in a post-closure scenario. Accordingly, the approved mining plan needs to incorporate this.

- **Financial Aspects of Mine Closure**

It is the responsibility of the mine owner/ lessee to ensure that the protective measures contained in the mine closure plan, including reclamation and rehabilitation works, have been carried out by the approved and final mine closure plans.

The Mine Closure Guidelines ensure confident financial assurance in terms of per hectare of total Project Area for the purpose, which is to be deposited every year after opening a Fixed Deposit Escrow Account before obtaining mine opening permission from the Coal Controller. The funds so generated are allocated to security to cover the cost of closure in case the mine owner fails to complete the relevant closure activities. The prime responsibility of mine closure shall always lie with the mine owner. In case these funds are found to be insufficient to cover the cost of final mine closure, the mine owner shall undertake to provide the additional fund equivalent to the gap in funding before five years of Mine Closure, failing which such other methods may recover it as the competent authority may deem fit in this regard.

**Need for a realistic closure cost assessment:**

The Mine Closure Guidelines ensure that the mining leaseholders/ mine owners must provide financial assurance for executing mine closure activities. Considering the longer life span of a mine, this financial assurance needs to be updated periodically. As the plan evolves, the cost estimate of all aspects of mine closure shall also grow in alignment with the same. There exists a persistent gap within the specific updates of the mines and minerals, the modification of financial packages, consideration of the economics of scale, and mechanisms to assess fund utilization, which need to be explicitly addressed.

**Need for change in methodology for practical assessment of financial assurance:**

Each mine has a unique geo-mining set-up and is not directly comparable. The quantum of work associated with rehabilitation/ reclamation of degraded land/ mine closure depends upon the stripping ratio of the mine (for OC mines) and the void space created (for UG mines). A high stripping ratio OC mine needs to handle more overburden material than a low stripping ratio mine per hectare of land in the specified project area. Thus, more funds for higher stripping ratio mines will be needed for closure activities compared to low stripping ratio mines. So is the case with UG mines. The UG mine with a higher void created due to mining will need to take more safety/ protective/ closure measures compared to a low void UG mine.

Thus, the concept of financial assurance per hectare of total Project Area needs to be modified. It may be assessed per cubic meter of material (coal & overburden/ rock) handled. The requisite information will be available from the proposed mining plan.

**There is a need for a monitoring mechanism to ensure the effective utilization of funds.**

Post-2003, mining leaseholders were required to provide financial assurances. However, uncertainty exists regarding the use of funds for reclamation activities. Regrettably, there is no effective mechanism to track and assess the use of funds allocated for mine closure activities. Compared to developed countries like Australia and Canada, the financial assurance required for mine closure in India is notably lower and does not effectively deter defaulters.

Responsibility of the mine owner/ lessee towards effective mine closure exists till the competent authority issues the final mine closure certificate. The existing guidelines are relatively simple mechanisms to monitor the implementation of mine closure activities. The authorities earmarked for such activities viz. IBM & CCO are understaffed, and apparently, these organizations need to be equipped to take up regular inspection/ monitoring of such activities, and thereby mostly rely on the reports furnished annually by the mining companies.

Thus, it becomes imperative to monitor and evaluate by competent authorities the extent to which Mine owners are obliged to carry out their mine closure plans. The government must look into this aspect and establish a robust monitoring mechanism vis-à-vis effective fund utilization.

# Annexure 3: Results and Discussions from aspiring and laggard districts of UP, Bihar and Jharkhand

**Village Profile**

Gender Distribution of the sample village respondents:

- The majority of respondents (village tool) ~83.3% identified as male, while a smaller proportion (16.7%) identified as female. The data indicates a significant gender skewedness among the respondents, with males comprising a much larger portion of the sample compared to females.

**Distribution by District Type (Laggard and Aspiring):**

- The respondents are categorized into two types of districts: aspirational and laggard. Among the respondents, 50.8% are from aspirational districts, while 49.2% are from laggard districts.
- The distribution between aspirational and laggard districts is relatively balanced, with a slight majority of respondents from aspirational districts.

**Total Population Served by Different Electricity Grid Types:**

- **Main Grid:** The average population served by the main grid is 1245. **Solar Mini Grid:** The average population served by solar mini grid is 295.**Both Main Grid and Solar Mini Grid:** The average population served by both main grid and solar mini grid is 1681.
- **Distribution of Population:** The main grid serves the highest mean total population, followed by the population served by both main grid and solar mini grid, with the solar mini grid serving the least.

**Average Number of Households:**

- The average number of HHs in the main grid is 219. While the average number of HHs in the mini grid is 55.

**Number of Connections categories wise (Main Grid):**

- The average number of domestic connections in the surveyed villages is approximately 212.
- The average number of Commercial connections in the surveyed villages is approx. 15, indicating fewer commercial establishments in the area.

**Number Households without Electricity Connections (Main Grid):**

- On average, about 8.9 households per village do not have electricity connections. This indicates that while the majority of households have access to electricity, there remains a significant portion without connections.

**Insights (Main Grid):**

- The higher number of domestic connections compared to commercial and community/institutional connections underscores the importance of electricity for residential purposes in the sampled villages.
- The presence of households without electricity connections highlights an area for potential improvement in access to electricity services, which could contribute to improved living standards and socio-economic development.

**Average Number of Households Supplied by Mini Grids/Solar Plants:**

- The mean number of households supplied by solar mini grids is approximately 44.

- This indicates that solar mini grids play a significant role in providing electricity access to communities, especially in areas where connecting to the main grid may be challenging or uneconomical.

**Availability of All-Weather Motorable Roads:**

- **Main Grid:** Approximately 80.70% of villages with main grid electricity have an all-weather motorable road leading to them.

- **Solar Mini Grid:** Only 31.30% of villages with solar mini grid electricity have an all-weather motorable road leading to them.

**Economic Activities by Electricity Grid Type:**

- **Main Grid:** On average, HHs in the villages connected to the main grid have a higher engagement in agriculture and allied activities, with an average number of 193 HHs engaged in agriculture. Similarly, the average number of HHs engaged in small scale/cottage industries and salaried employment are relatively lower at 4 and 38, respectively.
- **Solar Mini Grid:** HHs in the villages with solar mini grid connections exhibit lower engagement in agriculture and allied activities compared to those with main grid connections, with an average number of 51 HHs engaged in agriculture. Similarly, the average number of HHs engaged in the small scale/cottage industries and salaried employment are also lower at 1 and 3, respectively.
- **Economic Diversity and Development:** Villages connected to the main grid tend to rely more on agriculture and allied activities for livelihoods. Solar mini grid villages show lower engagement in economic activities overall, suggesting potential limitations in economic development opportunities.
- Villages with access to both main grid and solar mini grid electricity display a broader spectrum of economic activities, indicating potentially better economic development prospects and diversification of livelihood options.

**Status of village electrification:**

| | Main Grid (ASPIRING) | Solar Mini | Hybrid | Total | Main Grid (laggard) | Solar Mini (Lag) | Hybrid (lag) | Total (lag) |
|---|---|---|---|---|---|---|---|---|
| Yes | 65.1% | 100.0% | 64.3% | 67.2% | 82.5% | 58.3% | 85.7% | 78.0% |
| Yes, but some HH do not have | 34.9% | 0.0% | 35.7% | 32.8% | 17.5% | 41.7% | 14.3% | 22.0% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

*Figure 14: Electrification status of the village*

1. **Main Grid Electrification:**

- Out of the total villages categorized as Aspiring (65.1%) have all households electrified through the main grid, and (82.5%) households are electrified through the main grid in laggard villages. This indicates significant progress in extending the main grid infrastructure to all kinds of villages is found in the district's laggard districts.
- A higher proportion of villages (33%) in aspiring districts compared with laggard districts (22%) have incomplete electrification, with some households who do not have access to electricity.

2. **Solar Mini Grid Electrification:**

- Overall, (68%) of the sampled villages equipped with mini grid plants are electrified through these systems. The remaining (32%) of the mini grid villages do not provide electricity to households because the solar plants installed in these villages (e.g. Bihar) are primarily designed to cater to irrigation needs. In the Aspiring districts (n=4), all villages, constituting (100%) of the sample, have successfully electrified all households through solar mini grids. In contrast, this proportion was found to be (58.3%) in villages located in the laggard districts."

3. **Combination of Main and Solar Mini Grids:**

The villages which have a combination electricity supply from both main and solar mini grids are present mostly in laggard villages, with (85.7%) of them having this hybrid electrification setup. This indicates a diversified approach to ensuring better electricity access, leveraging both centralized and decentralized solutions.

4. **Access Disparities:**

- Despite high overall electrification rates, disparities exist within villages, where some households still lack electricity supply despite the village being categorized as electrified. This underscores the importance of targeted interventions to address access gaps and ensure equitable access to electricity for all households within a village.

- **Source of electricity:**
  - **Aspiring Districts:**

1. **Main Grid (State Electricity Supply Board):**

- 70% of the sample villages in Aspiring districts receive electricity from the main grid operated by the state electricity supply board.

2. **Solar Mini Grid or Solar Plant:**

- The survey was able to cover only a small proportion (6%) of villages dependent only mini grid plants in the overall sample of villages in the Aspiring districts.

3. **Hybrid Grid:**

- Almost a quarter of the sample villages in the Aspiring districts (23%) have both main and solar grids installed. While this percentage is relatively low compared to main sources, it still reflects a growing trend towards decentralized energy generation and consumption, contributing to overall energy resilience and sustainability.

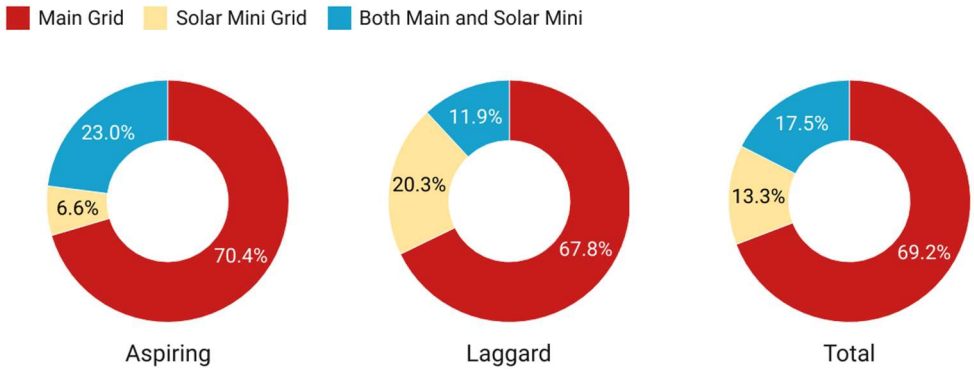


*Figure 15: Source of electricity for the village*

- **Laggard Districts:**

1. **Main Grid (State Electricity Supply Board):**

- Similar to villages in Aspiring districts, a little over two thirds (68%) of the villages in Laggard districts also receive electricity from the main grid operated by the state electricity supply board.

2. **Solar Mini Grid or Solar Plant:**

- The proportion of villages (20%) which rely on solar mini grids or solar plants for electricity supply in Laggard districts is almost double that of the Aspiring districts. This underscores the significance of decentralized energy solutions in bridging the electricity access gap in districts where the main grid infrastructure may be inadequate or non-existent.

3. **Hybrid:**

- The proportion of villages in Laggard districts, which have both types of grids installed is almost half the (12%) that of the villages in the Aspiring districts.

**Overall Insights:**

- The data indicates an adoption of solar energy solutions alongside the main grid infrastructure to augment the electricity supply situation in Aspiring districts, whereas, in the Laggard districts, the solar mini grids are more of a solution, where the main grid infrastructure is not able to reach.
- Despite differences in electrification status between villages in Aspiring and Laggard districts, both categories of districts show a significant reliance on solar energy as a last mile solution, highlighting its role as a key enabler of energy access and resilience in remote districts.
- The presence of rooftop solar grids in both Aspiring and Laggard villages suggests a growing awareness and uptake of decentralized energy generation options, contributing to energy self-sufficiency and sustainability at the local level.

- **Primary Source of Electricity in Villages:**

**Main Grid as Primary Source:** The villagers were asked in places where both main and mini grid-based electricity is provided, which source of electricity was considered to be the primary source.

- In Aspiring districts, (77.00%) of villages primarily rely on the main grid for electricity.
- In Laggard districts, a slightly higher percentage, (79.7%), depends on the main grid as their primary power source.
- Overall, approximately (78.3%) of villages, irrespective of their classification, rely on the main grid as their primary source of power.

**Mini Grids/Solar Plants:**

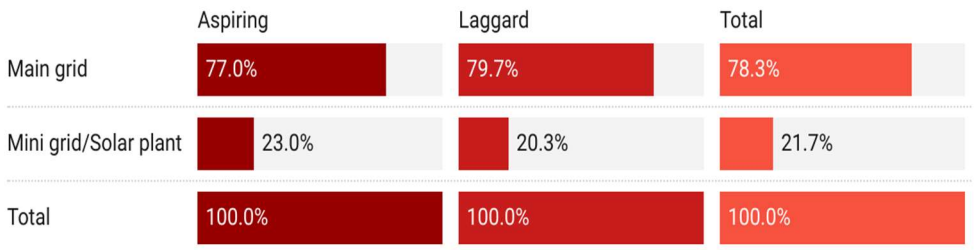


*Figure 16: Primary source of power for the village*

In aspiring districts, (23.0%) of villages rely on mini grids or solar plants as their primary power source.

- In laggard districts, this percentage slightly decreases to (20.3%).
- Across both aspiring and laggard districts, around (21.7%) of villages rely on mini grids or solar plants as their primary source of power.
- These insights suggest that while the main grid remains the dominant source of electricity in both aspiring and laggard districts, there is a significant reliance on mini grids or solar plants, indicating efforts towards diversifying energy sources, especially in remote or underdeveloped regions.

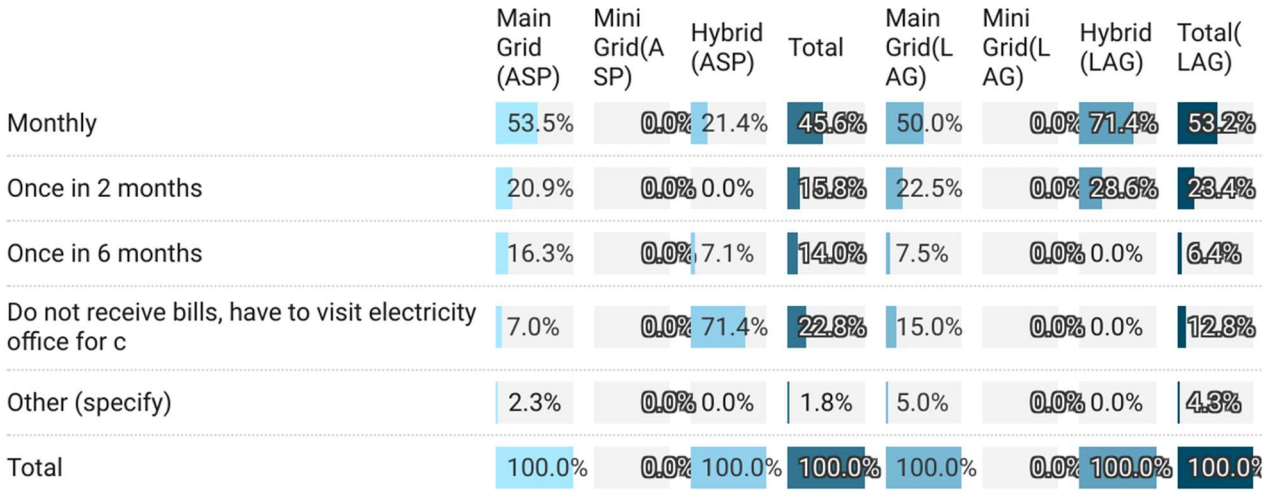


*Figure 17: Frequency of billing*

- **Frequency of Billing**

**1. Main Grid:**

- In Aspiring districts, (53.5%) of villages receive monthly bills for electricity from the main grid, indicating a regular billing cycle. The situation is similar in the Laggard districts, with (50%) of villages reported receiving monthly bills for electricity from the main grid.
- In the Aspiring districts, a smaller percentage, (20.90%), receive bills once every 2 months, while 16.30% are billed once every 6 months. Similarly, in laggard districts, (22%) of the villages receive bills every 2 months, and (7%) are billed every 6 months.
- Only (7%) of villages in aspiring districts, and (15%) in laggard districts do not receive bills.

**2. Solar Mini Grid:**

- Among the respondents, (81.3%) receive monthly bills indicating monthly billing is the predominant mode, and a regular billing cycle for electricity consumption.

**3. Both Main Grid and Solar Mini Grid:**

- In aspiring districts (21.4%), and laggard districts (71%) of villages receive monthly bills when using both main grid and solar mini grid, like the percentage for the main grid alone.

These insights highlight variations in billing practices across different types of electricity sources and underscore the need for improved billing infrastructure and practices, particularly in districts where billing irregularities exist.


*Figure 18: Existence of overdue bills*

- **Pending Bills**

**1. Overdue Bills for Main Grid Electricity Supply:**

- Across both aspiring and laggard districts, the majority of villagers have overdue bills for the main grid electricity supply.
- Only a small percentage of villagers, (7.0%) in aspiring districts and (6.4%) in laggard districts, do not have overdue bills for the main grid electricity supply.

These findings indicate a prevalent issue of overdue bills for main grid electricity supply in both aspiring and laggard districts. Addressing this issue could involve implementing measures to improve billing and payment processes, enhancing financial literacy among villagers, and ensuring better access to electricity billing services.

**Electricity Supply Disconnection Due to Non-payment of Bills:**

- In aspiring districts, (60%) of respondents reported that the electricity supply is disconnected due to non-payment of bills, while (40%) stated otherwise.
- In laggard districts, a higher percentage, (68%), reported electricity supply disconnection due to non-payment of bills, with only (32%) indicating no disconnection was undertaken.
- Overall, across both aspiring and laggard districts, the majority (63%) reported electricity supply disconnection due to non-payment of bills, while (37%) stated otherwise.

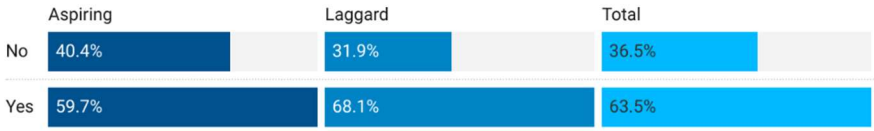


*Figure 19: Disconnection of electricity supply due to non-payment of bills*

These findings highlight a significant issue of electricity supply disconnection due to non-payment of bills, particularly more pronounced in laggard districts. Addressing this issue may involve implementing measures to improve billing processes, provide financial assistance or education, and ensure fair access to electricity services for all residents.

**Duration of Non-payment Before Disconnection:**

- Among aspiring districts, the most common duration of non-payment after which supply disconnection takes place is between 3 to 6 months, as reported by (50%) of respondents.
- In laggard districts, a slightly lower percentage (28%), reported disconnection after 3 to 6 months of non-payment, indicating a shorter duration before disconnection compared to aspiring districts.
- In laggard districts, a higher percentage of villages (56%), reported disconnection after over 6 months of non-payment, compared to (32%) in aspiring districts.
- A small percentage of respondents across both aspiring and laggard districts specified 'Other' durations for disconnection after non-payment, with (5%) in total.
- Additionally, a notable portion of respondents in both categories of districts (12% in total) indicated 'Don't know' regarding the duration of non-payment before disconnection.

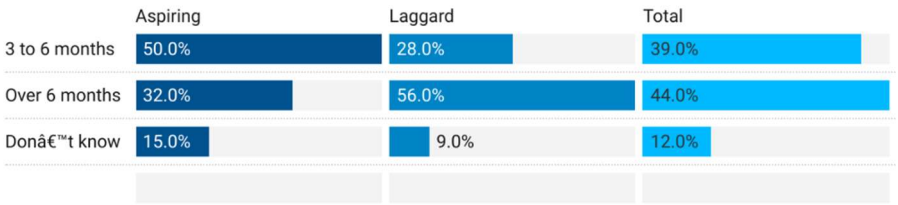


*Figure 20: Non-payment duration post which supply is disconnected*

These insights suggest variations in the duration of non-payment before electricity supply disconnection between aspiring and laggard districts – suggesting that the norms were not standardized across geographies, with laggard districts experiencing disconnection after longer periods of non-payment. Addressing this issue may involve exploring the reasons behind delayed disconnections, implementing measures to improve payment systems or providing financial assistance to prevent disconnections.

**Provision of Electricity to Institutions**:

- In aspiring districts, almost half the villages (49%) reported that institutions (Schools, Anganwadi's, Panchayats, etc.) are provided with paid electricity services, while a smaller portion (16%) stated that these services are offered for free.
- In laggard districts, however, a larger percentage (30%) reported free electricity services provided to these institutions compared to aspiring districts.
- However, a higher percentage (43%) of villages in laggard districts indicated uncertainty ('Don't know') about whether institutions are offered free or paid electricity services, compared to 35% in aspiring districts, indicating perhaps, centralized billing to the departments.

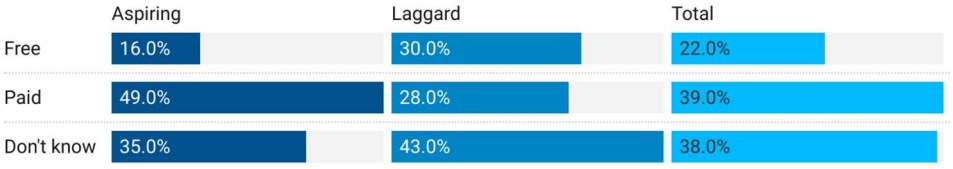


*Figure 21: Payment requirement of electricity supply for institutions*

These insights highlight the need for clarity and transparency in the provision of electricity services and the billing aspects to institutions in both aspiring and laggard districts. Efforts to improve awareness and communication regarding

the availability of government schemes and provision of cheaper cost of electricity services to essential institutions could enhance accessibility and address any potential disparities between aspiring and laggard districts.

- **Household Challenges with Current Grid for domestic consumers**:

- In aspiring districts, the majority of villages (86%) perceive challenges with the supply from the current main grid, while a smaller proportion (14%) indicated no challenges.
- In the laggard districts, a slightly higher percentage (92.5%) of villages reported facing challenges with the supply from the main grid, with only 7.5% stating no challenges.
- Regarding hybrid systems, a similar trend is observed, with the majority of households in both aspiring (92.9%) and laggard (85.7%) districts perceiving challenges, and this is the reason possibly for installing solar plants to improve the electricity situation.
- Overall, a significant proportion of households across all categories (main grid, hybrid, and both main grid and solar mini) perceive challenges with the current main grid system, indicating a widespread issue that needs to be addressed.

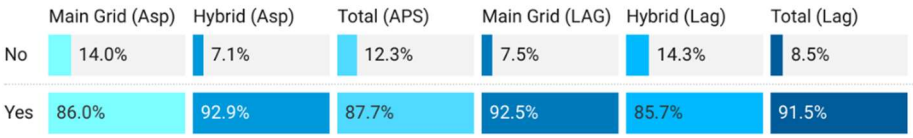


*Figure 22: Existence of challenges due to insufficient electricity supply*

These insights underscore the importance of identifying and addressing the challenges faced by the villages and the inhabitants, with the current electricity grid systems, particularly in remote and underserved areas. Efforts to improve grid reliability, accessibility, and affordability are essential to enhance the overall quality of life and promote socio-economic development in these regions.

- **Village level reporting of challenges faced by households with Grid Electricity Supply**:

On further probing the reasons for the challenges faced by the households in the villages. The following are highlighted:

- In aspiring districts, the most common challenges reported by villages include less hours of supply in summer (80.0%), frequent power outages (58.0%), and low electricity voltage (42.0%). However, the problems with the low hours of supply are less of a problem throughout the year – although this is a summertime issue.
- In laggard districts, while most villages reported less hours of supply in summer (75.7%), a higher proportion of villages reported frequent power outages (75.7%). The proportion of villages reporting low electricity voltage (40.5%) was lower than the villages in the aspiring districts.
- Additionally, in laggard districts, almost half the villages mentioned challenges related to less hours of supply throughout the year (48.6%), higher electricity bills (54.1%), and not receiving bills at regular intervals (45.9%).
- Notably, challenges such as less hours of supply in summer, frequent power outages, and low electricity voltage are common across both aspiring and laggard districts, indicating systemic issues in grid electricity supply.
- However, laggard districts face additional challenges such as irregular billing, higher bills, and longer resolution times for technical faults, suggesting a more complex electricity supply situation in these regions.

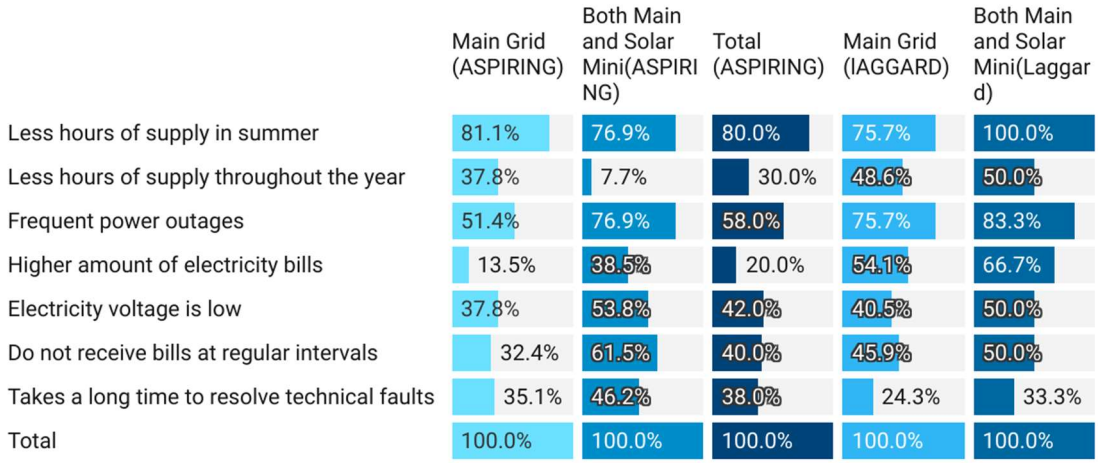


*Figure 23: Type of challenges faced due to insufficient electricity supply*

These insights highlight the specific challenges highlighted by the villages in aspiring and laggard districts regarding grid electricity supply. Addressing these challenges requires targeted interventions to improve service reliability, billing practices, and technical support, tailored to the unique needs of each area.

- **Improvement in Electricity Supply Quality:**

The village representatives were asked about the kind of improvements required in the grid-based electricity supply.

- In aspiring districts, the village level respondents reported that various types of improvements are required in the quality of electricity supply. A third of the villages stated that supply should be provided for longer hours (33.3%), while another third of the villages stated that there is a requirement of voltage stability (33.3%).
- In laggard districts, a comparatively smaller proportion of villages, reported the requirement of improvement in supply duration (27.7%), but a higher proportion reported the need of improvement in voltage stability (42.6%). Notably, a considerable percentage stated that there had been no improvement in supply quality (29.8%).
- Interestingly, a notable portion of villages in aspiring districts (28.6%) mentioned that although supply was provided for longer hours, there was no improvement in voltage stability, indicating that longer hours of supply alone may not address all quality issues.
- In laggard districts, while a higher percentage reported improvement in voltage stability (57.1%), a significant portion still indicated no improvement in supply quality (28.6%), suggesting persistent challenges in these regions.

- **Hours of Electricity Provided:**

1. **Aspiring Districts:**

- The majority of respondents in aspiring districts reliant solely on the main grid reported receiving electricity for 12-18 hours per day (69.8%). This indicates a relatively good situation in terms of electricity supply.
- Almost a sixth of the villages (16.3%) reported receiving electricity for 18-24 hours.
- Few villages reported lower durations of electricity provision, with only a small percentage (14.0%) receiving electricity for 6-12 hours per day, but none reported receiving less than 6 hours of electricity.

2. **Laggard Districts:**

- Similar to aspiring districts, the majority of villages in laggard districts reported receiving electricity for 12-18 hours per day (60.0%) – this proportion is considerably lower than that of villages in the aspiring districts.
- A notable proportion (17.5%) reported receiving electricity for 18-24 hours.

- The percentage of villages receiving electricity for 6-12 hours per day (22.5%) was slightly higher compared to villages in aspiring districts, suggesting variability in service reliability within laggard districts.
- No villages in laggard districts reported receiving less than 6 hours of electricity per day, indicating that even in regions with significant challenges, there is a baseline level of service provision.

**3. Overall:**

- The data suggests that while there may be variations in the duration of electricity provision within both aspiring and laggard districts, the majority of respondents in both categories receive electricity for at least 12 hours per day, indicating a basic level of service provision across the surveyed regions.

*Table 8 : Number of hours of electricity provided in a day*

| | Aspiring | | | Laggard | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Main Grid** | **Both Main and Solar Mini** | **Total** | **Main Grid** | **Both Main and Solar Mini** | **Total** | **Main Grid** | **Both Main and Solar Mini** | **Total** |
| 24 hours | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 18-24 hours | 16.30% | 28.60% | 19.30% | 17.50% | 28.60% | 19.10% | 16.90% | 28.60% | 19.20% |
| 12-18 hours | 69.80% | 28.60% | 59.60% | 60.00% | 57.10% | 59.60% | 65.10% | 38.10% | 59.60% |
| 6-12 hours | 14.00% | 35.70% | 19.30% | 22.50% | 14.30% | 21.30% | 18.10% | 28.60% | 20.20% |
| Less than 6 hours | 0.00% | 7.10% | 1.80% | 0.00% | 0.00% | 0.00% | 0.00% | 4.80% | 1.00% |

- **Average Hours of Electricity Supplied by Mini Grids/Solar Plants:**

- The average hours of service per day provided by solar mini grids during the summer and winter seasons is approximately 21 hours. This indicates that solar mini grids can provide a substantial amount of electricity service during the summer months, which is crucial for meeting the energy needs of households, businesses, and institutions.

- **Frequency of Power Outages:**

**1. Aspiring Districts:**

- A majority of villages in aspiring districts reliant solely on the main grid reported experiencing power outages more than once a day (88.4%). This indicates a high frequency of power disruptions, which could significantly impact daily activities and quality of life.
- A smaller proportion of villages (11.6%) reported experiencing power outages once a day, suggesting that even those who do not face multiple disruptions may still experience regular interruptions to electricity supply.

**2. Laggard Districts:**

- Similar to aspiring districts, a significant majority of villages in laggard districts reported experiencing power outages more than once a day (82.5%). This indicates a common challenge across both aspiring and laggard districts regarding the aspect of power disruptions.
- A smaller percentage of villages (17.5%) reported experiencing power outages once a day, which, is slightly higher than the frequency reported in aspiring districts indicating a slight better situation in the laggard districts.

3. **Overall:**

- The data highlights a widespread issue of frequent power outages in both aspiring and laggard districts, with the majority of respondents in both categories reporting experiencing disruptions more than once a day. This indicates a critical need for improvements in the reliability and stability of electricity supply, particularly from the main grid, to enhance the quality of life and support economic activities in these districts.

- **Metering Status, Frequency of Bills, and Disconnection of Supply due to non-payment**

- All of the mini grid/solar plant connections in surveyed villages are metred. This ensures accurate measurement and billing of electricity consumption, promoting transparency and accountability in the usage of electricity services.
- Among the respondents, 81.3% receive monthly bills indicating monthly billing is the predominant mode, and a regular billing cycle for electricity consumption.
- Among the respondents, 87.5% have overdue bills. a high percentage of respondents with overdue bills suggests potential challenges in timely bill payments for mini grid/solar plant electricity supply.
- 56.3% reported that the electricity supply is disconnected due to non-payment of bills. While 43.8% indicated that the electricity supply is not disconnected due to non-payment of bills.
- All respondents who experienced supply disconnection due to non-payment reported that it occurred within 3 to 6 months of non-payment.

- **Reasons for Better Consumer Perception of Mini Grid Electricity Supply:**

- **More Hours of Electricity Supply in a Day:** 81.3% of respondents perceive grid electricity supply as better due to receiving more hours of electricity supply in a day.
- **Less Cumbersome Official Procedure to Get Connection:**18.8% of respondents cited a less cumbersome official procedure to get a connection as a reason for perceiving grid electricity supply as better.

The majority of respondents prefer mini grid electricity supply primarily because it offers more hours of electricity supply per day, indicating a preference for reliable and extended service. Simplifying the process of obtaining a connection could further enhance consumer satisfaction and promote grid electricity uptake.

- **Deterioration in Supply Quality**:

No respondents in either aspiring or laggard districts reported a deterioration in the quality of electricity supply, indicating a stable or improving trend in supply quality overall.

These insights underscore the varied perceptions of electricity supply quality across aspiring and laggard districts. While improvements have been noted in some aspects such as supply duration and voltage stability, challenges remain, particularly in laggard districts, highlighting the need for continued efforts to enhance the reliability and stability of electricity supply in these regions.

- **Consumer Perspectives on Rural Energy Services**

Through interviews with different categories of consumers such as households, commercial enterprises, and institutions, the study captured insightful perspectives on the demand, supply quality, challenges in supply, the usage pattern and enablement livelihoods and living standards for energy among rural consumers. A wide range of aspects pertaining to electricity supply from both main grid and solar mini grid were covered by the study, including regularity of supply, voltage fluctuations, frequent outages and disruptions in supply, adequacy of supply, load capacity, etc. Issues of metering, billing, and payments were also explored.

The majority of respondents with main grid electricity connections reported that while they receive electricity supply daily, challenges related to low voltage and frequent outages persist. Respondents with mini grid connections reported that the supply is more reliable as compared to main grid, although the load capacity is sometimes inadequate for the usage of heavy appliances, especially for commercial consumers. A higher degree of satisfaction was also recorded among mini grid consumers. Most of the main grid and mini grid connections have attached meters, and billing and payments occur on a monthly basis. More main grid consumers have overdue bill payments for over a month as compared to mini grid.

- Domestic Consumers[2]
- Commercial Consumers[3]
- Institutional Consumers

A total of 238 institutions were covered by the study, out of which 48% were in aspirational districts and 52% were in laggard districts. Out of this, almost 32% of institutions do not have an electricity connection, and another 7% have an electricity connection that is non-functional at present.

- **Energy consumption patterns of institutions:**

Schools (43%), Anganwadi Centres (27%), and Panchayat Bhawan (13%) made up the majority of the sample for institutional consumers. Across all categories, all institutions have functional electricity connections. The most commonly owned electrical assets by institutional consumers include lights, ceiling fans, mobile phones and other chargeable devices, computers and laptops, printers and photocopiers. A higher proportion of mini grid institutional consumers in aspirational districts own refrigerators, television sets, and water pumps, while respondents across all categories aspire to own coolers, air conditioners, drinking water filters, etc. The peak load requirement period is from April to June.

In aspirational districts, the majority of institutions (67%) with both main grid and mini grid connections have main grid as the primary source of electricity. In laggard districts, all institutions in this category have the main grid as the primary source of electricity.

[2] Total N- Aspiring = 1152 [Main Grid = 841; Mini Grid = 173; Main and Mini = 138],
Laggard = 1154 [Main Grid = 826; Mini Grid = 281; Main and Mini = 47]

[3] Sample size- Aspiring = 137 [Main = 64, Mini = 65, Both = 8], Laggard = 126 [Main = 78, Mini = 48]

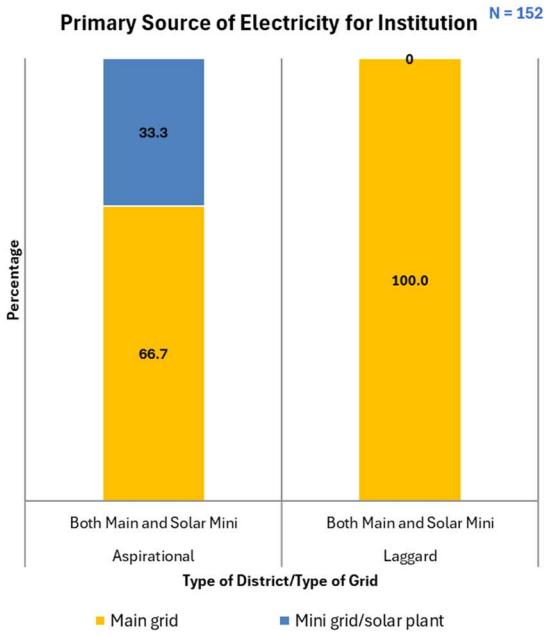


*Figure 24: Primary source of electricity for hybrid consumers*

There is considerable variation in the distribution of government scheme beneficiaries among institutional consumers. In aspirational districts, PM SAUBHAGYA and DDUGY are dominant. No institution in the villages having only mini grid reported receiving benefits from any scheme. In laggard districts, PM SAUBHAGYA and PMUY are dominant. No institution in villages with both main grid and mini grid connections reported receiving benefits from any scheme.

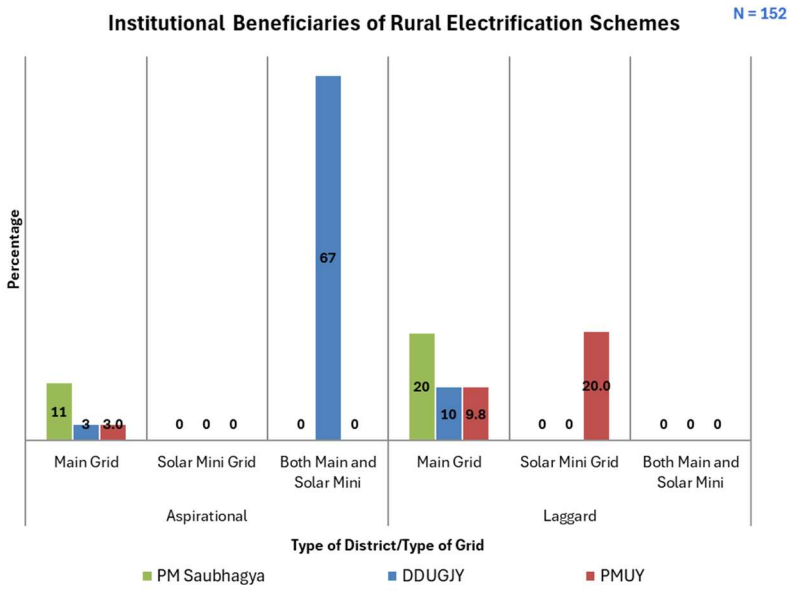


*Figure 25: Government scheme beneficiaries*

- **Quality of electricity services – Comparison between main grid and solar mini grid:**

The main grid electricity supply was reported to be reliable with adequate voltage across all categories. However, frequent electricity outages were also reported throughout the year, on a daily basis. Across all categories, the majority of respondents (60%) reported that institutions are not able to follow any set schedule of work due to the unpredictable nature of electricity supply from the main grid.

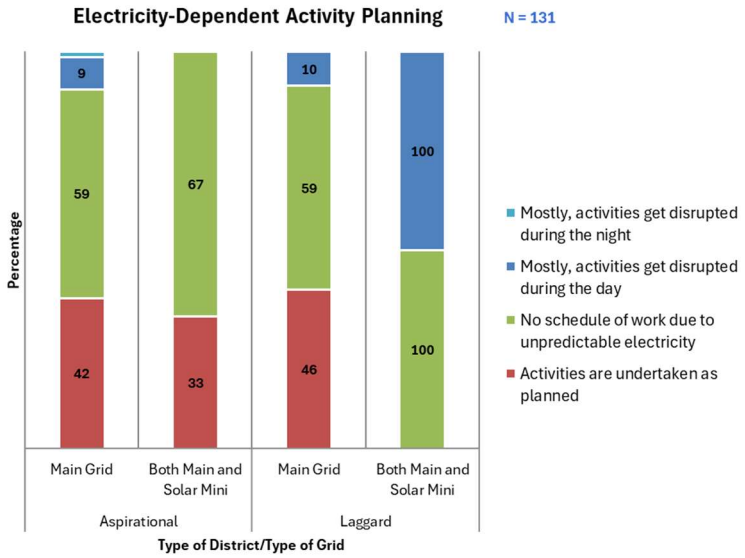


*Figure 25: Planning of business activities dependent on electricity*

A substantial majority of mini grid consumers (84%) reported that they receive round-the-clock supply of electricity from the mini grid on a daily basis, with adequate voltage maintained throughout the day. However, majority of the respondents (68%) reported that they do not operate high wattage equipment with mini grid supply. A higher proportion of consumers reported that they are satisfied with the quality of electricity services from the mini grid (92%) as compared to the main grid (76%).

Most commonly faced challenges in main grid electricity supply in aspirational and laggard districts for main grid consumers include frequent power outages and disruptions due to weather related factors as well as unreliable timing and duration of supply. For hybrid consumers in aspirational districts, the only challenge reported was frequent power outages and disruptions. In laggard districts, hybrid consumers also reported challenges such as frequent breakdown of electrical assets and high repair costs, as well as inadequate load capacity, in addition to the above.

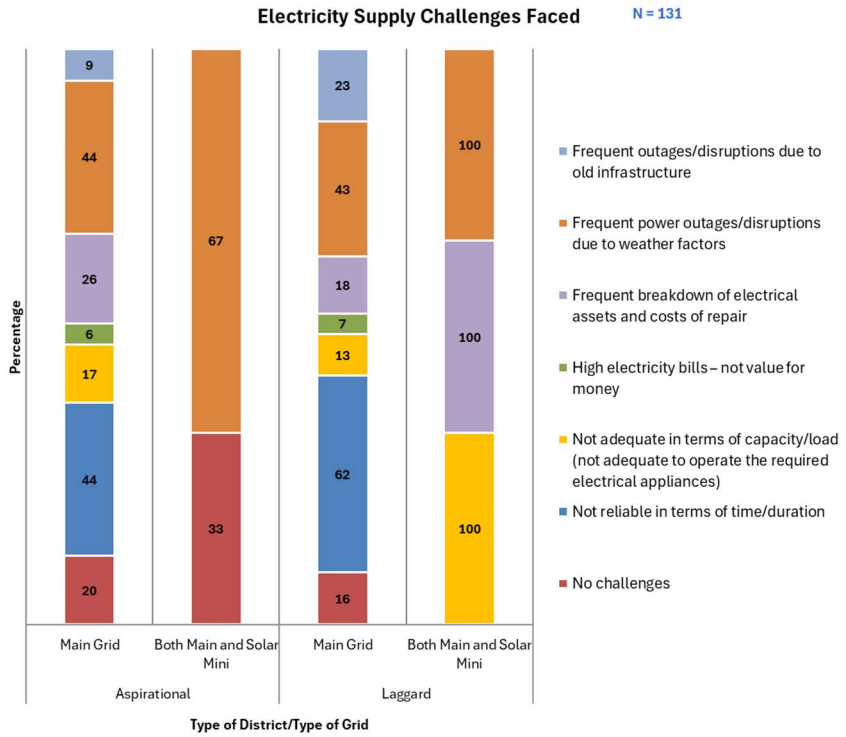


*Figure 27: Challenges faced with main grid electricity supply*

- **Billing and payments:**

In all categories, the majority of the respondents reported that different rates are charged for institutional consumers. A substantial proportion of institutional consumers in the only main grid category in aspirational districts as well as of those in the only main grid category and only mini grid category in laggard districts reported that they are charged the same rates as domestic connections. There seems to be no standard policy for billing for institutional consumers.

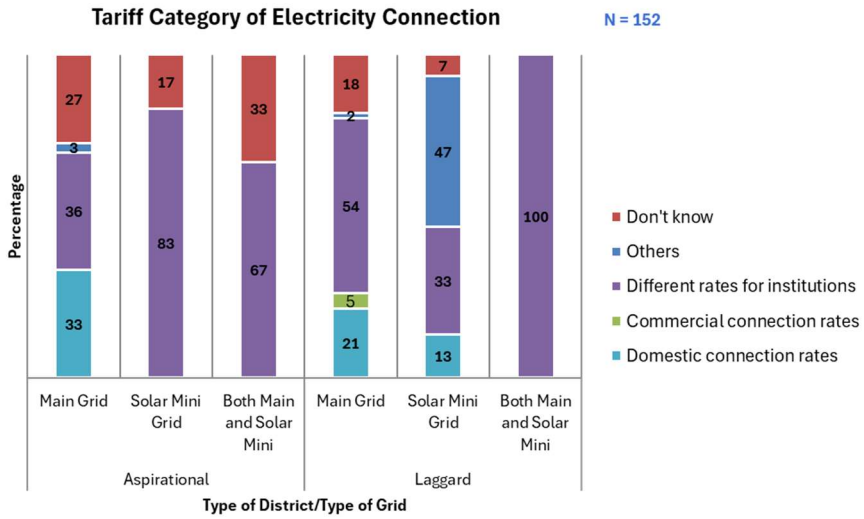


*Figure 28: Tariff structure for institutional consumers*

- **Willingness to Pay**
  - **Domestic consumers:**

In aspirational districts, the majority of domestic consumers desire uninterrupted 24/7 power supply, and increase in the number of hours of supply to more than 18 hours a day. In laggard districts, the majority of consumers desire an increase in the number of hours of supply to more than 18 hours a day. A very small proportion of consumers across all categories reported that they have no expectations of service improvement. Across all categories, a majority of consumers also reported that they want a reduction in electricity disruptions and outages. A substantial proportion also want an increase in load capacity to be able to run higher wattage equipment, and no voltage variation.

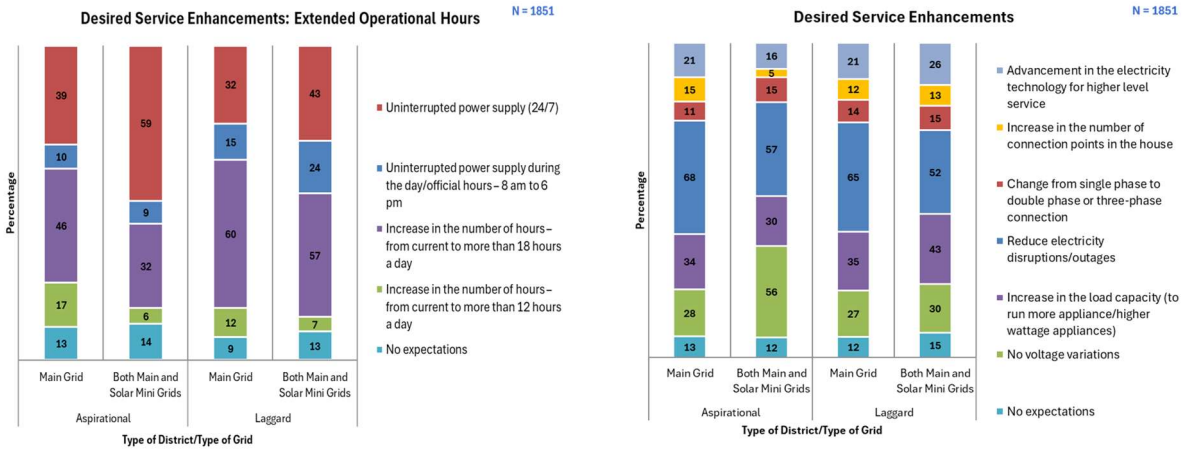


*Figure 29: Desired service enhancements-Domestic consumers*

For service improvements in the duration of supply with adequate voltage, the highest proportion of respondents (>35%) are unwilling to pay any additional amount over and above their current electricity bill. However, when further probed, the average amount of additional expenses that households were willing to incur was Rs. 221 for 8-12 hours of supply with adequate voltage and 3 hours of assured supply in the evening; Rs. 196 for 12-16 hours of supply with adequate voltage and 4 hours of assured supply in the evening; and Rs. 203 for 16-20 hours of supply with adequate voltage and 5 hours of assured supply in the evening. For more than 20 hours of supply from the main grid with adequate voltage and 6 hours of assured supply in the evening, the highest proportion of consumers (41%) are willing to pay 5% additional amount from their current electricity bill. For improvement in load capacity from the mini grid, the highest proportion of the consumers (74%) are willing to pay 5% additional amount as well.

Majority of domestic consumers across all categories reported that their criteria of focus when selecting an electricity service provider would be the per unit rate charged, followed by duration of per day availability of electricity. Service guarantee and installation charges were chosen as criteria by lesser proportion of consumers.

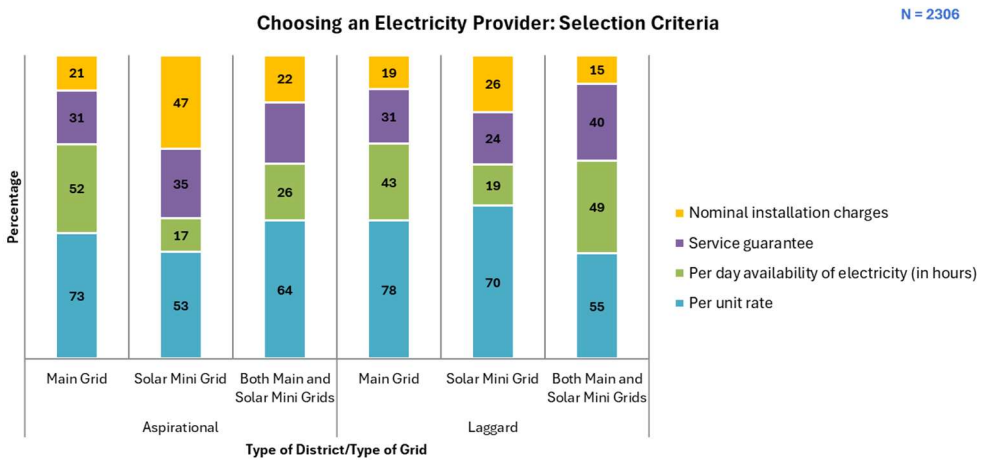


*Figure 30: Selection criteria for electricity service provider*

A hypothetical situation was presented to all respondents with three service providers offering varying per unit rates, installation charges, duration of daily supply, and service guarantee. Across all categories, a majority of consumers chose Option 1 – showing their preference for the provider offering the lowest per unit rate and installation charges, for 20 hours of supply, even though service guarantee is uncertain.

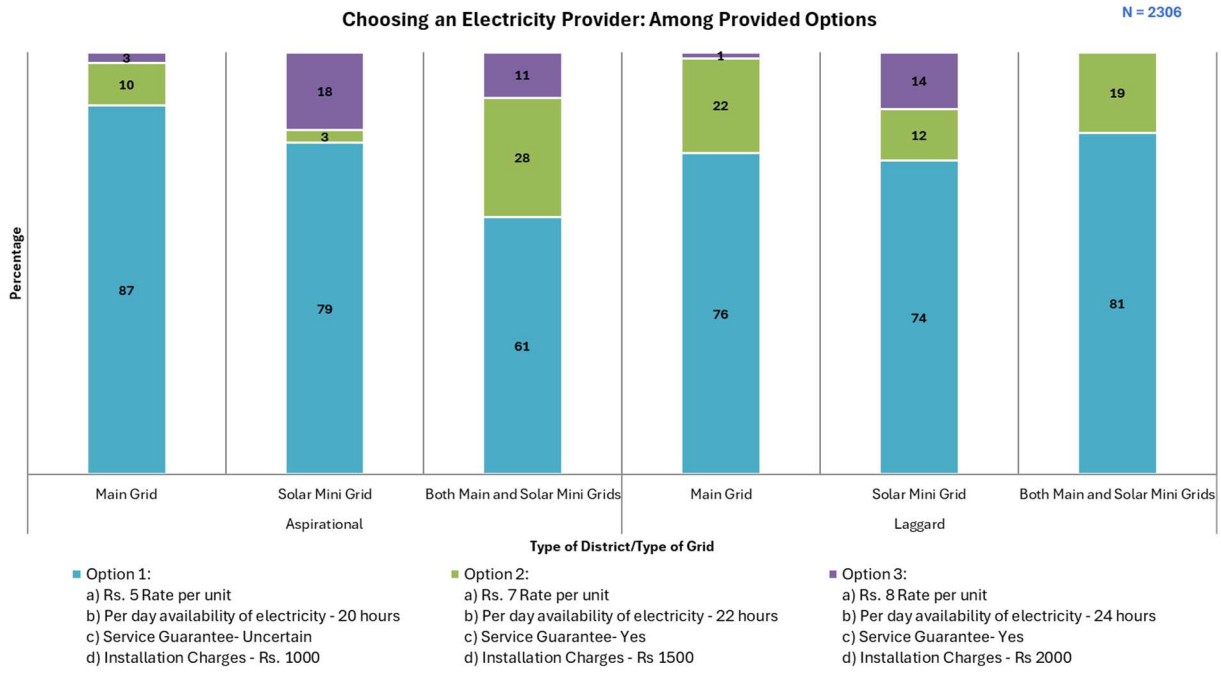


*Figure 31: Graphical representation of electricity provider*

- **Commercial consumers:**

The most desired service improvements reported by commercial consumers include uninterrupted 24/7 power supply, increase in the number of hours of supply to 18 hours a day especially among only main grid consumers who use electricity for their business enterprise from their domestic connections, reduction in electricity disruptions and outages,

voltage stability, and increase in load capacity to run more appliances and higher wattage equipment for business activities.

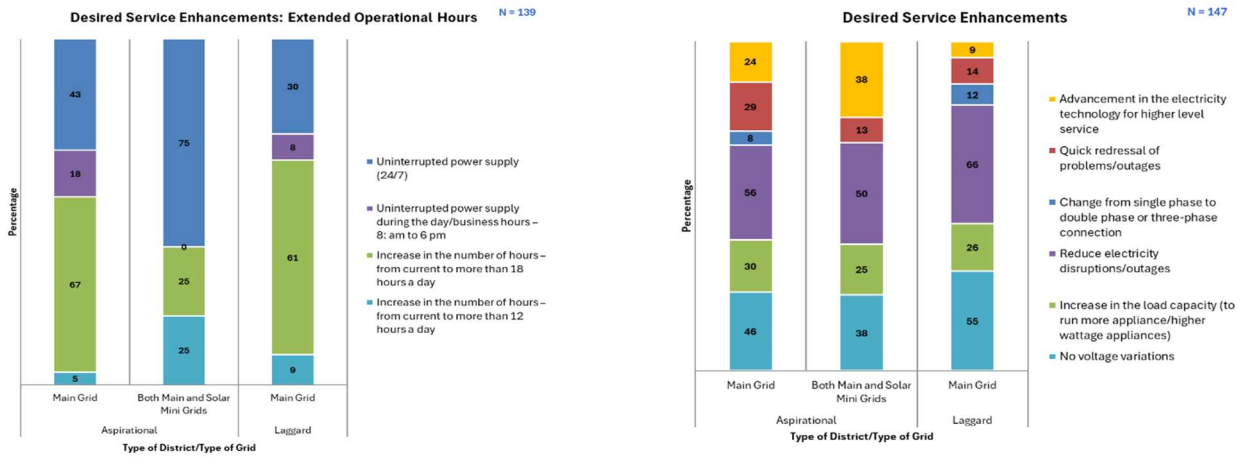


*Figure 32: Desired service enhancements- Commercial consumers*

For 12-16 hours of supply from the main grid with adequate voltage, the highest proportion of commercial consumers (35%) are willing to pay 5% additional amount from their current electricity bill. For improvement in load capacity from the mini grid, 47% of the consumers are willing to pay 10% additional amount from their current electricity bill.

Across all categories of consumers, per unit rate emerged as the most important selection criteria for choosing an electricity service provider, followed by per day availability of electricity in hours. For consumers with both main grid and mini grid connections in aspirational districts, nominal installation charges emerged as the most important selection criteria.

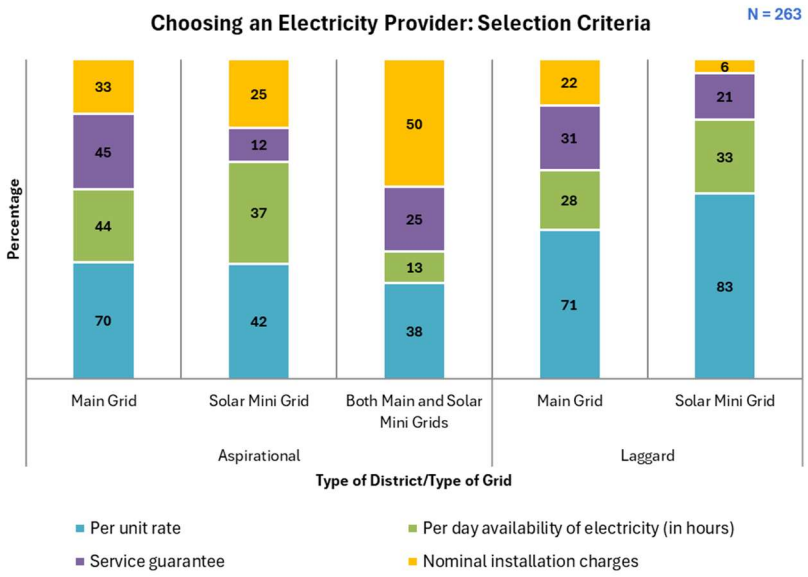


*Figure 33: Selection criteria for electricity service provider*

When the same hypothetical situation with three different service provider options was presented to commercial consumers, a majority of respondents across all categories chose Option 1 – showing their preference for the provider

offering the lowest per unit rate and installation charges, for 20 hours of supply, even though service guarantee is uncertain.

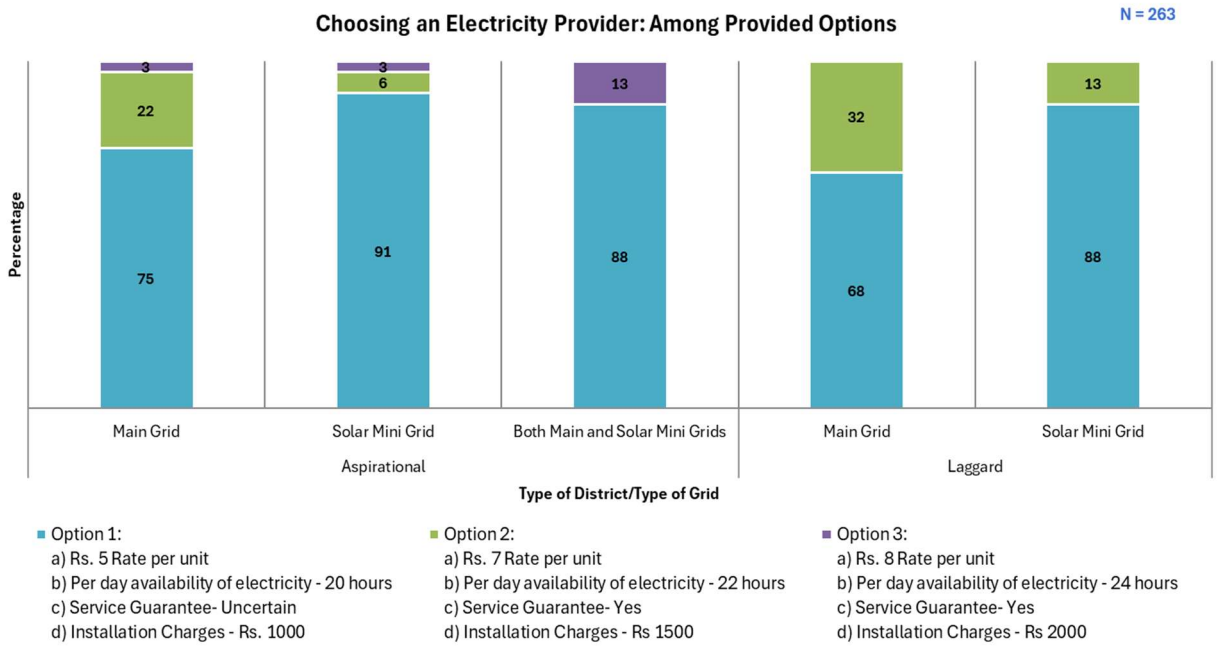


*Figure 34: Electricity service provider preference*

- **Institutional consumers:**

Across all categories, most desired service improvements reported by institutional consumers include voltage stability, increase in load capacity, reduction in electricity disruptions and outages, quick redressal of technical issues, and change from single phase to three phase connection.

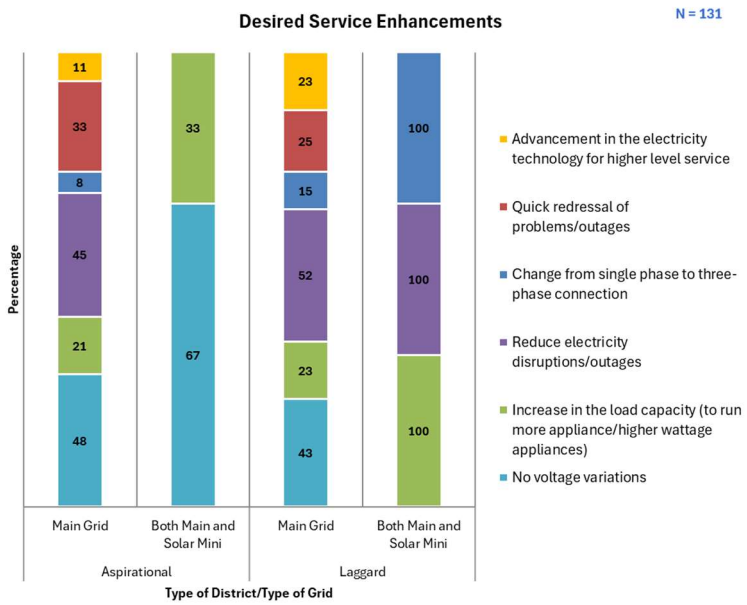


*Figure 35: Desired service enhancements - Institutional consumers*

For 12-16 hours of supply from the main grid with adequate voltage, the highest proportion of consumers (45%) are willing to pay 5% additional amount from their current electricity bill. For improvement in load capacity from the mini grid, the highest proportion of the consumers (36%) are willing to pay 5% additional amount as well.

The majority of consumers of villages with only main grid institutions in both aspirational and laggard districts chose per unit rate as the main criteria for selecting an electricity service provider. For only institutions in villages having only mini grid, the important criteria reported were nominal installation charges in aspiring and laggard districts, along with per unit rate in laggard districts. For institutions with both main grid and mini grid connections, the majority of respondents in aspirational districts chose nominal installation charges and per unit rate as the main criteria. In laggard districts for this same category, all the given criteria were chosen by all respondents.

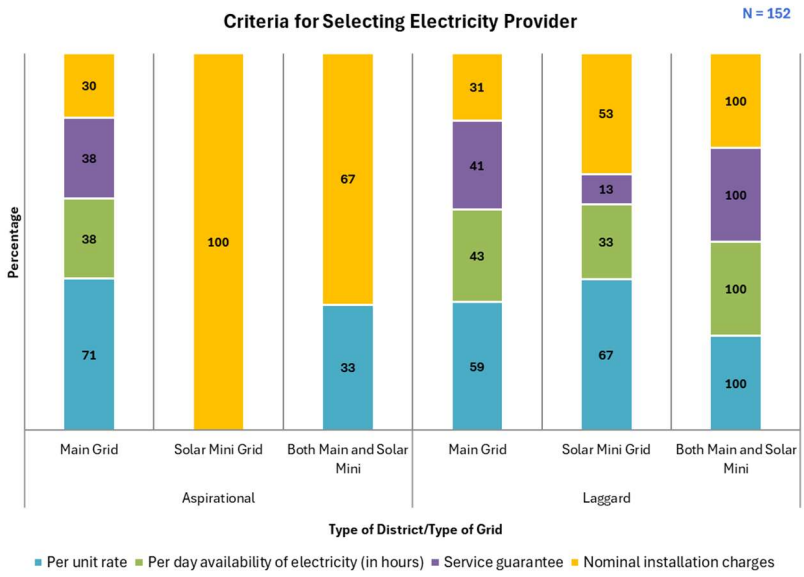


*Figure 36: Selection criteria for electricity service provider*

Institutional consumers were also presented with the same hypothetical situation with three different electricity service providers. Across all categories in aspirational districts, the majority of consumers chose Option 1 – showing their preference for the provider offering the lowest per unit rate and installation charges, for 20 hours of supply, even though service guarantee is uncertain. Although Option 1 is the choice for almost two thirds' institutions in villages with main grid and only mini-grid supply in laggard districts, it is seen that the majority of institutions in villages with both main grid and mini grid connection in laggard districts chose Option 2 – with a slightly higher per unit rate and installation charges, 22 hours of supply, and service guarantee.

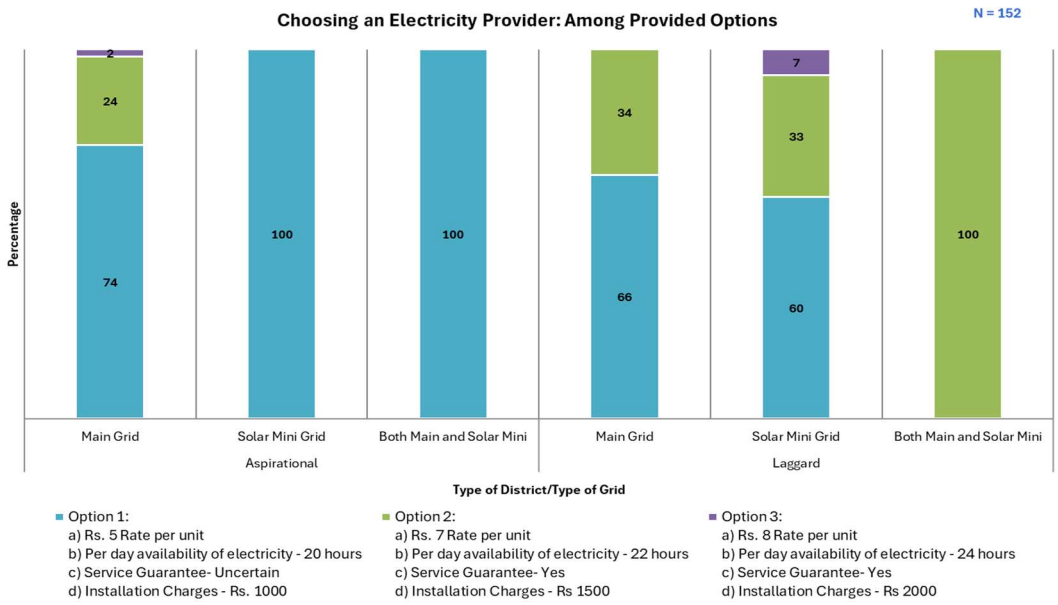


*Figure 37: Electricity service provider preference*

- **Supply-Side Dynamics**

*Operations, Financing, Opportunities and Constraints (Barriers and Facilitators) of Mini Grids*

- Mini grids have been established in recent years, with an average operational time of 6 months. Laggard districts have a slightly longer establishment period of up to 12 months, suggesting early adoption or longer project implementation times. 93% of mini grids are not integrated with the main grid, indicating standalone operations and the independent nature of these energy solutions. In aspirational districts, there is a small but notable presence of partial integration with 25% of the mini grids, pointing to a potential trend for grid interconnectivity. Half of the mini grids (50%) have a plant capacity between 5 kW to 10 kW, catering to localized demand or specific community needs. Aspirational districts feature higher capacities with 21 kW to 50 kW in 75% of cases, possibly reflecting higher energy demands or proactive scaling of infrastructure.
- Operator satisfaction and perspectives show that all operators in aspirational districts are very aware of solar power as a clean and environmentally friendly energy source, compared to 69.4% in laggard districts. Operators in both districts have been largely successful in providing connections to consumers who approached them for solar energy, with a 100% success rate in aspirational districts and 94.4% in laggard districts. Consumer preference across districts is primarily based on reliability of solar supply and environmental friendliness.
- The mini/micro-grids in India are experiencing significant growth in terms of consumer engagement and payment. Aspirational districts have seen a significant increase in household connections, commercial consumers, and institutional consumers, while laggard districts have seen a modest rise in household connections and commercial consumers. Payment models in aspirational districts are predominantly prepaid, suggesting a strategic move towards upfront payment structures.
- Billing methods in aspirational districts are primarily based on meter readings or consumption, while laggard districts have a significant proportion of consumers who are uncertain about their billing determinants. Service provision to households in aspirational districts has increased significantly, with a mean increase from 92.10 to 247.10. Both aspirational and laggard districts have expanded their consumer base, particularly in domestic households, with aspirational grids reporting a high average bill amount of Rs. 250, indicating a potentially higher usage or tariff rate compared to laggard districts which average at Rs. 91.50.
- Commercial sectors show a marked contrast, with aspirational districts billing significantly higher on average (Rs. 1,050.00) than laggard districts (Rs. 366.70), suggesting either greater commercial activity or higher tariffs in aspirational districts. The total average monthly bill collections for domestic consumers are substantially higher in aspirational districts (Rs. 31,562.50) versus laggard districts (Rs. 5,192.30), underscoring a more substantial revenue generation in aspirational districts.
- Payment consistency is significantly higher in aspirational districts with 75% of consumers always paying on time, while laggard districts struggle with 44.4% rarely making payments, which may affect the financial viability and cash flow for the operators in these districts. Additionally, aspirational districts have a higher mean overdue amount of Rs. 7,500 compared to Rs. 3,343.2 in laggard districts, potentially indicating stricter credit control measures or a higher tariff being imposed.
- Mini grid operator profiles in aspirational and laggard districts are diverse, with a majority of operators aged 25 years and older, indicating diverse age representation across operators. The workforce is overwhelmingly male across both districts, with women representing only about 8% of the operators in laggard districts. Laggard district operators average around 6 months of service versus 5 months in aspirational districts, hinting at greater experience or established operations in the former.
- A vast majority of operators reside in the serviced villages, especially in laggard districts (97.22%), signifying strong community ties and potential for tailored energy solutions with higher responsiveness. Operator satisfaction and perspectives show that all operators in aspirational

districts are very aware of solar power as a clean and environmentally friendly energy source, compared to 69.4% in laggard districts.

- Mini/micro-grids in India are experiencing significant growth in their consumer base, with aspirational districts experiencing a significant increase in household connections and commercial consumers. Payment models in aspirational districts are predominantly prepaid, contrasting with laggard districts where post-paid and other specified methods are more common. This suggests a strategic move towards upfront payment structures in aspirational districts, potentially enhancing financial sustainability.
- Billing methods in aspirational districts are primarily based on meter readings or consumption (50%), while laggard districts have a significant proportion of consumers who are uncertain about their billing determinants (38.9% don't know/can't say), which could indicate a need for clearer communication and billing transparency. Service provision to households in aspirational districts has increased significantly, with a mean increase from 92.1 to 247.1.
- Both aspirational and laggard districts have expanded their consumer base, particularly in domestic households, with aspirational grids reporting a high average bill amount of Rs. 250, indicating a potentially higher usage or tariff rate compared to laggard districts which average at Rs. 91.5. Commercial sectors show a marked contrast, with aspirational districts billing significantly higher on average (Rs. 1050) than laggard districts (Rs. 366.7), suggesting either greater commercial activity or higher tariffs in aspirational districts. The total average monthly bill collections for domestic consumers are substantially higher in aspirational districts (Rs. 31,562.5) versus laggard districts (Rs. 5,192.3), underscoring a more substantial revenue generation in aspirational districts. Payment consistency is significantly higher in aspirational districts with 75% of consumers always paying on time, while laggard districts struggle with 44.4% rarely making payments, which may affect the financial viability and cash flow for the operators in these districts. Infrastructure and safety are also significant factors in aspirational districts. Aspirational districts have a larger infrastructure setup, with 188 poles and streetlights compared to 33 and 7 in laggard districts. Circuit breakers are universal in aspirational districts (100%), and regular safety audits are more common in aspirational districts (100%) than laggard districts (69.4%). Grounding systems are less common in laggard districts (38.9%), pointing to an area where safety infrastructure can be improved. Surge protectors are in place in 62.5% of aspirational district grids but only 33.3% of laggard districts, which might leave the latter more vulnerable to power surges.