SHAKTI
SUSTAINABLE ENERGY
FOUNDATION

CLEAN

STATE OF THE DECENTRALIZED RENEWABLE ENERGY SECTOR IN INDIA

2019/20

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FOREWORD

2020 has been a very difficult year for the Decentralized Renewable Energy (DRE) sector. Just as it was showing signs of expanding its product portfolio beyond lighting and reporting small successes in penetrating into livelihoods, agriculture and health sectors, and the COVID-19 pandemic struck. The DRE sector has shown great resilience and adaptation to the catastrophe, but COVID-19 has taken its toll on the businesses and impact of CLEAN members. Employment has drastically dropped, so has investor interest. Sale of DRE products is abysmally low. All growth plans, diversification and expansion are on hold, waiting for better times.

The potential of and the need for decentralized solutions though has never been greater. CLEAN and its members continue to repose faith in DRE businesses and solutions. DRE is integral to any economic recovery package and there is a strong case for its inclusion as one of the sectors under the Atma Nirbhar Bharat. The case studies presented in this report present the diversity of DRE solutions at the local level and show immense opportunity for impact when supported with awareness creation, access to markets and financing. The surveys carried out for the report show very good participation by last mile vendors and self-help groups in propagating DRE products. When stimulated, they have the potential to drive markets and contribute to small towns and rural economic revival.

The fourth edition of the State of the DRE Sector report showcases the transitions and emerging solutions offered by the sector. This report also provides information on market trends and technological advances. It discusses the challenges faced and makes a compelling case for mainstreaming DRE into livelihoods, health, agriculture, education etc. The case studies also showcase that DRE businesses are driven by passionate people committed to socio-economic impact of the 'unserved or under-served' with profits as a secondary though necessary requirement. The response of CLEAN members to the COVID-19 situation, their effective engagement with the needy bear testimony to their resilience, innovation, and the innate desire to not only serve the but also carve a niche for DRE products/services and themselves that go beyond the basic energy access issues or solutions.

I expect that this State of the Sector report can be transformative for the sector. It will help in building confidence not only in the DRE sector but also in CLEAN and its members who are doing a great job for energy access across the country.

Svati Bhogle
Chairperson
CLEAN

PREFACE

'Access for Development' was the theme for the launch event of the third edition of the State of the DRE Sector report in 2019. This year, the DRE Sector has more interesting development stories to share. As the DRE businesses struggled in the early months of the COVID-19 crisis, many DRE enterprises saw this as an opportunity to expand their businesses through DRE enabled innovative solutions. Few of such innovations by DRE enterprises, specifically for the healthcare sector is covered in this year's report. Our belief that DRE can provide access for development just got further strengthened as we traversed through 2020.

The sector has multiple offerings to various sectors, be it agriculture, horticulture, food processing, textiles, and many other allied sectors. It has the potential to integrate DRE solutions with activities where human drudgery can be reduced. This year's report carries 23 case studies of innovative financing models, best practices, productive use of DRE applications, and COVID-19 relief measures by DRE enterprises.

This fourth edition of the State of the Decentralized Renewable Energy Sector in India 2019/20 report is an attempt to present an overview of the developments in the DRE sector. The survey conducted with CLEAN members, financiers, NGOs, think-tanks, and government representatives has helped to understand their perspectives and expectations to continue providing access for development. The survey details are presented in this report.

We sincerely hope that this report will be useful for relevant stakeholders, both from within and outside the sector – government departments, policy makers, financial community, donors and philanthropies, and passionate clean energy entrepreneurs – in achieving India's national energy goals. Like last year, we believe that this report will generate interest and create opportunities to deploy more number of DRE applications across the country.

Adwait Joshi
Chief Executive Officer
CLEAN

Anshu Bharadwaj
Chief Executive Officer
Shakti Sustainable Energy Foundation

ACKNOWLEDGEMENTS

CLEAN would like to express its sincere gratitude to the following members for their support in sharing the valuable information on operations, business models, financial requirements, and case studies. We would not have been able to put this report together without their timely inputs.

1. Aaranyak
2. BlueMatch Impact Solutions
3. Caspian Impact Investments
4. Centre for Development Orientation and Training
5. Chakraakaar Lifestyle Solutions
6. Chirasthaee Urja Samadha
7. CSIR-NEERI
8. Cygni Energy
9. Dhosa Chandaneswar Bratyajana Samity
10. Decentralised Energy Systems India
11. Devidayal Solar Solutions
12. Doorastha Analytics
13. E-Hands Energy India
14. Ecoideaz Ventures
15. Ecosense Appliances
16. Ekak Innovations
17. Emsys Electronics
18. Envo Renewable Energy Services
19. Fair Climate Fund
20. Forum for the Future
21. GENII Engineering & Services
22. Gram Oorja Solutions
23. Grameen India Innovations
24. Greenland Solutions
25. Greenway Grameen Infra
26. GSES India Sustainable Energy
27. Himalayan Rocket Stove
28. Human Organisation for Patronisation of Environment
29. Inspire Energy Care
30. iNVENCO
31. Luxlighting Technology
32. Mesha Energy Solutions
33. MicroEnergy Credits
34. NBIRT
35. OMC Power
36. Oorja Development Solutions
37. PRESPL
38. Pushan Renewable Energy
39. Ravi Engineering and Chemical Works
40. Reliable Skill Corporation
41. Renewable Energy Applications and Products
42. Riya Solar
43. Sakhi Unique Rural Enterprise
44. SCALE
45. SELCO
46. Simi Stove
47. Simpa Engie
48. Smokeless Cookstove Foundation
49. SNL Energy Solutions
50. Society to Create Awareness Towards Life and Environment
51. Sunrise Energy Corporation
52. Supernova Technologies
53. Suraj Solar Enterprise
54. Swayambhu Innovative Solutions
55. SwitchOn Foundation
56. Techno Village
57. Technology Informatics Design Endeavour
58. Udaipur Urja Initiatives Producer Company
59. Village Renewable Energy Systems
60. Villgro Innovations Foundation
61. Vineeti Technologies
62. Volks Energie
63. WiSH Energy Solutions

We are extremely grateful to all the advisory committee members: Abhishek Jain (CEEW), Anjali Garg (IFC), Divya Kottadiel (Power for All), Dwipen Boruah (GSES), Nilanjan Ghose (GIZ), Rekha Krishnan (WEFT), Santosh Kumar Singh (Intellecap), Srishti Mahajan (Shakti Sustainable Energy Foundation), and Tirthankar Mandal (WRI) for sharing their insights and providing valuable feedback on the draft report.

We would also like to thank Banker's Institute of Rural Development, ESAF, Midland Microfin, Muthoot Microfin, Pahal Financial Services, Sarala Women Welfare Society, Self Employed Voluntary Association, Uttarakhand State Cooperative Bank, and other anonymous investors for sharing their perspectives and contributing to the development of case studies.

We would like to acknowledge the regular support of the CLEAN Board of Directors.

Core Team: Hari Natarajan, Anuj Hemant Xess, Abhishek Dhawale, Amittosh Pandey, Ananya Saini, Juhi Anand, Gopal Krishnan, Rajni Jain, Ashima Singh, and Raushan Kumar.

Contributors: Adwait Joshi, David Durani, Deepa Sharma, Sreejith Narayan, Nibedita Panigrahy, Aayushi Malpani, Chhavi Arora, Sanya Mehra, and Manoj Kohli.

We extend our heartfelt thanks to Shakti Sustainable Energy Foundation for financially supporting this project and for their constant support to the network. Also, we express our gratitude to Good Energies Foundation for its continuous encouragement and institutional support for the CLEAN project.

Shakti Sustainable Energy Foundation seeks to facilitate India's transition to a sustainable energy future by aiding the design and implementation of policies in the following areas: clean power, energy efficiency, sustainable urban transport, climate change mitigation and clean energy finance.

LIST OF ABBREVIATIONS

AC	Alternating Current
AI	Artificial Intelligence
BCS	Bagepalli Coolie Sangha
BIS	Bureau of Indian Standards
BOOT	Build, Own, Operate, and Transfer
BVT	Bharatiya Vikas Trust
CAWACH	Centre for Augmenting WAR with COVID-19 Health Crisis
CEEW	Council on Energy, Environment and Water
CGTMSE	Credit Guarantee Fund Trust for Micro and Small Enterprises
CML	Centre for Microfinance and Livelihood
CPSE	Central Public Sector Enterprise
CSIR- NEERI	Council of Scientific and Industrial Research - National Environmental Engineering Research Institute
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DC	Direct Current
DDUGJY	Deen Dayal Upadhyaya Gram Jyoti Yojana
DFI	Development Finance Institution
DRE	Decentralized Renewable energy
DST	Department of Science and Technology
EFI	Equivalent Fortnightly Installment
EMI	Equivalent Monthly Installment
EV	Electric Vehicle
FCF	Fair Climate Fund
FLDG	First Loss Default Guarantee
GHG	Greenhouse Gases
GoI	Government of India
GS VER	Gold Standard Voluntary Emission Reduction Units
GST	Goods and Services Tax
HAP	Household Air Pollution
HEC	Human–Elephant Conflict
HR	Human Resource
ICS	Improved Cookstoves
INR	Indian Rupee
IoT	Internet of Things
ISO	International Organization for Standardization
JLG	Joint Liability Group
KUSUM	Kisan Urja Suraksha Evam Utthan Mahabhiyan
LT	Low Tension
MEC	Micro Energy Credit
MEDA	Maharashtra Energy Development Agency
MFI	Microfinance Institution
MML	Midland Microfin Ltd

MMS	Module Mounting Structure
MNRE	Ministry of New and Renewable Energy
MSD	Micro Solar Dome
MSME	Micro, Small, and Medium Enterprises
MUDRA	Micro Units Development and Refinance Agency
NABARD	National Bank for Agriculture and Rural Development
NBFC	Non-Banking Financial Company
NBIRT	NB Institute for Rural Technology
NGO	Non-Governmental Organization
NHB	National Housing Bank
NIBE	National Institute of Bio Energy
NISE	National Institute of Solar Energy
NIWE	National Institute of Wind Energy
NSTEDB	National Science and Technology Entrepreneurship Development Board
O&M	Operations and Maintenance
OMC	Omnigrid Micropower Company
OREDA	Odisha Renewable Energy Development Agency
PHC	Primary Health Centre
PM	Particulate Matter
PPA	Power Purchase Agreement
PRESPL	Punjab Renewable Energy Systems Pvt. Ltd
PSU	Public Sector Undertaking
PV	Photovoltaic
R&D	Research and Development
RESCO	Renewable Energy Service Company
RRECL	Rajasthan Renewable Energy Corporation Limited
SAUBHAGYA	Pradhan Mantri Sahaj Bijli Har Ghar Yojana
SCALE	Society to Create Awareness towards Life and Environment
SCF	Smokeless Cookstove Foundation
SDGs	Sustainable Development Goals
SELCO	Solar Electric Light Company
SEVA	Self Employment Voluntary Association
SHG	Self Help Group
SHS	Solar Home Systems
SIDBI	Small Industrial Development Bank of India
SME	Small and Medium-Sized Enterprise
SNA	State Nodal Agency
TCS	Tax Collection at Source
TDS	Tax Deducted at Source
UCRE	Uttarayan Cooperative for Renewable Energy
UCREE	Uttarayan Cooperative for Renewable Energy and Environment
UPNEDA	Uttar Pradesh New and Renewable Energy Development Agency
UUI	Udaipur Urja Initiatives
VER	Voluntary Emission Reduction
WUG	Water User Groups

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EXECUTIVE SUMMARY

Decentralized Renewable Energy (DRE) can ensure 24×7 reliable and quality energy supply through clean energy sources to all Indian households and small and medium sized enterprises (SMEs). Besides, DRE can also play a crucial role in enabling livelihood activities by energizing traditional and non-mechanized activities. The maximum beneficiaries of clean energy from DRE sources have been the poor and marginalized sections of the society, as DRE enhances their economic and social development. Today, the pursuance of these sections of the society for affordable and reliable sources of energy is increasing especially with respect to access and livelihood generation.

Similar to the past three editions of the State of the DRE Sector in India reports, the fourth edition presents the findings of a market survey. This edition has seen the participation of 63 DRE businesses. This report showcases the key highlights from the sector across technology, markets, finance, policy, and skills and training. The report also captures the impact of COVID-19 on DRE businesses.

Based on the response to the survey, analysis of inputs from various sources, and interaction with several stakeholders (both members and others), CLEAN has put together this year's State of the DRE Sector in India report. Spread over six chapters and 23 impactful case studies, this edition captures the state of the DRE sector in India in a nutshell.

The executive summary presents the main highlights of this report.

1. Enterprises reported lights and solar home systems (SHS) as their highest selling products. Other products such as solar pumps, improved cookstoves, and cold storages are also popular. Although most enterprises reported sales of less than 100 units for their products, low-priced products such as solar lights, improved cookstoves, and SHS recorded sales of more than 10,000 units.

2. A larger number of enterprises manufacture products with these sales numbers, indicating a greater market competition.

3. Enterprises cite lack of adequate financing channels and consumer affordability as the biggest barriers to the growth of their business. This is followed by the gap in consumer awareness about the products and their benefits. Limited market linkages and distribution channels are other pressing issues for DRE enterprises.

4. In terms of challenges faced by enterprises to improve market access, the majority of them cited lack of proper financing channels and consumer affordability as the biggest barriers. Consumer awareness about the products and their benefits is yet another challenge to scale business. Market linkages and distribution channels is another pressing issue for DRE enterprises.

5. The consumers who have used the products find them useful as these technologies have become more reliable and cost-competitive over time.

6. Enterprises prefer either non-governmental organizations (NGOs) associated with self-help groups (SHGs) or the more traditional, distributor–retailer network to sell their products. The last-mile delivery segment is seen to be growing year after year due to their vast reach and efficient supply chain networks at the consumer end.

7. 62% of the members surveyed reported that they have been profitable in FY 2019/20 as compared to 45% of the members FY 2018/19. 86% of the members were able to meet their projected revenue.

8. The success rate in raising funds so far has been 37% in which the most funds were raised through debt. Government has also provided mediums for enterprises to access finance, the main one being the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE).

9. The DRE sector was not immune to the impact of COVID-19. 50% of the members reported increased revenue loss between quarter 4 of FY 2019/20 and quarter 1 of FY 2020/21. Members feel that to overcome the adverse economic effects of the pandemic, various sources of debt and CSR funds can be helpful.

10. Investors cite that inability to provide collateral and change in government policies regarding the sector are the major challenges when it comes to enterprise financing in the DRE sector.

11. A large number of consumers are served by DRE enterprises and the size of loads are almost equal across residential, commercial, and community sectors.

12. Members have also reported that 1000+ educational institutions, 50,000+ health care institutions, and 700+ public buildings (including banks, post offices, and jails) are being supported by DRE technologies by either enabling or supplementing their energy access.

13. The product standardization space in the DRE sector is led by SHS and street lighting solutions, along with increased lab and field tests for improved biomass cookstoves. In terms of R&D, productive-use machinery has seen the most research and product innovation due to the varied needs of the end users.

14. Enterprises have also implemented new technologies such as Internet of Things (IoT), blockchain, and artificial intelligence (AI) for remote monitoring, managing payments, security, and performance analysis of their projects or individual products. A few enterprises are also seen foraying into the e-mobility space with products like e-rickshaws, solar-powered e-ambulances, and charging infrastructure.

15. 19% of the members reported a positive impact due to their participation in these schemes. Some member enterprises reported an indirect positive impact from recognition and certification given by the Government of India (GoI). This recognition helped them in successfully raising capital.

16. 22% of the member enterprises felt a direct or indirect positive impact from state government initiatives.

17. The survey done by CLEAN also indicates that there is maximum opportunity in rural development in areas such as health, livelihood opportunities, and agriculture; however, much remains to be done to leverage this potential.

18. The most widely appreciated step during COVID-19 was the reduction of 25% of existing rates of Tax Deducted at Source (TDS) and Tax Collection at Source (TCS) till 31 March 2021. 51% respondents expressed that this was a positive step taken by the central government.

19. With respect to employment generation by CLEAN members, 42 enterprises who participated in the survey reported a total of 1264 employees. In comparison, 42 enterprises had reported a total of 6910 employees in FY 2018/19. This shows a severe decline in employment over the past one year, which can largely be attributed to reduced business opportunities arising from the COVID-19 crisis.

20. Around 57% of enterprises reported that they are postponing the hiring activity for cost reduction in their business due to COVID-19.

OVERVIEW OF THE DRE SECTOR

Conducive policy environment, market demand, availability of finance, adequate workforce, and continuous development of solutions through technology innovation play a key role in strengthening the ecosystem of the DRE sector.

The insights presented have emerged from CLEAN's annual survey with its members and key stakeholders (including enterprises, financial institutions, civil society organizations (CSOs), etc.). 63 organizations (including members and non-members) participated in this year's survey.

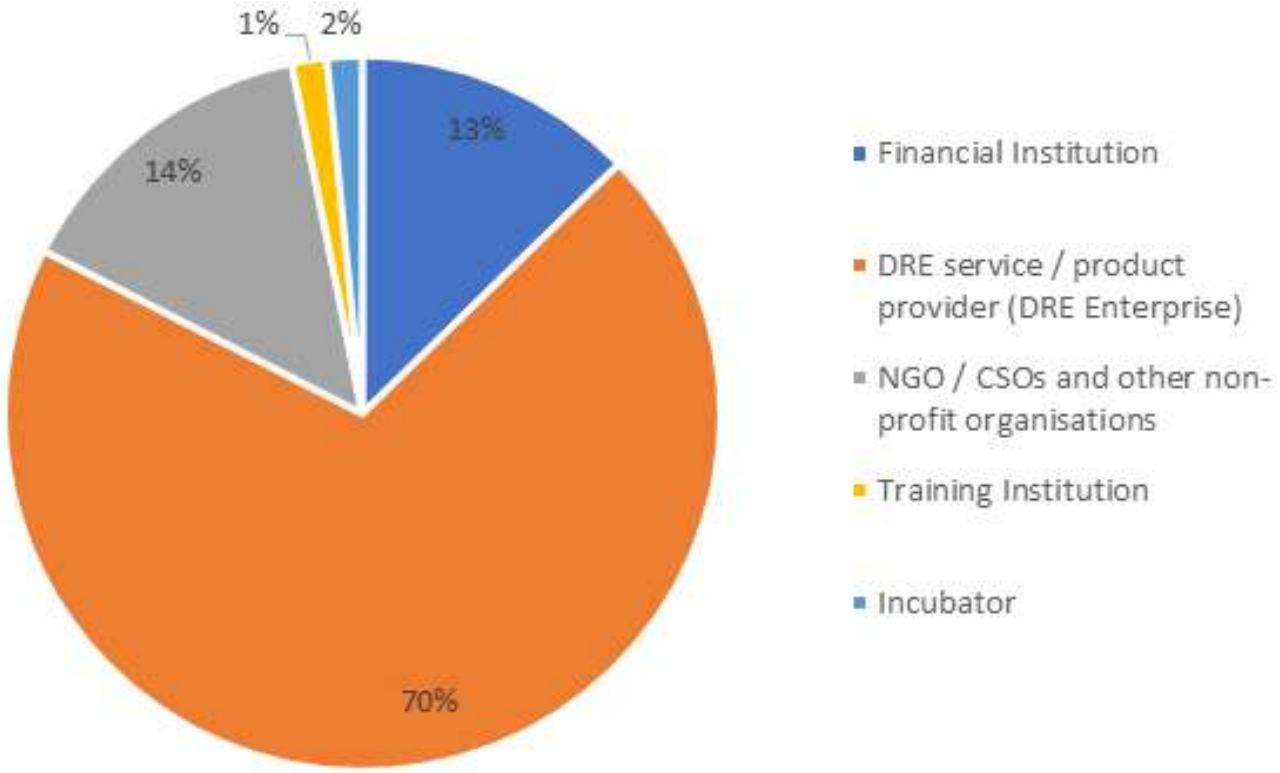


Figure 1. Break-down of CLEAN members
(Sample size: 63 respondents)

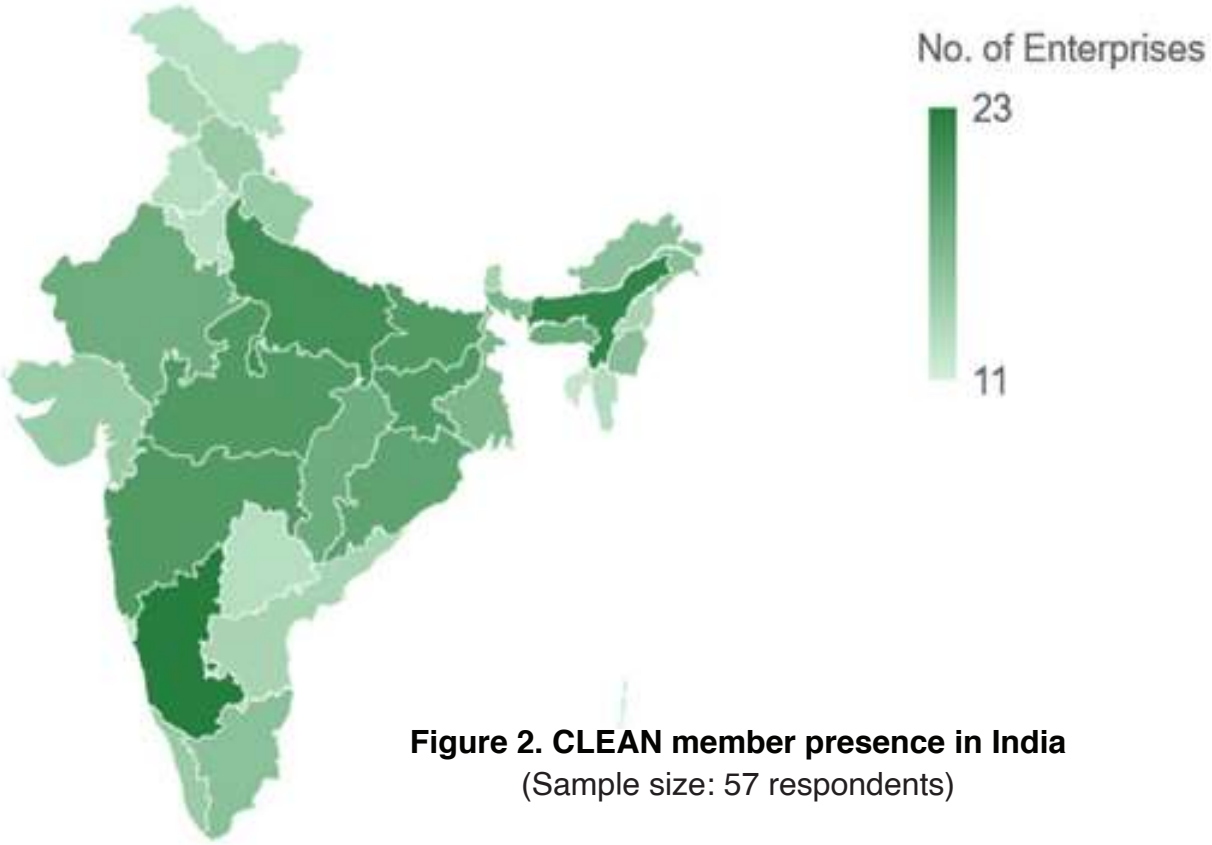


Figure 2. CLEAN member presence in India
(Sample size: 57 respondents)

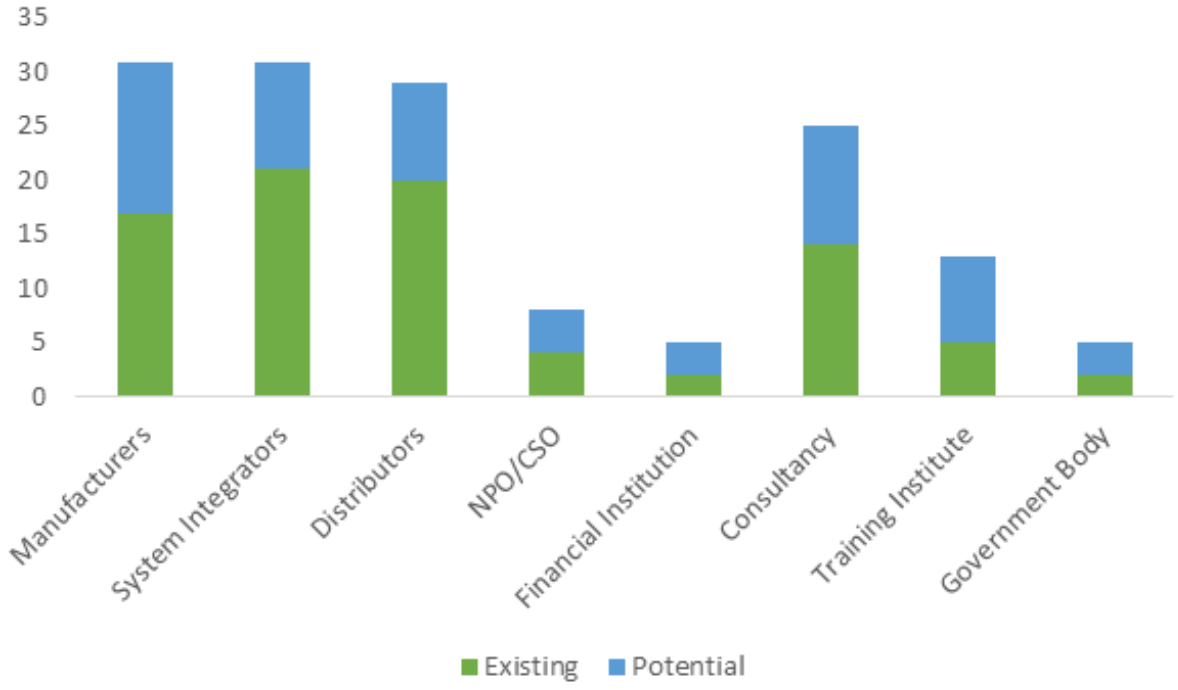


Figure 3. Existing and potential business areas of CLEAN members
(Sample size: 44 respondents)

Through the survey, CLEAN has tried to capture insights on the following aspects: (a) market, (b) finance, (c) technology, (d) policy (e) skills and training.

01

DRE MARKETS

Decentralized Renewable Energy (DRE) markets have been misconstrued as a source only to generate and deliver energy for household purpose, that too mostly lighting. Numerous case studies have shown the potential of DRE to run micro enterprises and business effectively.

The section elucidates the sales of DRE applications over the past one year, challenges faced to scale, and preferred market linkages and distribution channels. Their opinion on the state of the last-mile delivery network in their geographies and the dire need for it have also been accounted for in this section.

1.1. Most Popular DRE Products

Enterprises reported on the most popular products in their portfolio. This helps understand the technologies that are in high demand due to their utility. Most enterprises have more than one of these technologies in their portfolio so that they do not have to depend on just one product for their revenue. Some of the key take-aways from the responses are listed below:

- Lights and solar home systems (SHS) are the highest selling products. This is mainly due to their need, utility, and lower costs compared to other products.
- Solar pumps, improved cookstoves, cold storage, and device-charging stations are fairly popular in the market. Cold storages and device-charging stations are majorly used by small businesses to supplement their income.
- Agro-processing machines sold well due to the higher selling price of processed goods compared to raw produce. Textile-related applications are also popular due to increased productivity and income, mostly among the women.

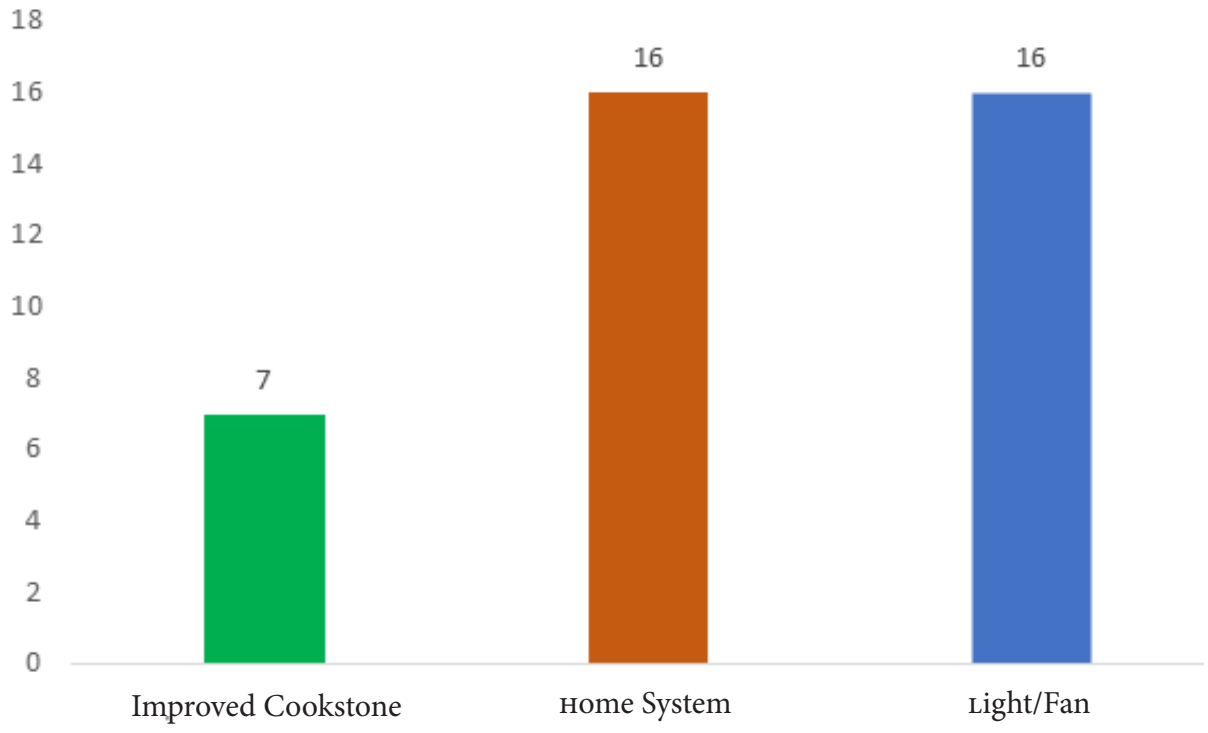


Figure 4. Most popular DRE products
(Sample size: 33 enterprises)

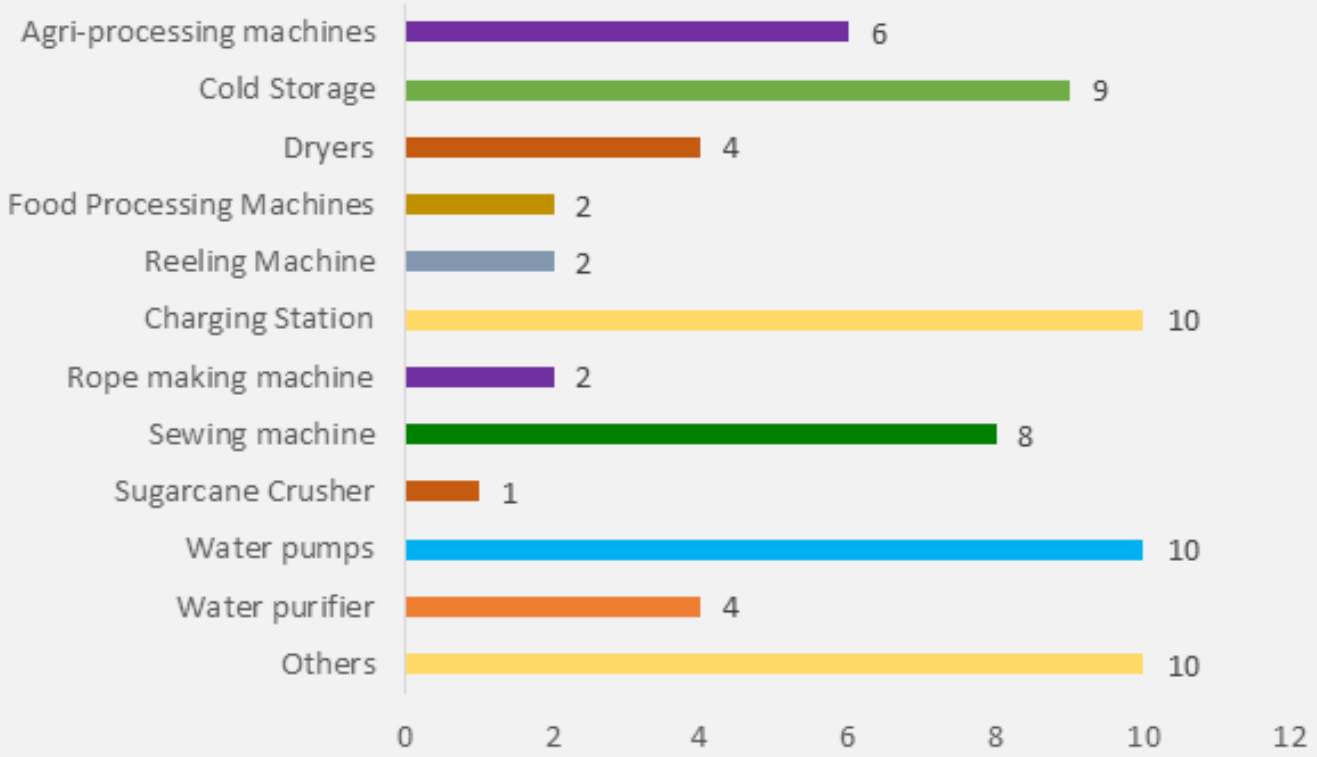


Figure 5. Other popular DRE products
(Sample size: 33 enterprises)

1.2. Sales of DRE Products: 2019/20

Product sales are a reliable way to gauge the market demand and acceptability of any product. Variety of factors such as price points, need and demand for the product, and market competition play a crucial role in the sale of any product.

- For all the products collectively, most enterprises reported that they were able to sell less than 100 units of their products.
- Only low-priced products such as solar lights, solar home systems (SHS), and improved cookstoves recorded sales in excess of 10,000 units.
- The figure also demonstrates the variation in the number of enterprises manufacturing different products. Products with the highest sales also have a larger number of enterprises manufacturing them.
- This is also substantiated in GOGLA's report 'Peering into the Future', which states that the sector is decidedly more mature if there are multiple options for a single product. The large number of enterprises engaged in manufacturing these products indicate the confidence of the producers and the interests of consumers.

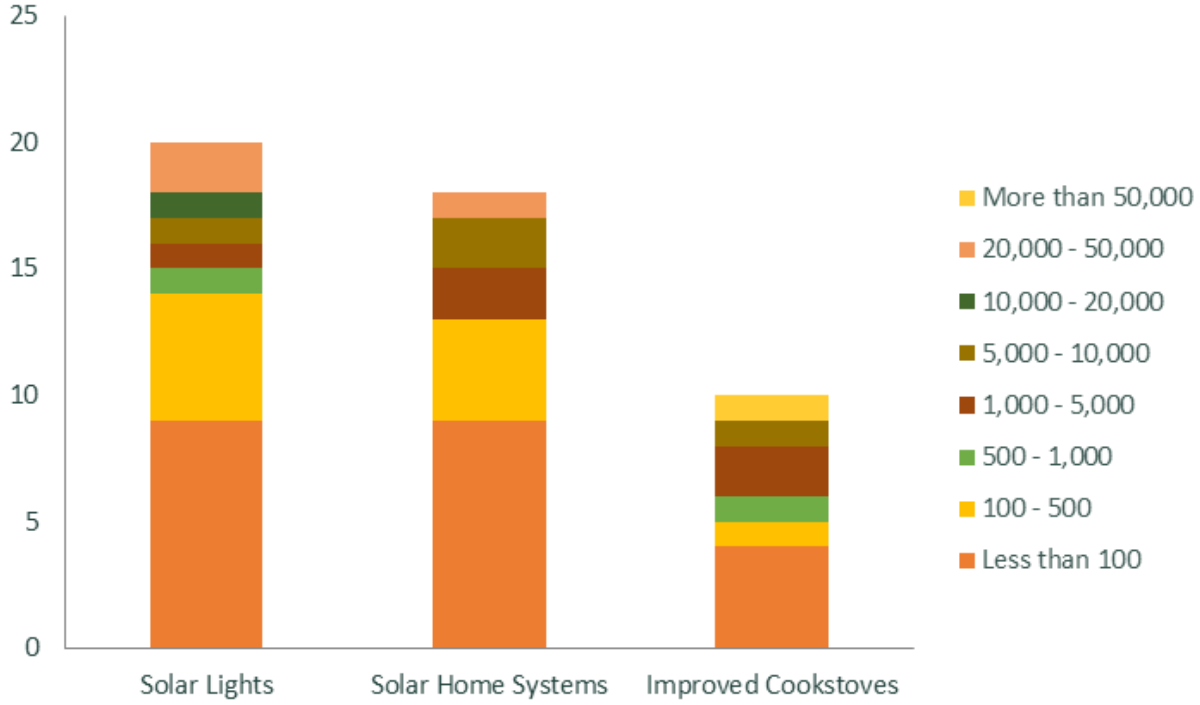


Figure 6. Product sales in FY 2019/20 [1]
(Sample size: 33 enterprises)

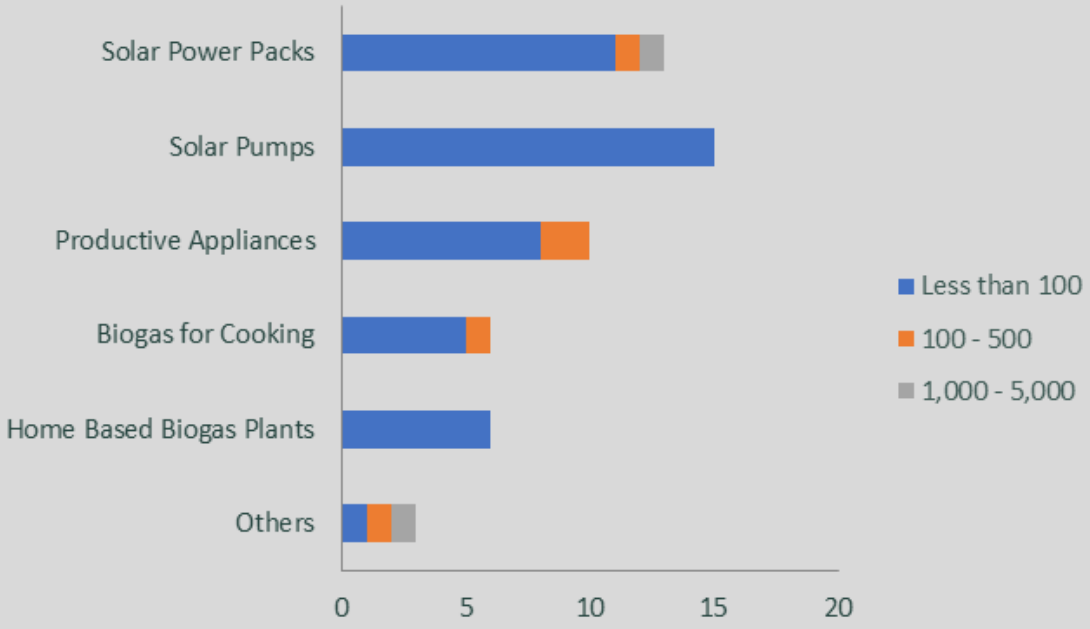


Figure 7. Product sales in FY 2019/20 [2]
(Sample size: 33 enterprises)

1.2.1. Trend of energy consumption: NGO perspective

NGOs working in last mile distribution of DRE applications have highlighted that they see a decline in clean energy consumption levels. Some areas are still restricted to small products such as solar lamps and have not been able to tap into a wider range of products. While growth in the dissemination of common products has been reported, lack of awareness about other products remains a major barrier.

NGOs who have actively worked with the last mile and the enterprises in the deployment of clean energy technologies have witnessed DRE making a significant impact. Last year, CLEAN covered 27 case studies, including 5 case studies of NGO partners. DRE applications have played a positive role in improving the overall quality of life at the grassroots level. Applications such as solar street lights and solar home lights have helped in improving the quality of education by enabling children to study in better lighting conditions.

Clean cookstoves, briquettes, and pellets have helped in the reduction of hazards related to traditional methods of cooking. Conversion of agro-waste into products like leaf plates has also proved advantageous as it prevents burning and air pollution.

1.3. Products foreseen to scale up and sector-wise predictions

This segment portrays the future demand of certain technologies and the sectors in which members think DRE technologies will flourish. These insights are also a strong indicator for the growth in demand and the need for investment in particular technologies as it is the enterprises who have a better pulse of the sector in terms of what products are necessary for the consumers and which of them can sell.

- From the survey conducted, CLEAN foresees growth in applications such as cold storages, water purifiers, and agro-processing machinery such as dryers in the near future. Food processing applications are also expected to show positive growth.
- Sectors such as food processing, small scale industries, dairy and horticulture have a lot of scope to integrate DRE in their operations.
- DRE interventions in the health sector are also anticipated to grow. More developments are also expected in other applications such as DC prepaid energy, improved heating and cooking solutions.

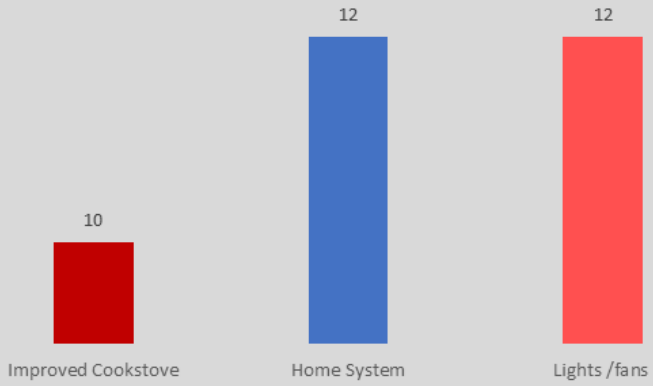


Figure 8. Major applications foreseen to scale up
(Sample size: 34 enterprises)

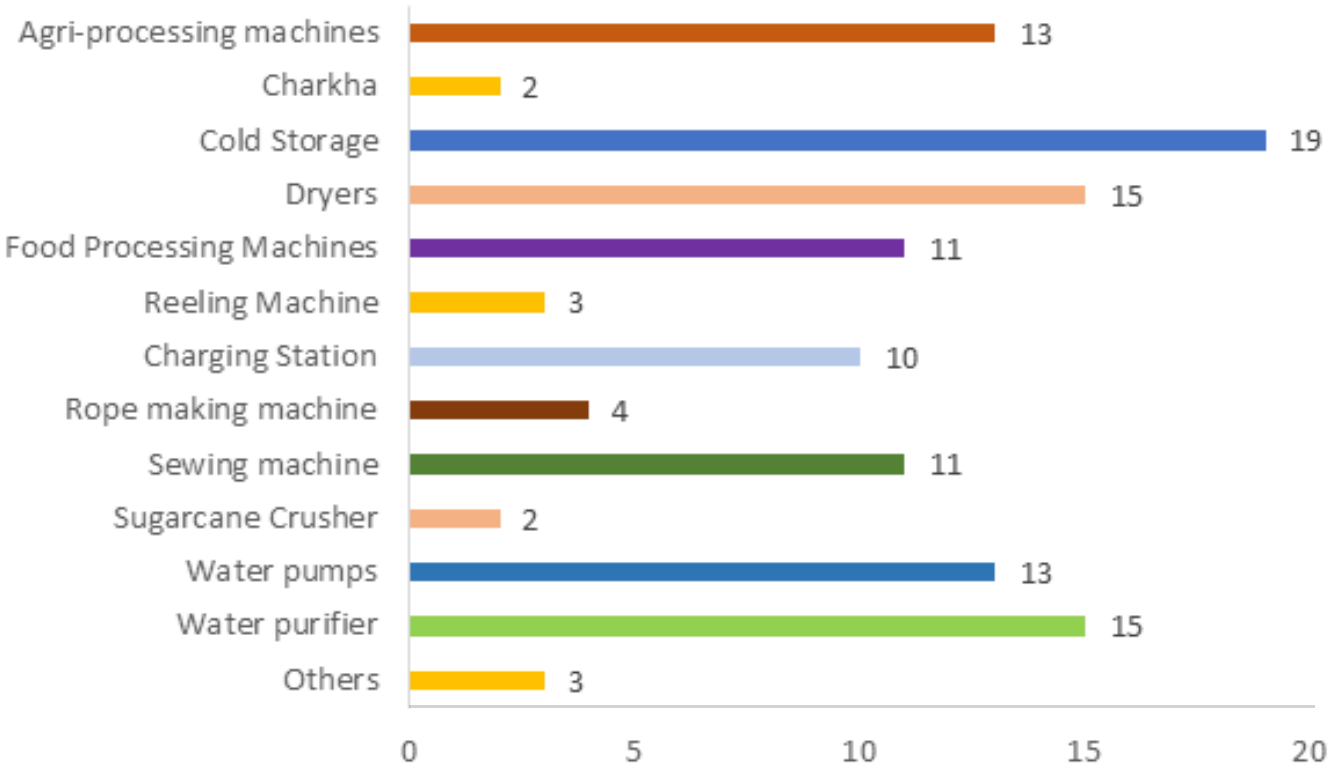


Figure 9. Other applications foreseen to scale up
(Sample size: 34 enterprises)

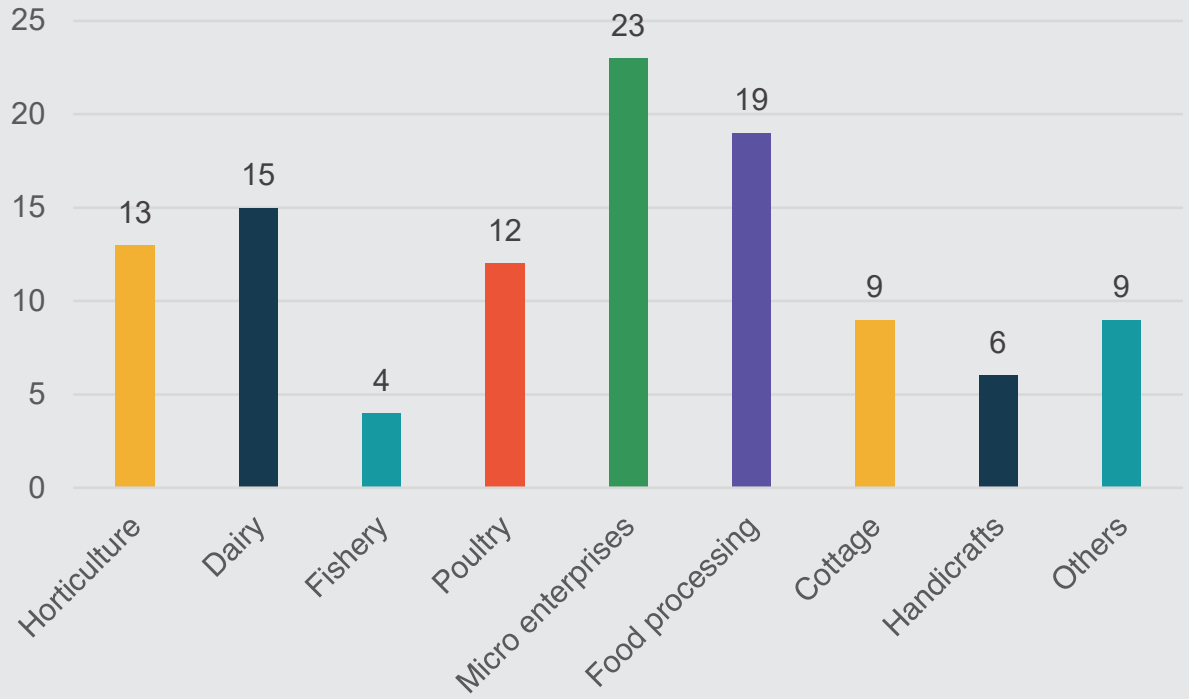


Figure 10. Sectors that foresee higher penetration of DRE
(Sample size: 34 enterprises)

1.3.1. Penetration of DRE products: NGO perspective

A report by CLASP has found that the main driver for the off-grid market is not for use with SHS kits but primarily because these products are viewed as energy efficient.

CLEAN member NGOs have reported the highest levels of penetration in food processing and horticulture related applications. This could be attributed to reasons such as the increase of productivity and income enabled by the applications such as roti rolling, papad making, and other similar applications. They also play an important role in reducing drudgery involved in traditional methods.

Other significant segments include dairy, handicrafts, and other small-scale industries.

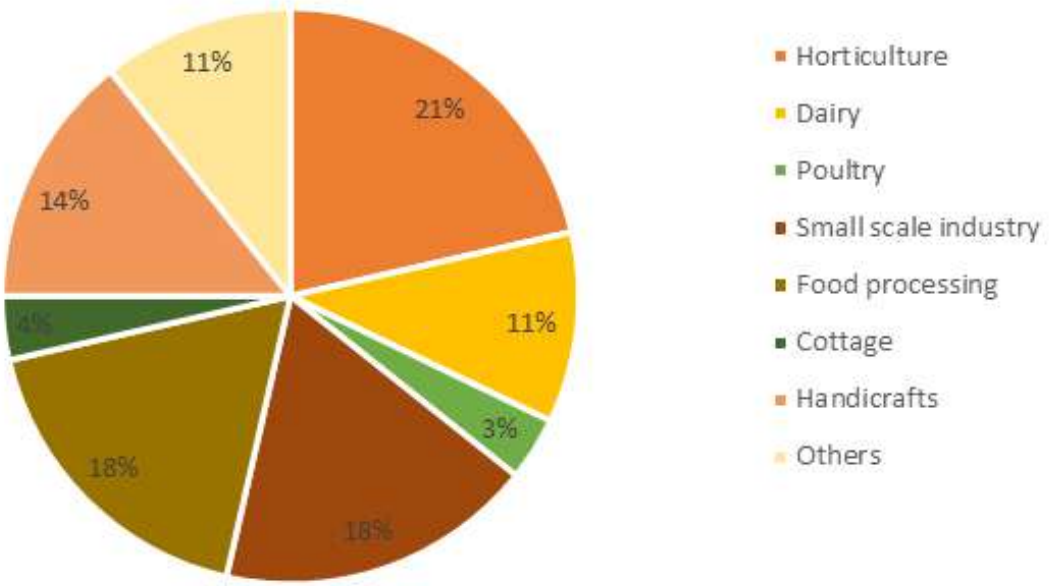


Figure 11. Sector-wise penetration of DRE technologies
(Sample size: 9 NGOs)

1.4. Challenges to scaling products and market access

Enterprises always face challenges in scaling their operations or improving their market access. Most prominent among these challenges are depicted here. There are differences in barriers to scale different products. Challenges to market access however, are common across all product categories and technologies.

- About 68% of CLEAN member respondents reported that challenges in terms of lack of proper financing channels and consumer affordability are common across different DRE applications
- 50% of respondents reported lack of consumer awareness and market competition as major barriers to scaling of businesses.

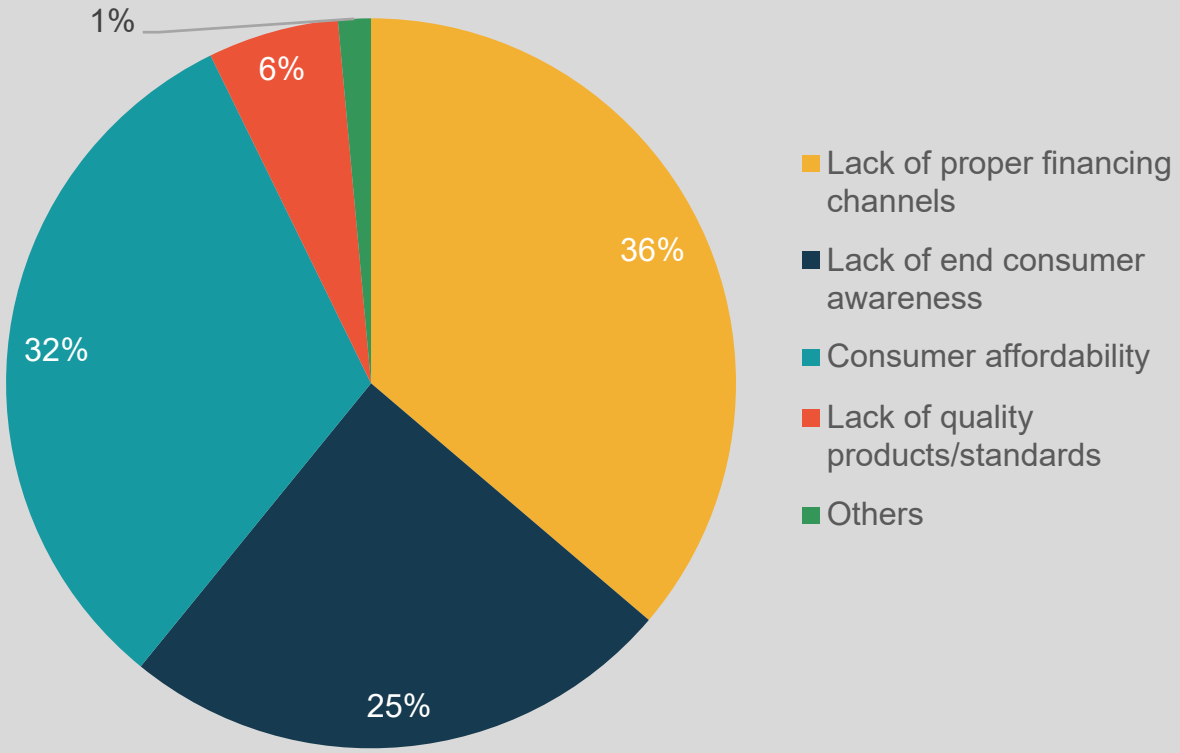


Figure 12. Challenges faced in improving market access
(Sample size: 32 enterprises)

- Other barriers cited by members were lack of end-user financing, government tenders and product availability at the consumer end.
- Additionally, 25% of CLEAN members reported lack of consumer awareness as a major challenge. This leads to other challenges such as lack of consumer interest and lack of demand for the products.
- Consumer awareness needs a greater level of involvement of stakeholders from other cross-cutting sectors.

The marketing of DC applications is comparatively difficult if the existing AC powered versions are prevalent and well accepted. Due to rapid grid extension in the country, AC and DC dual powered applications are gaining more acceptance.

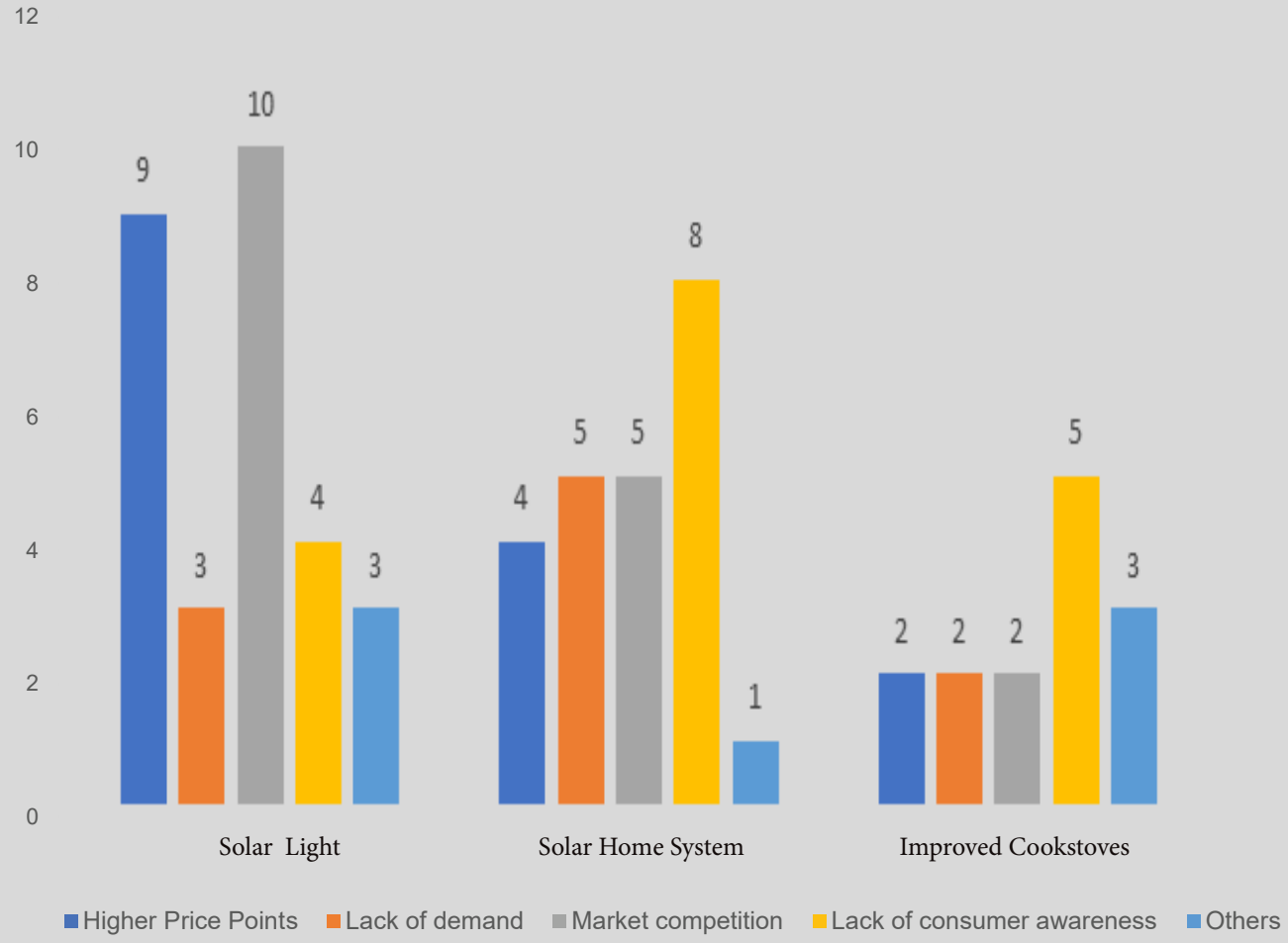


Figure 13. Challenges in scaling up of technologies [1]
(Sample size: 33 enterprises)

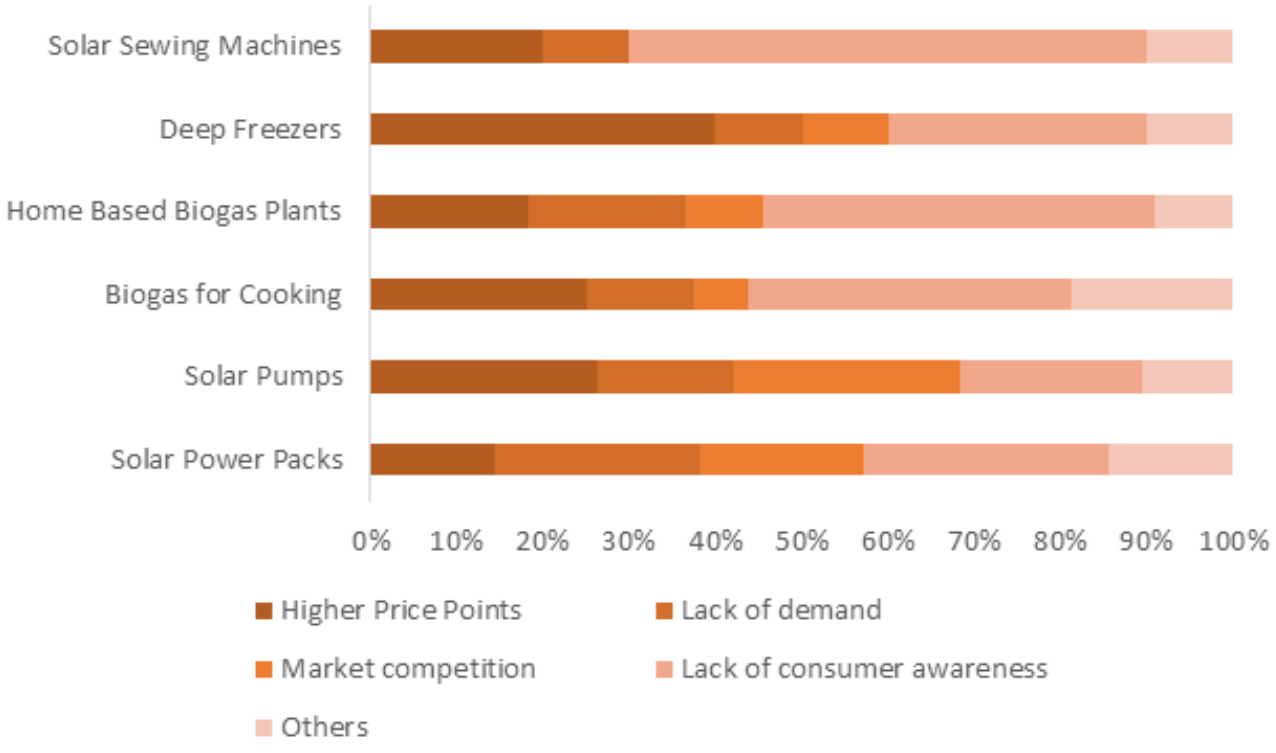


Figure 14. Challenges in scaling up of technologies [2]
(Sample size: 33 enterprises)

- On the other hand, responses from the NGOs show that 32% members reported lack of proper financing channels as the major challenge faced in terms of market access. Figure 15 highlights some of the other challenges to market access.

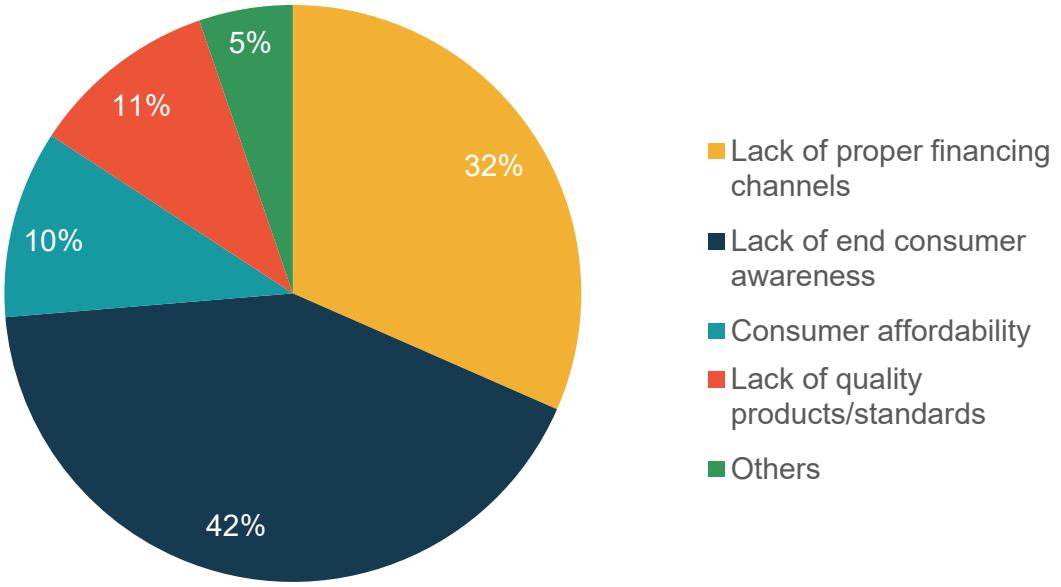


Figure 15. Challenges to market access
(Sample size: 9 NGOs)

1.5. Market linkages and distribution channels

Distribution channels and market linkages are crucial for the success of any product. It does not matter how good the product is if it cannot reach the targeted audience. This section highlights the most effective and most utilized market linkages and distribution channels that the enterprises use. These insights are further corroborated by CLEAN members in separate conversations either individually or through the working group meetings that CLEAN conducts across various technologies.

- 27% of the CLEAN member enterprises surveyed reported that they prefer either NGOs associated with SHGs or distributors/retailers to sell their products.
- The last-mile delivery segment is seen to be growing year after year due to their reach and efficient supply chain networks. They have been instrumental in reaching where other distribution channels cannot reach. They rely on inputs from associated microfinance institutions (MFI) or SHGs to introduce relevant products in their operational areas.
- Some other marketing methods used by the enterprises are digital media, local village-level entrepreneurs (VLEs) and direct sales.

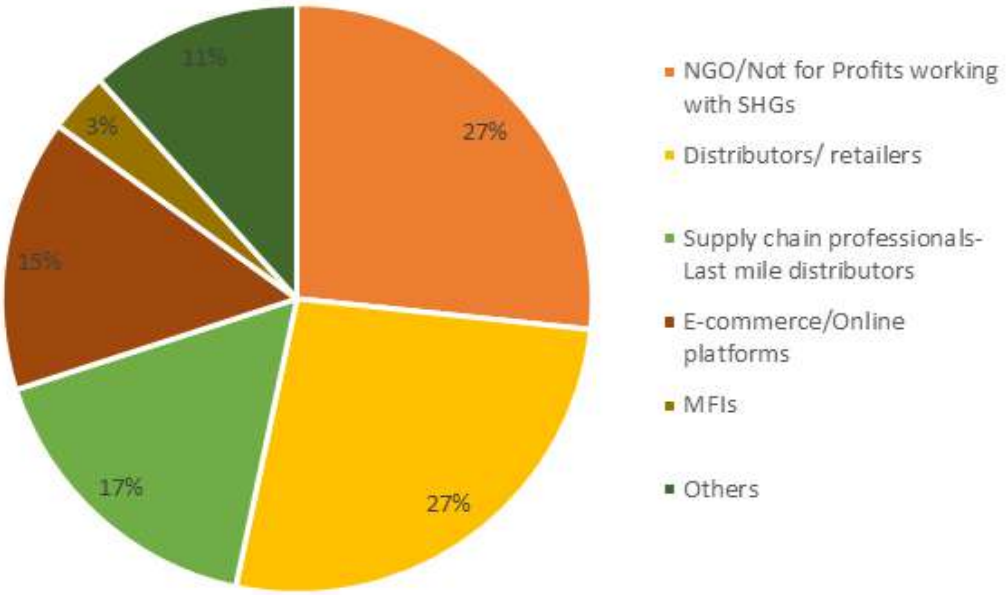


Figure 16. Market linkages
(Sample size: 31 enterprises)

The responses from the NGOs provided the following insights into market linkages and distribution channels:

- 45% respondents reported that they use NGOs, SHGs and non-profit organizations for developing effective market linkages and distribution channels.
- An equal number of respondents mention that they utilize distributors and retailers.
- Other popular channels include e-commerce, app based and other online platforms and MFI partners.

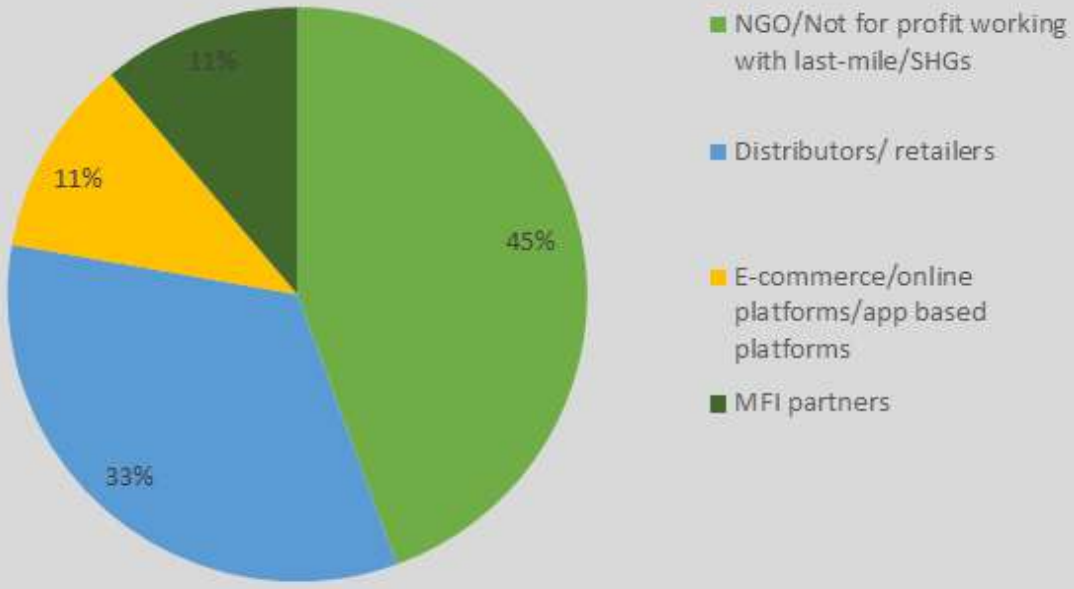


Figure 17. Distribution channels and market linkages utilized by NGOs
(Sample size: 9 NGOs)

02

FINANCING LANDSCAPE OF DRE SECTOR

This section captures the financial needs of the DRE sector, opportunities and achievements, and perspectives of enterprises and investors.

Similar to last year's report, CLEAN members have reported on where they see opportunities for growth in the sector and also the challenges. The investors have also shared their perspectives for the sector.

This section also captures the impact of COVID-19 on the sector. In such an unprecedented situation, the attempt is to report the immediate financial needs of members and the initiatives taken by investors to support the sector.

The DRE sector in the last one year has seen significant achievements in accessing finance. However, not all efforts have been fruitful.

Table 1. Finance accessed by DRE enterprises

Name of the enterprise	Name of the investor/s	Type of fund	Approximate amount raised (INR)	Year
Frontier Markets Consulting	Engie	Equity	Undisclosed	2020
Greenway Grameen Infra Private Limited	Bettervest	Crowdfunding	Undisclosed	2020
Oorja Development Solutions India	DOEN Foundation	Debt (Convertible grant)	2.40 crore	2020
S4S Technologies	Yunus Social Business	Debt	1.03 crore	2020
Atomberg Technologies	A91 Partners	Venture capital	73.15 crore	2019
Pushan Renewable Energy	POWERED Accelerator	Grant	6.50 lakh	2019
Sistema.bio	Endeavor Catalyst, DILA CAPITAL, Engie RDE Fund, EcoEnterprise Fund	Mix of equity and debt for the series A investment round	87.72 crore	2019
UNesar Private Limited	HPCL	Seed funding	Undisclosed	2019

Source: News articles, press release, confirmed by enterprises

2.1. Sources of finance

While DRE enterprises reach out to different types of investors to access finance, this section reports their efforts and initiatives in the past one year.

Debts and grants are the most preferred source of finance for DRE enterprises, registering the highest success rate as compared to various other sources. Debt includes loans and overdraft facilities from various financial institutions such as public and private banks, NBFCs and MFIs. The attempt to access funds in the form of equity and CSR funds has been low comparatively. However, other sources such as impact investors, raising funds by issuing US$ Convertible Notes, crowdfunding, friends, and family, etc., were reported to be easily accessible. Overall, the success rate of attempts made in raising funds through various sources rested at 39%. The success rate of accessing finance through debts was 41% followed by grants (40%), equity (33%), and CSR funds (23%).

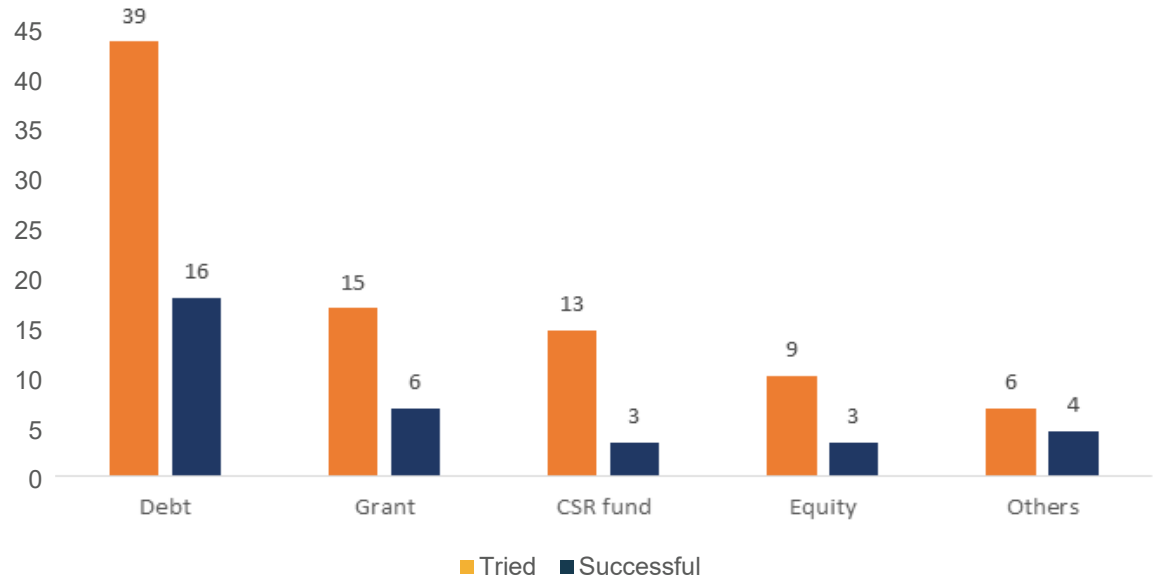


Figure 18. Financing sources for FY 2019/20
(Sample size: 32 enterprises)

The DRE enterprises have tried availing debt from various sources such as banks and NBFCs. Availing debt from private banks and lenders is most preferred, followed by public sector banks and NBFCs. It was reported that 34% of respondents did not have any ongoing loan due to either non-requirement or limited success in availing debt. The other sources of debt included corporate debt, social impact funds, and private lenders, i.e., debt from friends and family members.

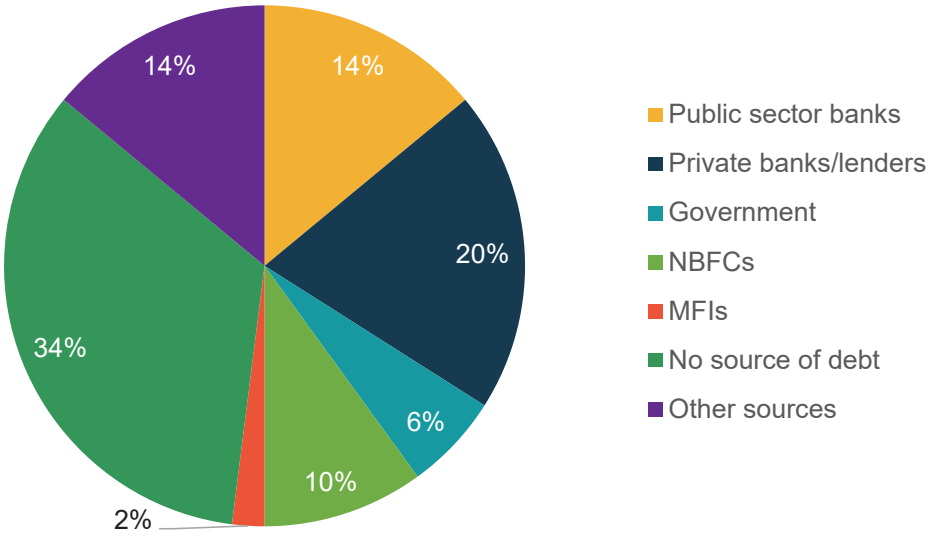


Figure 19. Ongoing source of debt
(Sample size: 37 enterprises)

2.2. Enterprises' access to government finance

It was reported that accessing finance from government schemes and products was rarely availed by enterprises. Amongst them, Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) has been the major source of loan for the members. Out of total respondents, five members were able to avail loan from CGTMSE. It is a boon for first-generation entrepreneurs as it gives bank credit to anyone setting up a unit of their MSE without the hassle of a collateral or third-party guarantee.

The other government-supported scheme is MUDRA loan. Two members were able to avail loan through MUDRA loan scheme. MUDRA loan is an NBFC supporting the development of the micro-enterprise sector. MUDRA provides refinance support to banks and MFIs for lending up to INR 10 lakh to micro units. The scheme facilitates employment creation and income generation.

Three members reported that they were successful in availing loan through other schemes.

A large number of members were unable to avail any loan schemes. Out of all the respondents, 27 members were not able to avail loan, i.e., 73% of the total respondents. Some of the reasons for this are that the organizations were not eligible for loans and also the ticket size of some schemes were so small that enterprises did not try to avail it. Also, there is a lack of awareness about the existing schemes and their eligibility within some of the enterprises. This indicates that even though there are initiatives taken by the government to support the financial needs of the enterprises, the on-ground reality is that enterprises are not grabbing these opportunities.

Some of the banks, which were reported to facilitate these loans, are State Bank of India, Canara Bank, IDBI, Punjab National Bank, Bank of Maharashtra, Vijaya Bank, and Bank of India. All the enterprises successful in availing the government loans belong to the solar segment, whereas the general bank loans were availed by a mix of solar and non-solar enterprises.

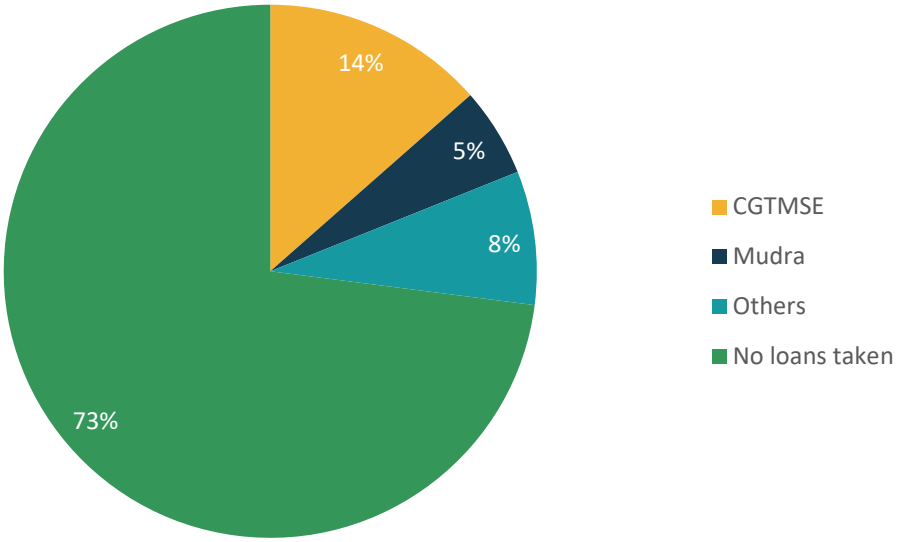


Figure 20. Loan schemes availed by the members
(Sample size: 37 enterprises)

2.3. Financial growth of DRE enterprises

2.3.1. Profitability

CLEAN's analysis for profitability shows that 62% of the CLEAN members surveyed have been profitable in FY 2019/20. As per last year's report, only 45% of the members were profitable in FY 2018/19.[1]

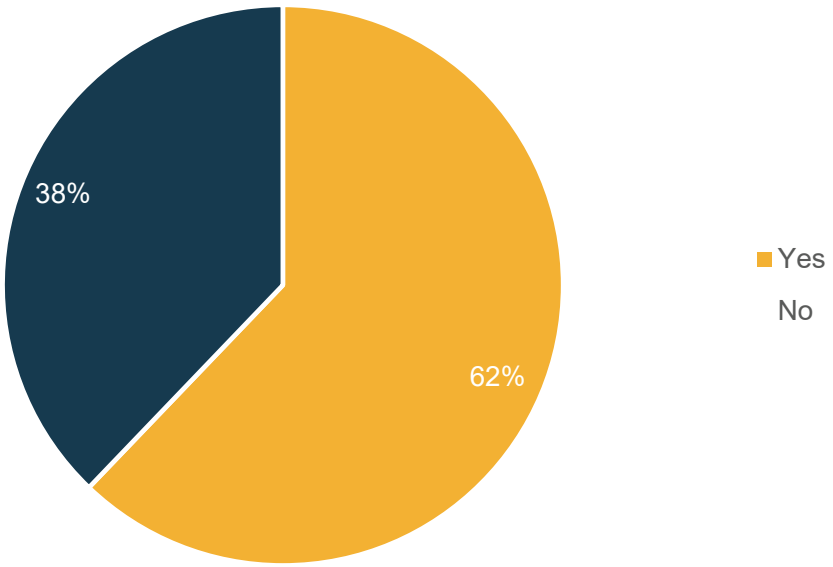


Figure 21. Profitability in FY 2019/20
(Sample size: 37 enterprises)

1- State of the Decentralized Renewable Energy Sector in India 2018-19. Accessed from - https://www.thecleannetwork.org/pdf/State-of-DRE-Sector-in-India-2019_Web.pdf

2.3.2. Revenue

Revenue, also referred to as sales, is the amount of money a company earns. 87% of the enterprises reported that they were able to meet their projected revenue. Rest 13% were unable to do so. None reported to exceed their projected revenue. One of the reasons for the decline in revenue or not being able to exceed the projected revenue was the shutdown of operations due to COVID-19 pandemic.

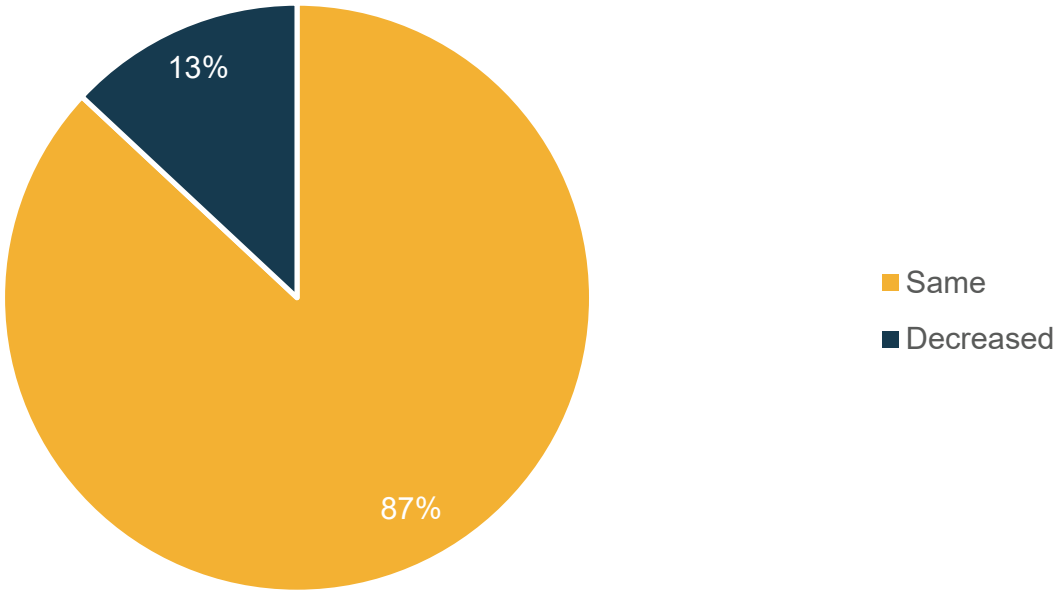


Figure 22. Projected vs actual revenue
(Sample size: 23 enterprises)

2.3.3. Linkages for end-user financing

End-user financing has always been a concern in the DRE sector. Only 24% of the members reported about having a tie-up with some financial institutions to support their customers with end-user financing.

- The names reported by members for end-user financing includes Meghalaya Rural Bank, State Bank of India, UCO Bank, Bank of Baroda, RBL Bank, Sarala Women Cooperative Bank, North East Small Financial Bank, Madhya Pradesh Gramin Bank. Some members also reported tie-up with multiple NBFCs and MFIs for end-user financing.

- The linkage is majorly to support end-users to purchase SHS. Other products include solar power systems for small businesses, solar-powered poultry incubator and brooder, solar-powered pottery wheel, clean cookstoves, and livelihood solutions

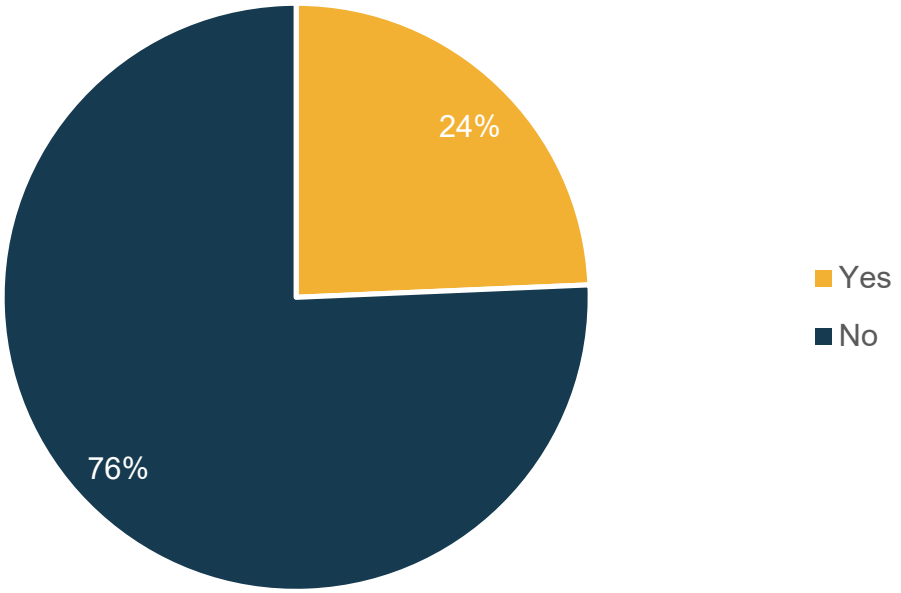


Figure 23. Linkages for end-user financing
(Sample size: 38 enterprises)

Table 2. Financial linkage with DRE enterprises for end-user financing

Name of the enterprise	Name of the investor/s	Supported DRE application/ service	Impact
Dhosa Chandaneswar Bratyajana Samity (DCBS)	State Bank of India, UCO Bank, Bank of Baroda, and other NBFCs	For on-lending	DCBS is an organization working for poor women for their socio-economic development in rural India. It also has an MFI wing for which they have created various financial linkages with banks and NBFCs. They utilize this opportunity for on-lending purposes and have benefitted more than 12,000 households till date in West Bengal.
E-Hands Energy India	Sarala Women Cooperative Bank	Solar home system	E-Hands Energy aims at providing energy access to under-served communities in remote, hilly areas of rural India who are off the country's electricity grid. This award-winning entity has partnered with Sarala Women Cooperative Bank to provide end-user financing for solar home systems majorly in Bihar. Through this initiative, E-hands has catered to more than 100 households till now.

Name of the enterprise	Name of the investor/s	Supported DRE application/ service	Impact
Envo Renewable Energy Services	Meghalaya Rural Bank	Solar home system and livelihood solution	Envo Renewable Energy Services provides reliable energy services for under-served communities of the North East Region of India. Due to the tie-up with the Meghalaya Rural Bank, Envo has successfully served 15 households till now.
Greenway Grameen Infra	Multiple MFIs	Clean cookstove	Greenway is India's largest clean cookstoves company. This multiple award-winning start-up social enterprise has received support from various MFIs for its cookstoves and served nearly 2,00,000 customers with the help of this linkage.
Luxlighting Technology	NSTEDB, DST, and GoI	Solar Touch Free automatic hand sanitizer 3.5L	Luxlighting is a leading manufacturer of scientific and laboratory equipment. Based in New Delhi, Luxlighting was successful in availing funds through CAWACH scheme to bring out a technology, which serves as a precaution against COVID-19. This has been sold nearly 500 units till date.
Pushan Renewable Energy	Madhya Pradesh Gramin Bank	Solar home system, solar power systems for small	Pushan is a social enterprise working on creating awareness, providing integrated solutions, and developing local entrepreneurs by training in the solar energy segment. Based in Madhya Pradesh, Pushan has a tie-up with Madhya Pradesh Gramin Bank to provide end-user financing for various solar applications. Till now, Pushan has successfully served nearly 350 households with this linkage.
Simpa Energy India	RBL Bank	Solar home system	Simpa Energy India serves in Uttar Pradesh, Bihar, and Odisha by following the pay-as-you-go model. With the help of RBL Bank, Simpa has catered to approximately 50,000 customers till now.

Name of the enterprise	Name of the investor/s	Supported DRE application/ service	Impact
Techno Village	North East Small Finance Bank	Solar-powered pottery wheel	Techno Village is a Guwahati-based company working in the field of sustainable energy and developing innovative solutions in health, education, and livelihood. It is supported by SELCO Foundation and has the linkage for end-user financing with North East Small Finance Bank. Techno Village has provided solar-powered pottery wheels to 10 households with the help of this linkage.

Though some of the members have received finance from the investors, still a major number of enterprises failed to create the linkage.

The members tried to partner with banks, NBFCs, DFIs, MFIs, CSR firms, donors, impact investors, venture capitalists, private equity, and government support through subsidies. But they were unsuccessful as investors did not trust their products and were not interested in the sector and new unidentified markets. Also, young enterprises were not financially supported start-ups and many enterprises did not have collaterals. Eligibility to avail loan is a factor that needs to be considered by the enterprises.

2.4. CSR Opportunities in DRE

As reported above, only 23% of members were able to raise CSR funds. CLEAN tried to capture the sectors in which members feel the potential for DRE to contribute and the initiative can be supported by CSR.

2.4.1. DRE enterprises grabbing CSR opportunities

DRE enterprises can access CSR funds in two ways, i.e., via partnership with NGOs or via district magistrate office. Many of the DRE enterprises have implemented projects through these methods. Accessing CSR funds through district magistrate office is a route that PSUs have been comfortable with for implementing CSR projects.

There is a higher chance of accessing CSR funds if the enterprises are implementing their projects in the aspirational districts. The majority of the PSUs and large CSR foundations have chosen the aspirational districts as their priority geographical areas. CLEAN earlier also tried to interlink the DRE interventions in the aspirational districts through CSR support.[2]

2- DRE Intervention in Aspirational Districts through CSR – September 2020. Accessed from - https://drive.google.com/file/d/1ySJ3ha4x4LZIUFFIAHMz_NbG8QIBv_8e/view

2.4.2. Scope for CSR interventions in aspirational districts

The Aspirational District Programme by NITI Aayog focuses on evaluating the districts that need improvement and monitoring to raise the living standards of the citizens and ensure inclusive and sustainable growth for all.[3] The Programme has been divided on the basis of sectoral classification and the respective themes have been assigned weights and data points to evaluate the rankings of the districts. The development of aspirational districts is undertaken by the Central Public Sector Enterprise (CPSE) for the CSR initiative.

The weightage given in the programme to health and nutrition and education is equivalent and highest, i.e., 30%. This has been followed by agriculture (20%), basic infrastructure (10%), financial inclusion (5%), and skill development (5%). A total of 115 districts have been selected where these focus areas will be taken care of for their improvement.

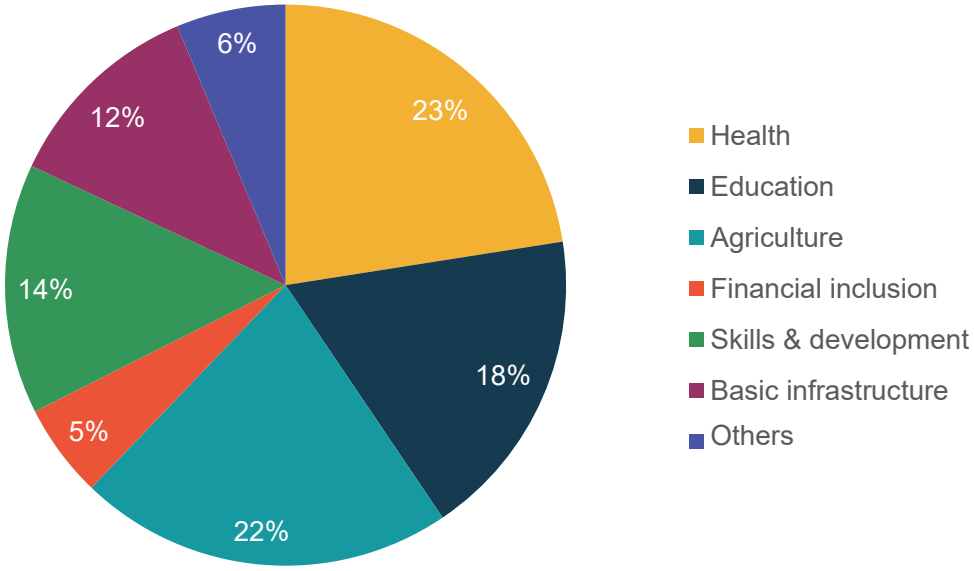


Figure 24. Sectors in which CSR support is required
(Sample size: 37 enterprises)

More than 22% of the members felt that DRE intervention into health and agriculture would be impactful and contribute to sustainability. It was followed by education where 18% of the respondents showed interest. Skill and development and basic infrastructure had the similar likeness from the members with support of 14% and 12%, respectively. Some of the members also pointed out other interesting fields such as rural development, clean drinking water, food processing, livelihood, cooking fuel, waste management, and knowledge building, which can be included within the sectoral classifications provided by NITI Aayog.

3- *Deep Dive Insights from Champions of Change - The Aspirational Districts Dashboard - June 2018. Accessed from - https://niti.gov.in/sites/default/files/2018-12/FirstDeltaRanking-May2018-AspirationalRanking.pdf*

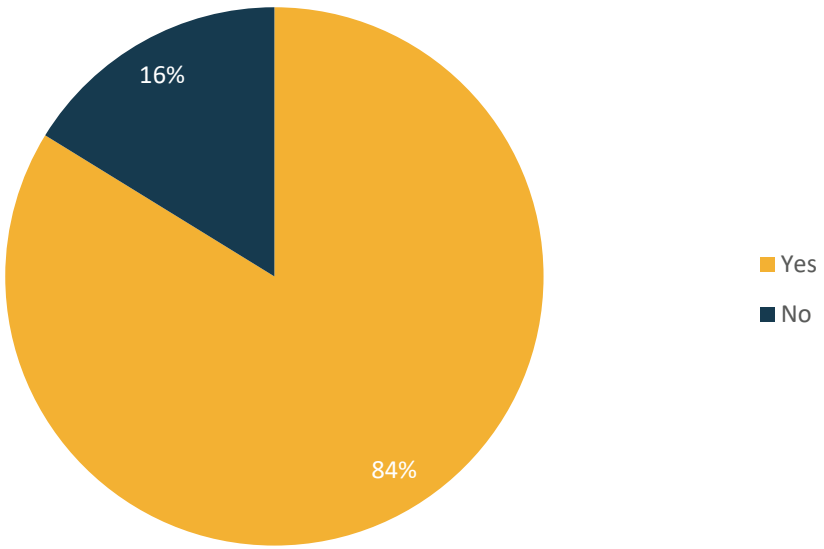


Figure 25. Members' willingness to work in aspirational districts
(Sample size: 37 enterprises)

Some of the members have already worked in the aspirational districts in the past; around 84% of the CLEAN members expressed interest to work in the aspirational districts, provided they get support in form of CSR funds and guidance. Most of the members have also listed names of aspirational districts in which they are willing to work and contribute to the initiative of NITI Aayog.

Deployment of DRE technologies in conjugation with other needed areas, especially in the aspirational districts, has a lot of potential. This calls for a detailed study to map DRE interventions with other sectors.

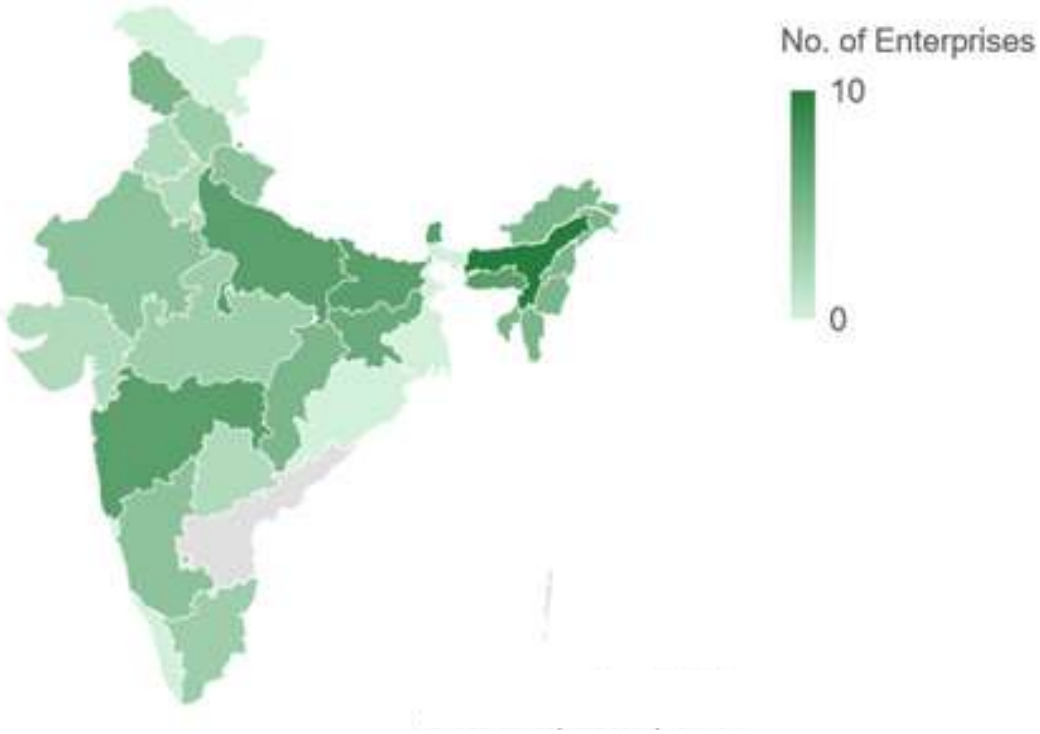


Figure 26. Interest area of members to work in aspirational districts
(Sample size: 27 enterprises)

Based on members' responses, nearly 9% of the members are willing to work in the aspirational districts of Assam. Some names of the districts in Assam are Dhubri, Goalpara, Udalguri, Barpeta, and many more, where most of the members have shown interest in working. This has been followed by Bihar, Maharashtra, Meghalaya, Sikkim, and Uttar Pradesh where nearly 6% of members want to leave their footprints. Overall, we can see that a majority of the members are inclined towards working in the north-eastern, northern, and eastern regions of India.

2.4.3. CSR support needed for DRE initiatives

CLEAN members came up with some products, applications, and ideas, which can be taken to the next level with the support of CSR funds and guidance. Some of them are mentioned below:

- Some of the existing products and applications include clean drinking water facility, SHS, community kitchen, heating and cooling solutions, sewing machines, cold storage, cookstove, microgrid, pump, fertilizer sprayers, and other food-processing units, animal early warning system, and organic pesticide made out of biogas slurry.

- During the COVID-19 crisis, many CLEAN members reported on developing products and appliances such as sanitary napkins incinerator, non-medical mask incinerator, solar-powered COVID-19 medical waste destroyer, solar touch-free automatic hand sanitizer, solarized vaccine carrier, solar-powered E-ambulance, solar-powered mobile medical unit, solar-powered mobile eye check-up van, solar-powered E-learning system with TV monitor, and solar-powered packaging machine.

- These enterprises have put forward some innovative ideas as well, which need CSR support. Generating Gold Standard carbon credits from clean cooking, waste management, school-level education for DRE sector, VLE capacity building support, digital payments, smart analytics and network intelligence solutions based on DRE, which provide basic clean and reliable electricity access and training and skill development with testing and recycling labs are some of them.

2.5. COVID-19: Impact on Business and Expectations Enterprises

2.5.1. Impact on DRE enterprises business

COVID-19 has negatively impacted nearly all businesses worldwide, including the DRE sector. CLEAN, through the survey, tried to understand the losses incurred in the members' businesses due to the pandemic.

2.5.1.1. Impact on revenue

COVID-19 has hit the Indian economy hard. A significant 53% of Indian businesses indicate the marked impact of the coronavirus-induced pandemic on business operations even at early stages. The pandemic has significantly impacted the cash flow at organizations with almost 80% reporting a decrease in cash flow.[4]

CLEAN gathered information regarding the revenue loss between quarter4 of FY 2019/20 and quarter 1 of FY 2020/21. The survey reveals that 47% of the respondents were in the category of increased revenue losses. Only 18% of the respondents mentioned that the revenue losses had decreased, whereas 35% of the members responded that there was no change in the revenue.

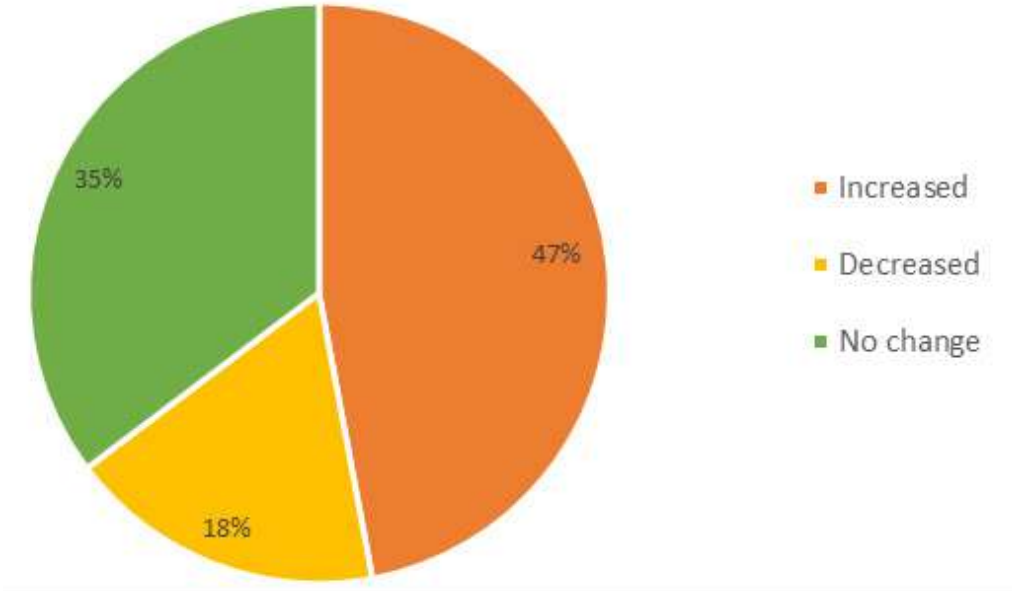


Figure 27. COVID-19 impact on revenue loss
(Sample size: 17 enterprises)

Maximum members reported revenue loss between INR 10 lakh to INR 50 lakh. There was a decline in revenue loss in between of both the quarters for the amount less than INR 10 lakh but an increase in revenue loss was observed for more than INR 10 lakh. Some of the members also faced revenue loss of over INR 5 crore, which is a big amount for the sector.

4- Impact of COVID-19 on Indian Economy - FICCI. Accessed from - http://ficci.in/spdocument/23195/Impact-of-COVID-19-on-Indian-Economy-FICCI-2003.pdf

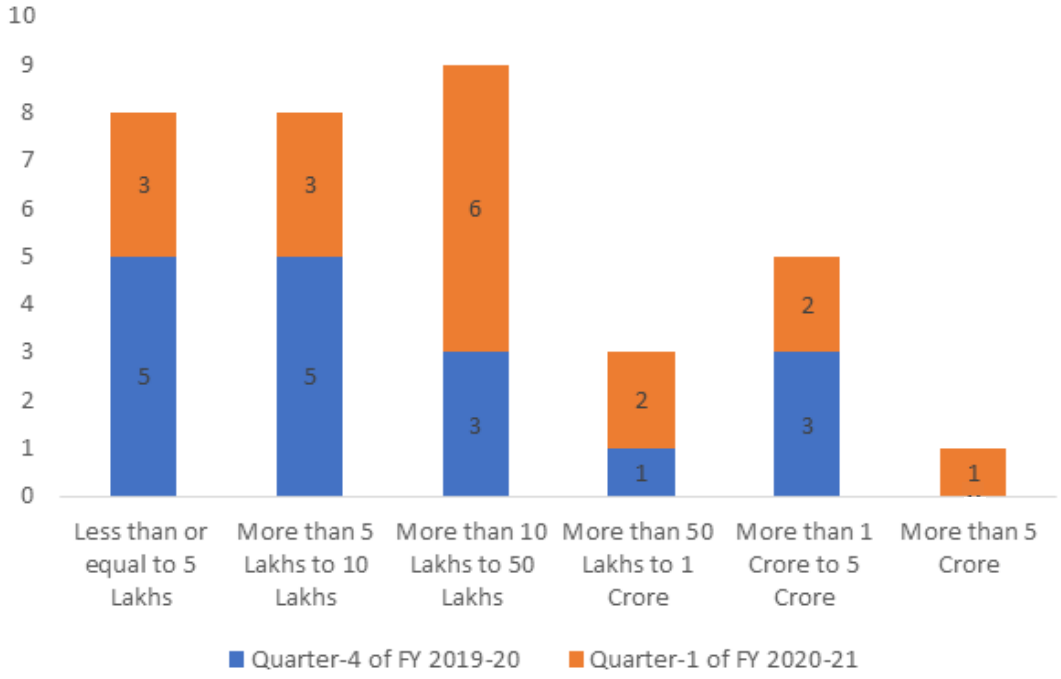


Figure 28. Revenue loss in quarters
(Sample size: 17 enterprises)

Majority of the members are facing challenges in the business operations due to the pandemic in some way or the other. The major challenges relate to access to finance by the enterprises and demand and sales reduction. To add to it, at the time of publishing this report, there are no government policies specifically providing financial relief to the DRE sector. Supply chain has been adversely impacted hampering the operations and due to online operations, the traditional business is about to come to an end.

Figure 29. Challenges faced by enterprises during COVID-19
(Sample size: 34 enterprises)

Due to the travel restrictions, people are neither able to operate their business nor retain their old customers as the service sector has been stopped keeping in mind the safety of employees and customers. The source of income for customers has also been affected, leading to problems of affordability by the end-consumers. Not only enterprises, but the end-users are also facing challenges in raising finance for buying DRE products.

Figure 30. Challenges faced by enterprises during COVID-19
(Sample size: 34 enterprises)

2.5.2. Expectations and way forward

Along with the challenges, members felt that there are various opportunities emerging with the changing situation. There is scope of growth in the sector with innovation. Members feel that there is a huge opportunity to work towards DRE intervention in the health, hygiene, and livelihood sectors. Innovation is going to be the key to sustainability. Also, due to migration, the scope of job creation locally and remote survey will increase leading to rural development. Government has taken various steps during the COVID-19 pandemic and some have been beneficial for the members like tax reduction and funding for MSME. It was reported that there is a need for change in policy at the state level based on the requirements of the state. Digitization has played an important role during this pandemic but members feel intervention in some sectors like education, energy, climate change, and agriculture can be helpful. There is no doubt that there have been positive changes as well in this situation like travel restrictions leading to pollution reduction and safety, cost saving, and awareness among people. Leasing the asset can be helpful for both enterprises and the customers in this situation.

Figure 31. Challenges faced by end-users during COVID-19
(Sample size: 30 enterprises)

Nearly 37% of members feel that in order to overcome the impact of COVID-19, the various sources of debt can be helpful for them to sustain their business. This is followed by CSR support where 23% of the members feel that this source of fund can be utilized for the recovery or improvement of their business. More than 18% members are in need of grants during the pandemic and approximately 14% of members are looking forward to equity support from investors. It was reported that end-user financing will also be required to support the customers in buying the products so that sales can increase. There are nearly 7% of members who will not be needing any financial support but other kinds of help would be beneficial to their business development.

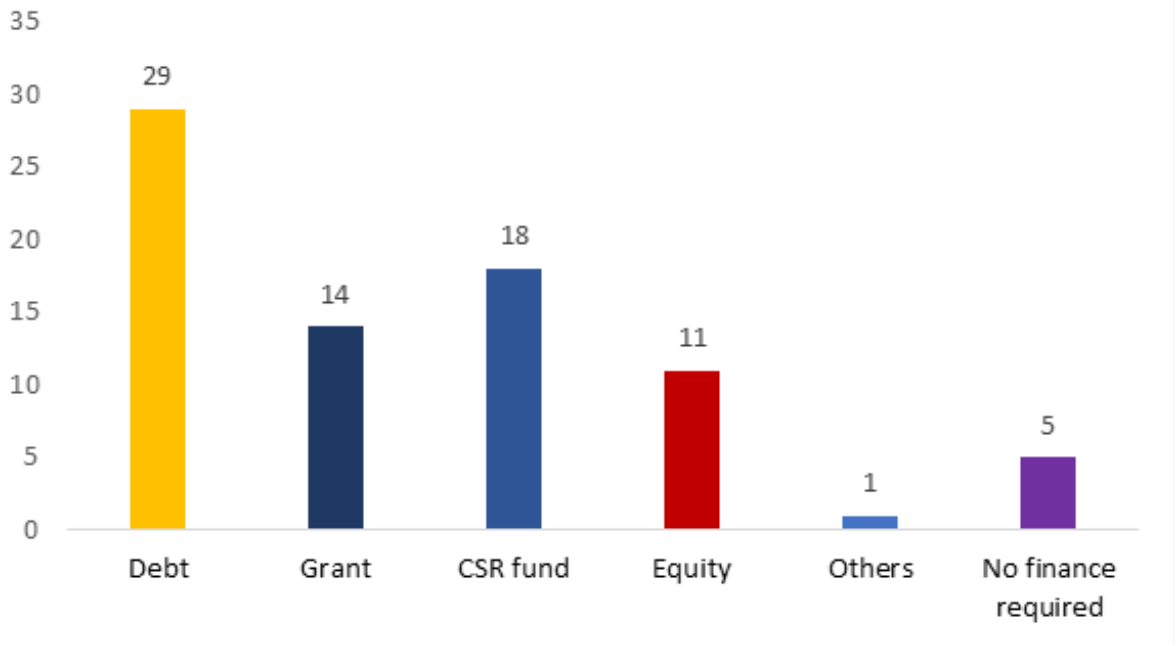


Figure 32. Financial requirement reported by members
(Sample size: 33 enterprises)

The introduction of relief package by the finance minister has brought various opportunities for the enterprises who have registered themselves with MSME. One of the benefits of a registered MSME with a valid Udyog Aadhar Number is ease in availing bank loans if the enterprise is an existing borrower in some bank. Keeping this in mind, CLEAN tried to find out the proportion of members who have registered themselves with the Ministry of MSME (as per the past definition of MSME).[5]

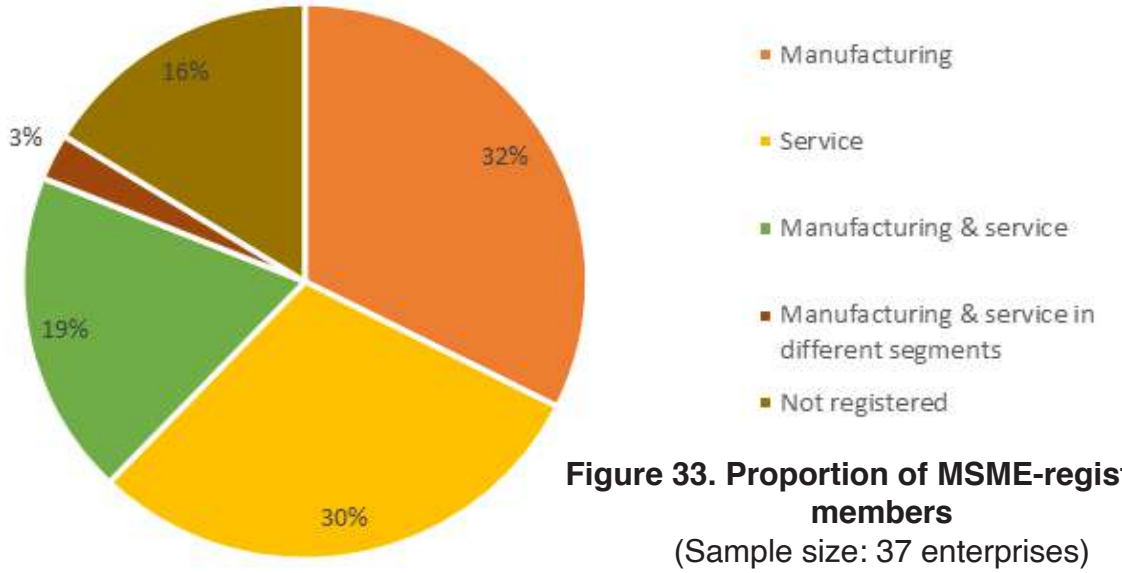


Figure 33. Proportion of MSME-registered members
(Sample size: 37 enterprises)

5- *Old definition of MSME. Accessed from - https://msme.gov.in/faqs/q1-what-definition-msme*

Approximately 84% of members reported having registered themselves with MSME in different segments. Nearly 32% of the members have taken the registration for manufacturing sector and 30% of the members are registered under service sector whereas 22% of the members have registered themselves under both manufacturing and service sectors. Still there are 16% of the members who have not registered themselves.

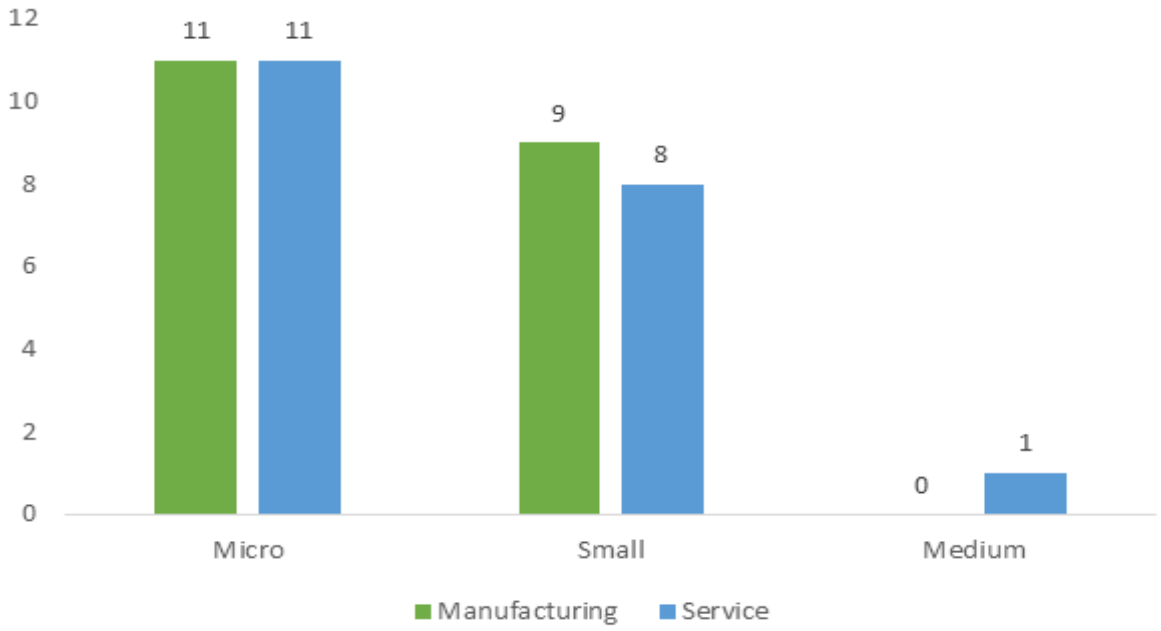


Figure 34. Status of members registration for MSME
(Sample size: 31 enterprises)

As per the responses, 55% of the registered members fall into the category of micro enterprises and 43% are in the category of small enterprises. Only one enterprise falls into the category of medium enterprises, that too for the service sector. None of the members fall under the category of medium enterprises for the manufacturing sector.

There is a new definition of MSME,[6] which has been announced in May 2020 and is applicable from July 2020.

6- New definition of MSME. Accessed from - https://msme.gov.in/know-about-msme

2.6. Investor's Contribution and Expectations from DRE Sector

2.6.1. Contribution in the DRE sector

Looking at the financial demands of the members, CLEAN tried to capture the role of investors in the DRE sector. For the growth of the sector, it is important to understand the inputs of the investors and their expectations from the sector. This would provide huge scope of improvement for the members and help them in raising funds in future.

2.6.1.1. DRE as part of investors' portfolio

Investors play a vital role in supporting any kind of business. Some of the investors have shown interest in the DRE sector and contributed in uplifting it through enterprise and end-user financing. Nearly 22% of the investors are involved in enterprise financing whereas 67% of the investors are into end-user

financing, which are mainly the MFIs. 11% of the investors have also mentioned that they do not have specified segments for DRE applications in their portfolio but they do support some of the products.

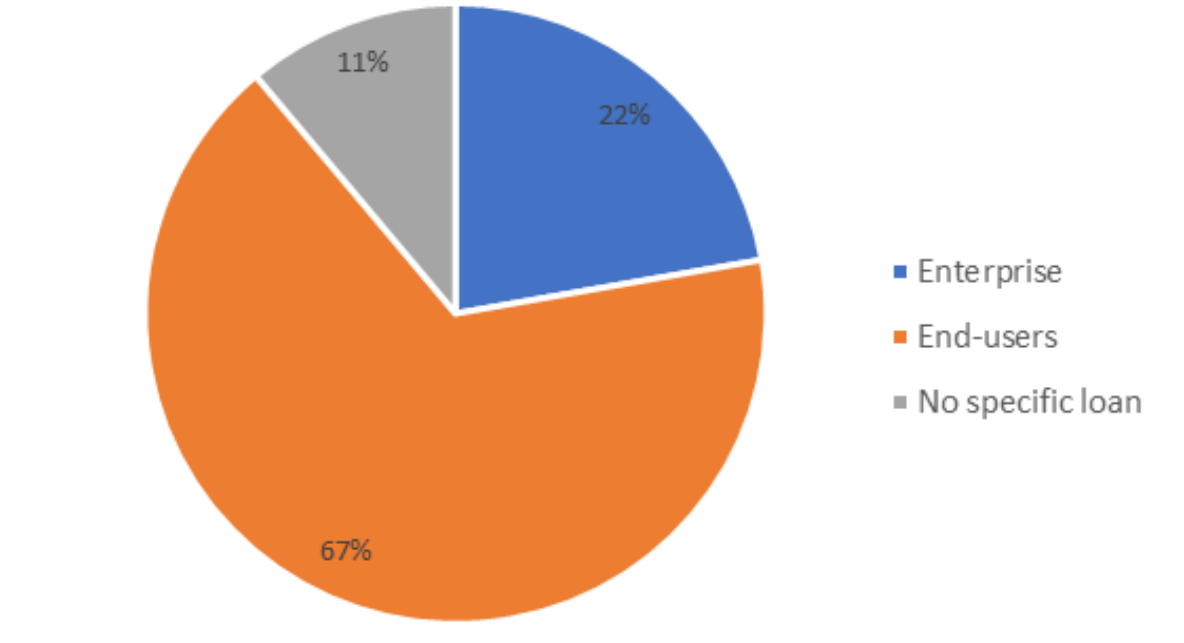


Figure 35. Investors' product range
(Sample size: 8 investors)

The ticket size for financial products related to end-user financing falls between INR 500 and INR 15,000 (can increase in some cases) for 3 months to 36 months. The rate of interest is generally in the range of 9%–26% but some of the investors also provide interest-free loans. Mostly, the investors provide unsecured lending for end-user financing but in the case of solar rooftop, house registry acts as a collateral.

The ticket size for the financial products for enterprise financing falls between INR 1 crore and INR 10 crore for a period of 12 months to 36 months at the rate of 15%–18%. These are secured loans where current assets are taken as collateral.

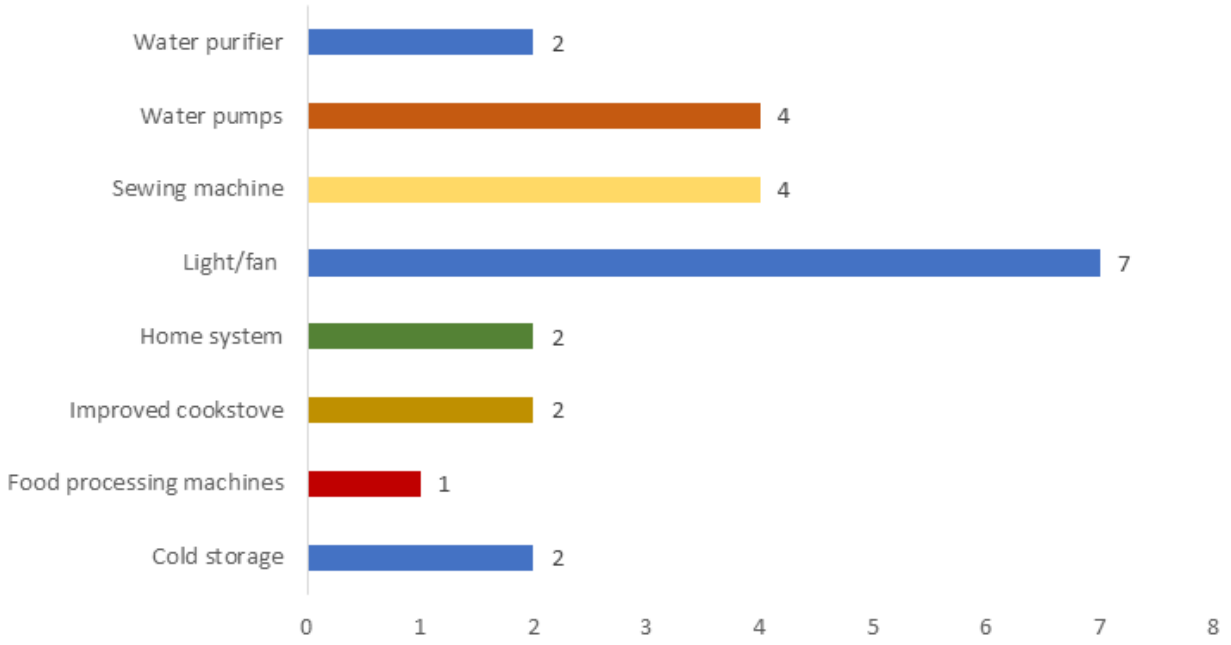


Figure 36. Investors portfolio covering DRE products/applications
(Sample size: 8 investors)

Approximately 29% of the investors are into financing lights and fans (e.g., solar light, torch, fan, street light, etc.). This is majorly done by MFIs for end-user financing. Sewing machines and water pumps are supported by 17% of the investors and 8% of the investors provide financing for cold storages, improved cookstoves, home systems, and water purifiers. Most of the expensive products are being financed under enterprise financing but still there are many products for which no such funding support is provided. This is because of lack of awareness about the products by both investors and customers and lack of trust of investors on the new products coming up in the market.

2.6.1.2. Linkages with enterprises

The DRE enterprises are looking forward to linkages with investors mainly to support their customers and help them in accessing their products. Nearly 25% of the investors have mentioned that they have partnered with some of the DRE enterprises. Still a large number of enterprises are looking forward to such linkages.

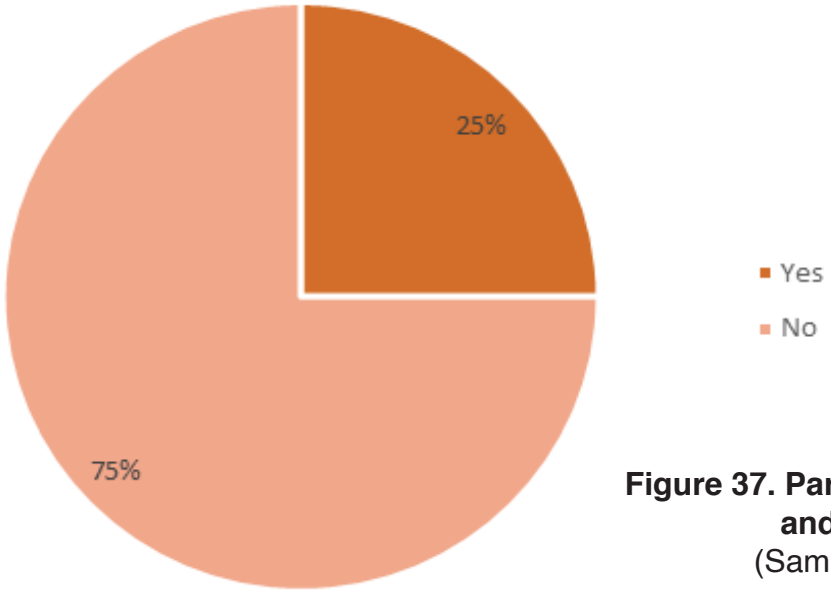


Figure 37. Partnership between investors and DRE enterprises
(Sample size: 8 investors)

2.6.2. Investors' expectations from enterprises

Approximately 25% of the investors feel that inability to provide collateral and change in government policies regarding the sector are the major challenges when it comes to enterprise financing in the DRE sector. Seasonal and unpredictable income of enterprises is also one of the factors. The investors have also pointed out other reasons due to which they are resistant towards financing the enterprises of the sector. The consumers are unaware about the products due to which they do not demand for finance for a particular DRE product.

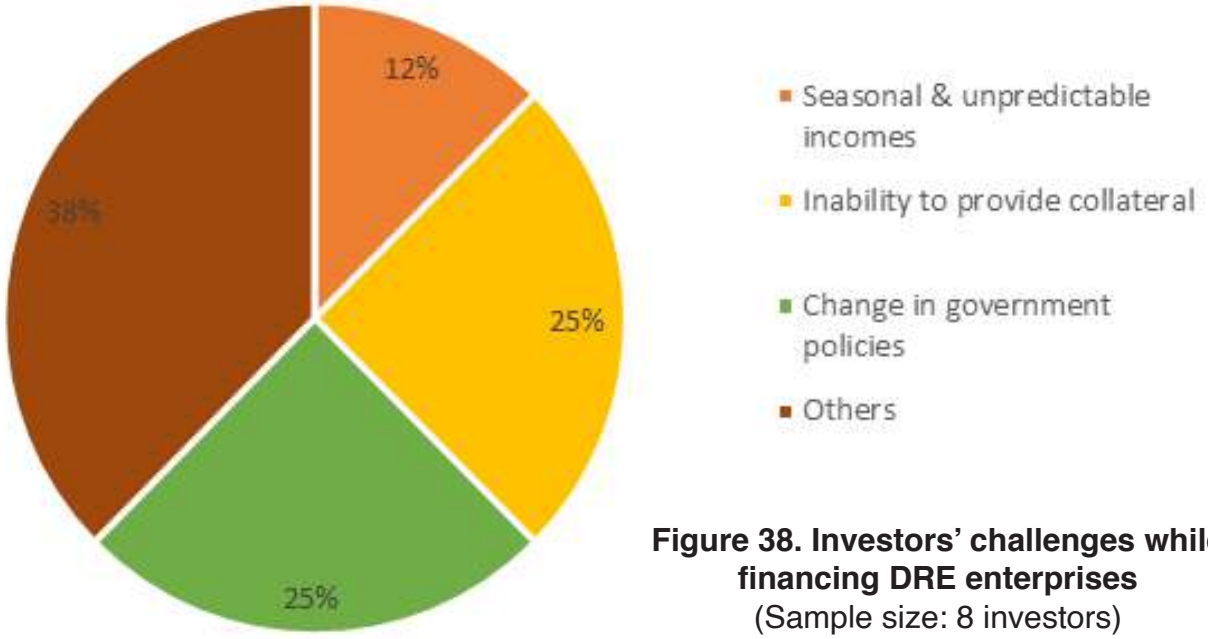


Figure 38. Investors' challenges while financing DRE enterprises
(Sample size: 8 investors)

For the challenges faced in end-user financing, 33% of the investors felt that seasonal and unpredictable income of the customers is the major challenge faced by investors in end-user financing. They also feel that due to poor after-sale services by enterprises, a customer's productivity is affected, which directly impacts repayment. Lack of formal lending history is also one of the challenges faced by the investors. Also, if the government provides subsidy for a product, the customers confuse it with the bank loan due to which the repayment is hampered.

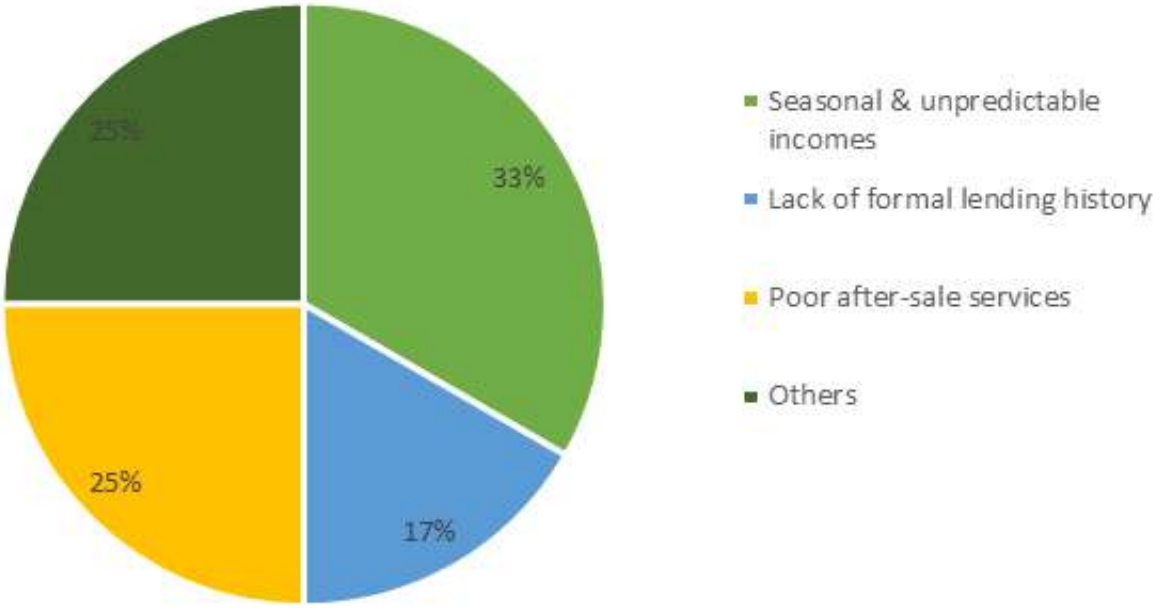


Figure 39. Investors' challenges while financing end-users for DRE products/applications
(Sample size: 8 investors)

As per the investors, awareness programmes driven by DRE enterprises for the local community will be the most effective way to increase demand for the product within the community. Financial support can be provided if there is demand by the customer for any product. The reduced price of the product, improvement and innovation in the products, and better after-sales services are the key areas, which the enterprises need to focus on for creating a better market and gauging financial support.

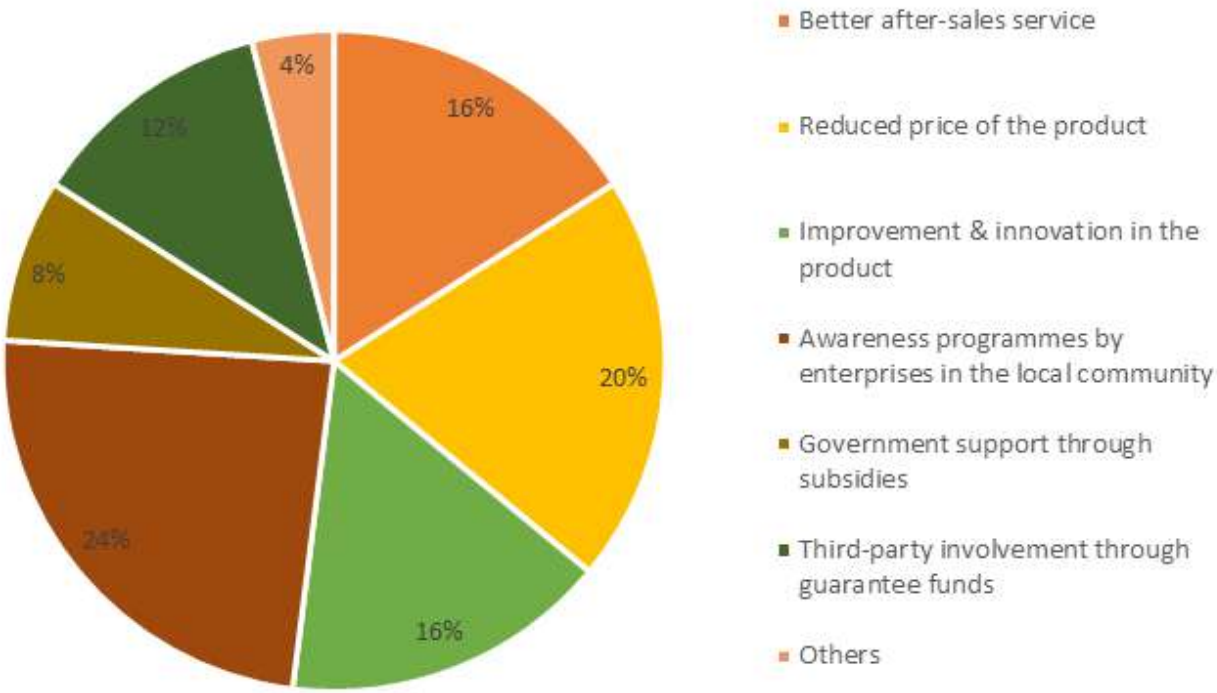


Figure 40. Areas of improvement for enterprises as per investors
(Sample size: 8 investors)

Third-party involvement through guarantee funds and government subsidies can act as a booster for the investors in financing DRE products as it will help in risk sharing. Improvement in corporate governance, quality of book keeping, and diversification of end-use segments is important in the case of enterprise financing.

2.6.3. COVID-19: Investors' actions

There have been initiatives taken by investors to support their existing customers in terms of end-user financing. The investors are providing emergency loans and small ticket size loans for the existing borrowers. Some of the investors are also supporting new borrowers in accessing equipment through which they can generate income and earn their livelihood. On the other hand, for the enterprises, there are new small loans for selected existing customers to get back to their business and for the new customers, there are loans with up to 3 months of principal moratorium.

During the period of COVID-19, GoI also took initiatives like the Centre for Augmenting WAR with COVID-19 Health Crisis (CAWACH). Some foundations also supported in channelizing funds to support the enterprises.

A lot remains to be done to fulfil the financial requirements of the enterprises and end-users. Especially during the pandemic and post-pandemic periods, there is a need for handholding and working together for the sustenance and growth of DRE enterprises. In this regard, support from the investors would help them in bringing back to normal.

Case Study 1: Creation of First Loss Default Guarantee Fund for solar pumps in West Bengal and Odisha – SwitchON Foundation

Problem statement

In Eastern India, merely 33% of the farmlands are irrigated. They are done mainly using diesel-powered pumps, which are not only environmentally degrading but also have high recurring cost. The most suitable alternative is the use of solar-powered irrigation pumps, which have a penetration of only 0.5%. Higher capital costs and end-user finance are the key bottlenecks to upscale this promising technology. Banks were also reluctant to provide loans for the same to 'unbankable' marginal farmers tagging them as 'risky investment'.

The intervention

To unlock finance for solar pumps, SwitchON Foundation (a CLEAN member) set up a First Loss Default Guarantee (FLDG) fund in 2017 with support from Pacesetter Fund and Good Energies. They also partnered with RBL Bank and Axis Bank to provide marginal farmers with loans for acquiring solar pumps. The FLDG fund was set up to de-risk the lending by commercial banks and allow the farmer to easily avail a loan for solar pumps at lower than market rates.

- By conducting socio-economic surveys, 6115 marginal farmers and water entrepreneurs were identified.
- Post identification, several sensitization and training programmes were provided to field-level bank employees and the identified farmers' group to enhance awareness about solar-based technologies.
- The farmers who were eager to adapt the technology were then clubbed into Water User Groups (WUGs) and Joint Liability Groups (JLGs) for facilitation of loan towards acquiring solar pumps.
- More than 70 WUGs, which have positively impacted 680 farmers directly, have been created.

Impact

- Increase in the income of 680 farmers by 2X.
- 68 solar pumps installed and 0 EMI defaults from farmers till date.
- Saving of INR 3000–6000 per month from diesel expenses.
- Reduction of 115,000 tonnes of CO_2 emission per pump over its lifetime.
- Re-introduction of traditional third-crop cycle annually.

Case Study 2: Clean cooking with biogas – Fair Climate Fund

Problem statement

The Chikballapur district in the Indian state of Karnataka is an underdeveloped region where a large part of the population lives below the poverty line. Traditionally, people cook indoors in open wood fire, which causes harmful smoke. Also, women spend a lot of time (almost 16 hours a week) gathering firewood. The rural households in Chikaballapur (nearly 73.90%) are primarily dependent on fuelwood for cooking and heating water. The region is also scarce of biomass.

The intervention

Since 2009, Fair Climate Fund has been working with its local Fair Climate Network partner ADATS to supply biogas plants to 12,000 farming families in the Chickballapur district of Karnataka province. A biogas plant consists of an underground biodigester in which organic waste, mainly cow droppings, is converted into methane gas and bioslurry. The gas is led to the house through a plastic hose where it is connected to a two-burner gas stove. This clean way of cooking replaces the traditional way of cooking in open fire. The bioslurry is the residual product that remains and can be used as a biological and sustainable alternative to fertilizers. About 2 cows are needed to provide an average household with sufficient gas for cooking on a daily basis. Cooking on biogas is comparable to cooking on normal gas in terms of convenience and air quality. The only difference is that biogas is a 100% renewable energy.

Impact

When cooking with biogas, there is no smoke development as compared to cooking in open fire. This means health benefits for the whole family, in particular for women and children. In addition, women no longer have to fetch wood, cooking is easier and faster, and it prevents black soot deposits in the house. On an average, women save eight hours a week by using biogas. This time can be spent on family, household or economic activities. Moreover, the bioslurry is a good and free alternative to fertilizers. Various studies have shown that bioslurry has a positive effect on agricultural productivity.

- 11,633 Biogas installations are used.
- 218, 418 Thousand kilograms of wood saved = 436,837 trees
- 203,361 tonnes of CO_2 reduced

This project is Gold Standard certified and additionally has the Fairtrade Climate Standard certification. The farming families in this project are members of the Bagepalli Coolie Sangha (BCS), a Fairtrade certified democratic organization that has stood up for the interests of local farmers and agricultural workers for over 25 years. BCS owns the project and is entitled to the revenues resulting from the sale of carbon credits. This income is sufficient to cover all costs of the project and the biogas installations. The surplus of income goes directly in cash to the farming families. In addition, a Fairtrade premium is used to set up training courses in the field of climate resilience and adaptation. These training courses are provided by ADATS.

Case Study 3: Carbon forward funding to subsidize improved cookstoves – Udaipur Urja Initiatives Producer Company

Problem statement

Udaipur district is situated in a semi-arid agro-climatic zone. The area is surrounded by the Aravalli Hill ranges. Over 95% families in the project area use traditional cookstoves, either three-stone fires or stoves built of mud/clay/cement without a chimney and grate. These rural communities depend primarily on fuelwood to meet their needs of domestic cooking and heating. On an average, about 3.21 tonnes of biomass, in which wood is a key constituent, is used by a family every year. Wood is collected by women from common lands or private pastures or own fields. As a result of deforestation, effort and time for wood collection have increased considerably, resulting in more drudgery for collectors. In some villages, families have gradually shifted onto purchasing of wood or payment of labour for collection. Thermal efficiency of traditional stoves is as low as 10%, hence greater amounts of firewood are needed. The traditional cookstoves also have higher emissions of GHG and PM, which cause harmful health effects to women and young children. The purchasing power of the villagers is also low.

The intervention

To tackle the above problem, Udaipur Urja Initiatives (UUI) Producer Company Limited designed and implemented a pro-poor carbon credit financed clean cookstove project. The project supported 18,500 families to access the technology of improved cookstoves (ICS) through carbon finance. Two models of biomass ICS, Greenway Smart and Greenway Jumbo, were selected after extensive demonstration and pilots with the users. The use of stoves reduced emission of GHGs by about 2.24 tCO_2e per family every year. The life-span of stoves is estimated to be of 5 years. Each project family received two stoves, one of each model. The families contributed a token amount to receive the set of stoves and the remaining was funded through carbon forward funding from two carbon investors. This has been possible only after registration of the project activity as a GS VER project activity. A part of that went to the development fund of their respective community institution and another part to the project for maintenance, monitoring, and community governance of the

project. After distribution, the use of stoves is being monitored regularly through community mobilizers (village women), community institutions, and UUI.

The monitoring data is electronically recorded in an online monitoring solution. A local repair centre has also been formed to ensure timely maintenance and repair of the faulty stoves. Continuous awareness creation among the communities also ensures sustained interest of the communities to use ICS and not revert to traditional stoves.

Impact

- Excessive smoke by burning fuelwood using traditional stoves was the main cause of eye-related and respiratory problems. These problems have decreased drastically after the implementation of the project activity.
- 150 jobs are created due to the project activity of which 134 are for women and 16 for men.
- According to the study conducted by Duke University in the project region for about 600 households, it was observed that households exposed to the intervention spent less time cooking and collecting solid fuels @ 0.5–0.7 hours/day. According to the study, it also suggests that adopting households had reduced firewood use, relative to non-adopters, by over 2 kg/day.
- 43% reduction in time spent for collecting fuelwood and cooking over their baseline scenario. A headload lasting for 2.5 days in the baseline for cooking now is used for 5 days. There was a reduction of 1.86 person-days/week/household due to the project activity. Nearly 50% of women worked on their own land, grazed cattle or did other jobs, while a quarter of them had more time to rest and take care of their children with the time saved.
- Only 4% of the surveyed houses purchased fuelwood. They have reported a reduction in the use of fuelwood, thereby saving money.
- Till date, 105,258 VERs have been issued by Gold Standard for this project.

Case Study 4: Joint liability group lending mechanism for solar lighting products – Midland Microfin Limited

Problem statement

There are many people with lung disease, eye deterioration, and burns due to the use of kerosene lamps. Women have felt unsafe walking to the toilet outside after dark. Babies are being delivered by midwives using only a candle, and students cannot study when the sun goes down for lack of light leading to increased illiteracy and perpetual poverty.

The intervention

Midland has introduced solar light product by collaborating with D-light and Greenlight Planet. Midland provides solar product loan to its existing JLG (Joint Liability Group) group members. The JLG is a group of five women formed by the members with the assistance and supervision of a Centre officer. The JLG enables the members to support each other emotionally and financially by guaranteeing the timely repayment of loan. The members jointly stand liable for the repayment of the loans disbursed to each of them. Members can avail this loan on 6 months, 9 months, and 11 months EFI or EMI (equivalent fortnightly installment or equivalent monthly installment). Midland also provides credit shield insurance to members along with loan. The solar product loans are available from a range of INR 1499 to INR 2899. The interest rates are 27%. Greenlight Planet's Sun King Pro 200 is available at Midland Microfin Ltd (MML) branches across Rajasthan, Punjab, and Haryana. The loan officers of MML create awareness about the solar products by pitching it during the centre meetings. It is supported by product company staff members.

Impact

- Households impacted with clean energy: 33,484.
- Individuals empowered: 162,470.
- The repayment rate for solar product loan is 98.5%.
- These loans have considerably reduced the dependence of households and businesses on kerosene oil for lighting purpose, thereby improving their health.

Other offerings from Midland

Midland is also a pioneer in introducing water purifier in the MFI industry. MML has introduced off-grid water purifier in the Malwa region of Punjab (also known as the cancer belt of India due to poor quality of drinking water) so that clean drinking water can be produced. In addition to that MML gives loan to facilitate access to solar-powered home lighting systems. These lighting systems are currently being offered to clients in five states (Haryana, Punjab, Rajasthan, Uttar Pradesh, and Bihar). Midland also partners with MEC to invest in carbon funds.

Case Study 5: Caspian helps fast-growing Start-up/SMEs when growth hits a roadblock – Caspian Impact Investment

Problem statement

Fast-growing SMEs face various challenges in the pursuit of their mission. During good times, SMEs need capital to support growth, whereas in bad times, SMEs need support to survive/recover the external/internal shocks. External shocks (such as this pandemic) quickly dissipate into liquidity shocks for SMEs. Caspian debt supports SMEs in various facets of the growth journey by offering customized, collateral-free debt solutions.

During 2017, Greenway has faced such external shock as an aftermath of demonetization, where Microfinance partners could not collect repayments from its borrowers. Greenway then has faced the twin problems of shrinking sales and delayed collections.

The intervention

Caspian offered a bill-discounting facility to help tide over this liquidity crisis. This facility allowed Greenway to borrow money on the tap against existing and new debtors, which reduced the waiting time for cash collection by 2–3 months. This facility allowed the company to unlock money, which was stuck in receivables to pay staff salaries, vendor payments, and enabled the company to revive sales.

Impact

- Greenway discounted the receivables from the MFI partners and was able to pay its own suppliers and employees. The MFI partners got more time to make payments. With time, business came back to normal.
- Similarly, Caspian has offered customized debt solutions to 17 other Cleantech entrepreneurs (including a few CLEAN members) facing various growth challenges through various debt structures, including purchase order financing facilities, short-medium-term working term loans, bridge loans, project finance loans etc.
- Caspian has disbursed a total of INR 235 crore in loans to Cleantech enterprises using customized debt solutions.

Other offerings by Caspian for DRE sector

Caspian provides both debt and equity support for all clean technology enterprises, including enterprises working in DRE applications such as cold storage, improved cookstoves, home lighting system, water pumps, lights, and energy efficient fans. Apart from Greenway Grameen, Caspian has also supported DRE enterprises, namely, Ecozen Solutions, Punjab Renewable Energy Systems, Cygni Energy, Atomberg Technologies, GPS Renewables, and a few others. The ticket size ranges from INR 50 lakh to INR 15 crore at a rate 14%–18% for 1–3 years.

Case study 6: Interest-free solar product loan to a grocery shop owner – Sarala Development and Microfinance Pvt. Ltd

Problem statement

Mrs. Moni Pradhan, mother of two children, owns a grocery shop in Chapaguri of Bongaigaon, Assam, started few years back. It gave her livelihood income of about INR 1000 – INR 1500 per month causing difficulties in managing her family. She was thinking of reviving her shop to meet her family needs and was in search for assistance. She came to know about the micro finance program of Sarala and approached us for a loan from a group of Sarala nearby her house. She had been given a loan after due diligence process and she invested in her shop. It helped her to store more grocery, but she was unable to increase her income significantly. She had some issues of timely repayment of micro finance loan, leading to a visit of Branch Manager to inquire about the reason for irregularities. When enquired, Branch Manager discovered that she closed her shop early due to non-availability of light after sunset and came back to home in the evening. Chapaguri is a hilly region; the location becomes dark around 3:30 pm during winters and around 4:30 pm during summers.

The intervention

The branch manager oriented her about the Solar home system products, which are provided though unsecured lending. Solar product loans of Sarala are interest free loans with no other costs included. Each product is facilitated with 2 years replacement guarantee. The Solar home system can provide light to the shop after sunset with the help of battery. She agreed to purchasing the product by taking the interest free loan. A solar home system product, Sunking Home-60 from Green light planet was provided to the shop owner. The solar home system has a Solar Pv capacity of 6 Wp, 1 USB charging port, 6000 mAh battery with 24 hrs backup, 3 LED lights (100 lumen each).

The cost of SHS was INR 4999. The down-payment was INR 499 and the equivalent fortnightly instalment was INR 250. The tenure of loan repayment was 9 months. Sarala adopts a Loan Officer-led model of energy lending. The decision to pursue this approach was on the assumption that loan officers, who maintain long-term relations with their clients, could easily increase trust, comfort, and interest in solar products among clients.

Impact

Mrs. Pradhan, now has extended hours of business after the daylight and is a regular and loyal customer of Sarala. Her children now can study in the night. Moni's income has increased by about 60%. Her economic status has improved in such a way that she is able to repay the loan in advance.

Sarala has solarized nearly 100% percent of its client base. Sarala plans to start Joint liability group lending for Solar water pumps. Currently Sarala offers loans for Solar Home Systems, Solar Fans and Solar Torch in Assam and loans for Solar Torch in West Bengal, Bihar, Jharkhand and Sikkim.

Case Study 7: Ray of hope amidst lockdown – helping others by helping self – Self Employment Voluntary Association

Problem statement

Following the outbreak of the global pandemic COVID-19, there has been devastating and disproportionate effect on the unorganized sector, especially the micro-level enterprises in the rural and urban settings. Their source of income has been affected badly following the government announcement of nationwide lockdown on 24 March 2020 and its further extension, to contain the spread of COVID-19.The case in Manipur is not different. Further many district administrations in Manipur have issued strict guidelines of wearing face masks to completely cover mouth and nose and made it mandatory for citizens to wear it while stepping out in public places. Manipur being geographically land-locked faces another challenge in terms of logistics of availing those masks from outside the state.

The intervention

SEVA is one of the implementation partners of Tata Trusts initiative 'Ensuring energy security for communities living in remote areas in Manipur'. SEVA has built a number of micro entrepreneurs based out of renewable energy like solar-powered sewing machine, embroidery machine, and weaving centres. Anandi is amongst one of those micro entrepreneurs. Through SEVA, Anandi received a loan amount of INR 30,178, which included a 75-Wp solar panel, with a battery capacity of 75 Ah, a solar-powered sewing machine, which can run 8 hours through battery back-up. Through her solar-powered sewing machine, Anandi manufactures face masks at community level for rural health-care service provider, NGOs, community-based organizations, local clubs, old-age people, orphanages, and Divyang.

Impact

By working three to four hours a day, Anandi produces around 35–40 pieces of mask in a day. She is able to sell the mask at around INR 30 per piece making a profit of around INR 8 per mask. She has earned a net profit of around INR 12,000 during the lockdown period with minimum support available. The renewable energy initiative of Tata Trusts has ensured to help the local micro entrepreneurs to generate livelihood opportunity during this time of crisis, at the same time helping to fight against the pandemic even though at a miniscule level. Even though Anandi owned a grid-connected electric-run motor, she was in desperate need for reliable power source to run her sewing machine, as the grid was not able to provide that. Now the solar sewing machine is providing that reliability and efficiency for her, as she can store the power and use it whenever she wants to use it.

Case study 8: Lighting up the floating huts of Loktak Lake – SNL Energy and Self Employment Voluntary Association

Problem statement

Moirang is a block in Bishnupur district of Manipur. Loktak Lake is located at Moirang block, where fishing communities survive on floating huts.

Fishing in the lake is the only source of income they have. Due to unreliable electricity supply and lack of grid connectivity in few huts the residents have issues with drying fish and meeting basic lighting needs of children for studying at night. They use kerosene lanterns and candles which are very dangerous for such types of huts because it can catch fire and burn the hut to ashes. The residents also came up with the idea of tourist Homestay concept, since Loktak Lake has its own charm by its beauty which attracts many bag packers and visitors from across the country and abroad. There was a barrier in terms of energy source. The community also received complaints from the tourists in terms of improper lighting. The local authority in that part of the Loktak lake doesn't allow diesel engine to be operated. Even though some of them buy solar panels and batteries from the market, they do not use a proper charge controller, as a result the batteries get discharged quickly.

The intervention

In March 2018, CML Tata Trusts launched the Initiative-"Ensuring Energy Security for communities living in remote areas in Manipur". The main objective was to provide decentralized solar energy solutions to unserved and underserved rural community with unreliable electricity access. Lighting up the huts through clean source of energy (Solar) is a component of this initiative from CML TATA TRUST (Funding Partners). SEVA Manipur provides end user financing and SNL Energy is the Technical Partner for identifying and installing the solar PV system. SELCO Foundation is the Design partner for this initiative.

SNL contacted one of the hut owners and discussed a customized solar home system that can be installed properly with MMS and without exposed wiring. They have installed three

40W Solar PV system with 2.5 W LED bulbs. SNL has been able to reach out to 500+ rural households. SNL also offers livelihood solutions like Blacksmith blower, sewing machines etc.

On an average the monthly EMI is between INR 600 and INR 1000 for the tenure of 3 years. SNL provides 3 years free service after that an annual maintenance contract can be signed for INR 650.

Impact

- Existing grid-connection users have reduced their monthly electricity bill by 40%.
- New SHS users are now able to work at night and can save on fuel and labour-hiring charges upon using livelihood products such as sewing machines, blacksmith blowers, and water pumps.
- Children can study during the night without kerosene lamps or candles.
- Due to the availability of regular and proper lighting source, more tourists come to stay in the huts. This has increased the income of the families.

03

3. DRE TECHNOLOGY

This section reports on (a) the most popular DRE products, (b) products that are foreseen to scale up in the near future, and (c) products that require standardization measures. Members have also reported areas where they see opportunities for growth, for example, in the use of new technologies such as IoT and Blockchain and in electric vehicles. This section also highlights the challenges faced by enterprises to scale DRE technologies. The section ends with the steps taken by DRE enterprises to diversify their products and stay in the business during the COVID-19 crisis.

3.1. Consumers and Types of Loads Served

In this section, the number of consumers served helps understand the impact on livelihood and the project growth. The types of loads, i.e. residential, commercial or community, give an idea of the type of projects that are executed. Here, residential loads refer to a single household and community loads account for a few houses together.

There are quite a few projects that involve DRE technologies being implemented at public places such as banks, educational institutions, health-care institutions like public health centres (PHCs). These projects have been accounted for separately in the information box below and demonstrate the reach of our DRE enterprises.

- Approximately 1.2 million individual consumers have been served by 19 CLEAN member enterprises surveyed.
- From the CLEAN members who participated in the survey, 30% serve a residential customer base, and 32% serve a community level consumer base. A majority of these enterprises (38%) work on commercial loads. Community loads account for projects catering to the energy needs of a few houses together. Sizes vary from project to project.

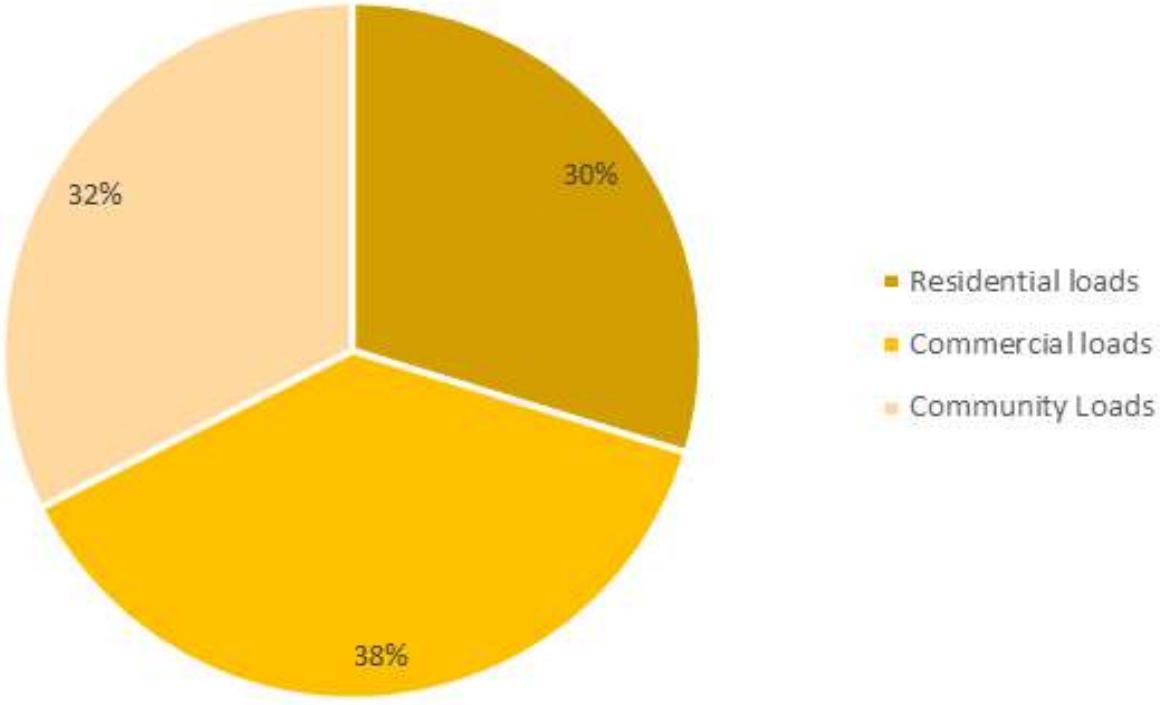


Figure 41. Types of consumer loads served
(Sample size: 23 enterprises)

DRE-supported Infrastructure

CLEAN member enterprises* have reported enabling and supplementing energy access to the following:

- Educational institutions: 1110
- Healthcare infrastructure (including mobile medical units): 50,000+
- Public infrastructure (banks, jails, etc.): 710

* Sample size: 9 enterprises

3.2. Testing and Standardization

DRE solutions are rapidly emerging as promising solutions for rural households and livelihoods that necessitate the need for standards and testing services. This will pave way for a baseline level of quality and durability of the products.

Last year, CLEAN with support of CSIR-NEERI initiated testing services of biomass based improved cookstoves for its members.

CLEAN with support of experts in the space of improved cookstoves, has developed the star labelling scheme with focus on compliance with ISO standards. The twin objectives of this are: (i) to be able to assess the performance of an option on various relevant criteria for practitioners to identify critical gaps or limitations and (ii) to be able to communicate these performance-related aspects to users to enable them to make efficient and suitable choices. The seven parameters that have been rated under the star labelling are as listed below:

1. Thermal efficiency
2. Carbon monoxide
3. Particulate Matter (PM2.5)
4. Safety
5. Durability
6. Heat output controllability and
7. Cooking versatility

Apart from this, CLEAN has heard from various stakeholders on the need to standardize, test and provide certificates to productive applications for their growth. It is extremely important for the Ministry of New and Renewable Energy (MNRE) and its affiliated institutions such as NISE, NIWE and NIBE and other institutions such as BIS and ISO etc. to attest these applications.

- Solar-based home lighting solutions and street lights lead the race in terms of standardization requirements.

- In productive end-use applications, members reported that there is a need of formalizing baseline parameters for cold storages, solar water pumps and agro-processing applications such as dryers and rice hullers etc.

Table 3. Testing priority for various DRE technologies

Level of priority	DRE Technologies
High Priority	Solar home systems, cold storages, solar water pumps, agro-processing machines
Medium priority	Solar sewing machines, food-processing machines, space heating applications
Low priority	DC compressors, biogas meters

- Sewing machines and food-processing machines are also gaining momentum in markets in order to get standardized.
- New emerging businesses such as electric vehicle charging systems and energy storage systems also need standardization and testing measures.

3.3. Product Innovation and Scope for Further Research

The DRE products have to be customized and aligned to the needs of the consumers. Members have expressed the need for support to continue doing R&D for a better consumer experience with customizable, energy efficient, and grid synchronization features.

- Productive end-use applications have been the most cited response for research and innovation. This sector is diverse and accommodates machineries for various different applications, especially in agro-processing and food processing.
- DRE powered DC applications are playing a major role in boosting the manufacturing Members during various conversations with the CLEAN team highlighted the need for research on mapping of energy efficient motors suitable for various motorized applications. Lack of reliable motor manufacturers ranging from a fractional kilowatt to kilowatts in this segment is a major concern as posed by the members.
- Healthcare related DRE applications also need a lot of field research especially in rural areas where the electricity is unreliable.
- The Efficiency for Access Research and Development fund chose organizations like Devidayal Solar and Greenlight Planet to grant funds for their R&D operations in the DRE powered cold storage sector. The need for such funds in almost all the sub-sectors of the DRE space is dire and would go a long way to promote innovation even in existing products.

- Many international organizations like CLASP and Efficiency for Access provide funds to enterprises specifically for research and innovation. In India's context, there are government organizations like the Department of Science and Technology(DST) and private organizations like Social Alpha who actively fund research in sectors such as improved biomass cookstoves, solar energy materials and storage solutions (DST).

3.4. Implementing New Technologies like IoT, Blockchain, and EVs

Newer technologies like blockchain and IoT have been implemented at a concept level in many sectors including clean cooking, solar mini grids, asset security etc. Their role in the larger energy sector is also widely discussed and a few projects utilizing these concepts are already operational. In the DRE sector, these devices could revolutionize the performance monitoring and trading of the generated clean energy. Some enterprises are already on track to implement these technologies, on top of their existing projects or in their upcoming ones, to improve the output of their projects. As the future is DRE and we need to eventually phase out fossil fuels, a few companies are also looking at e-mobility as an attractive product segment and are in the process of developing products for the same.

- Enterprises have found a variety of applications for blockchain technology right from using it as a mode of managing payments for community lighting systems and electric charging infrastructure to integrating it with carbon credits.

- IoT and AI have seen usage mainly for remote monitoring, security and maintenance. The collected data from these IoT device sensors are also used for gaining insights within the enterprises' own system.

- Doorastha Analytics uses its 'iLUMY' solution for tackling microgrid monitoring and reliability. In a project in Uttar Pradesh for 100 consumers, they have set up two separate solar DC microgrids to tackle the unreliability of the main grid. They implemented IoT solutions to facilitate prepaid smart meters for energy consumption. The operator used a mobile app to recharge the meters and maintain ledgers of energy consumption. Such critical interventions showcase the role of these new technologies and the ease and functionality they bring with them.

- A few companies have designed e-vehicles or charging infrastructure. E-rickshaws and solar powered e-ambulances are some of the vehicles that the members manufacture and are looking to get into the market.

3.5. Steps Taken by Enterprises to Maintain Business during COVID-19 Crisis

COVID-19 gave an opportunity for members to explore business opportunities in other areas. For example, quite a few enterprises diversified into manufacturing face masks, face shields, sanitizers, and contact-less dispensers. This diversification of products was necessary to keep the company operations running smoothly.

- Enterprises also used their own distribution networks for the distribution of these manufactured products. For example, Onergy moved to manufacturing masks and selling them through their existing supply chain network.

- Some enterprises worked on implementing various renewable energy technologies in PHCs and for other medical-related equipment. For example, Envo Renewables facilitated, installed, and commissioned a 4 kW solar inverter based hybrid system at the Corona Care Centre (CCC) and a 3 kW solar inverter-based hybrid system at the Isolation Ward (IW), and the Therapeutic Care Centre of the Civil Hospital in Williamnagar, East Garo Hills, and Meghalaya.

- Digitalization of businesses and work from home efforts taken up by enterprises have helped them to keep functioning. Enterprises also used the lockdown period to develop new products. For example, Ekak Innovations developed a solar-powered packing machine and an IoT based device to help long distance truck drivers.

- Some enterprises have forayed into COVID sample collection kiosks, COVID isolation wards, incinerators, high efficiency cremators, community kitchen kits for migrant camps, etc.

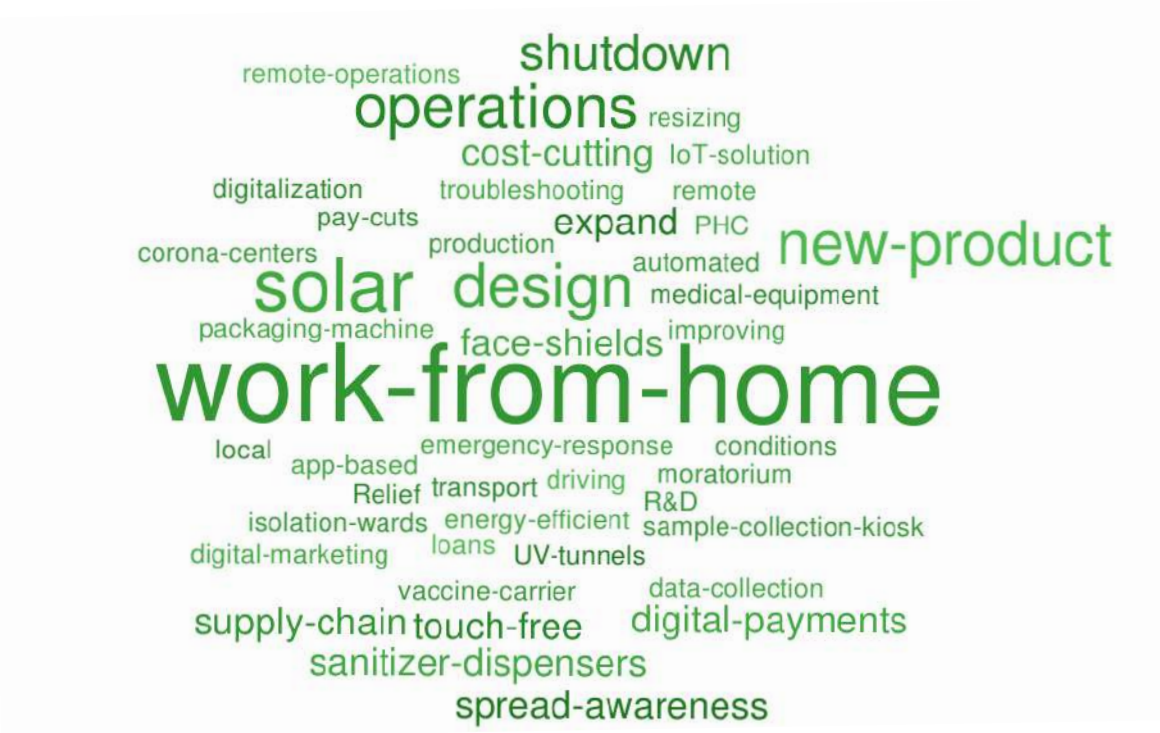
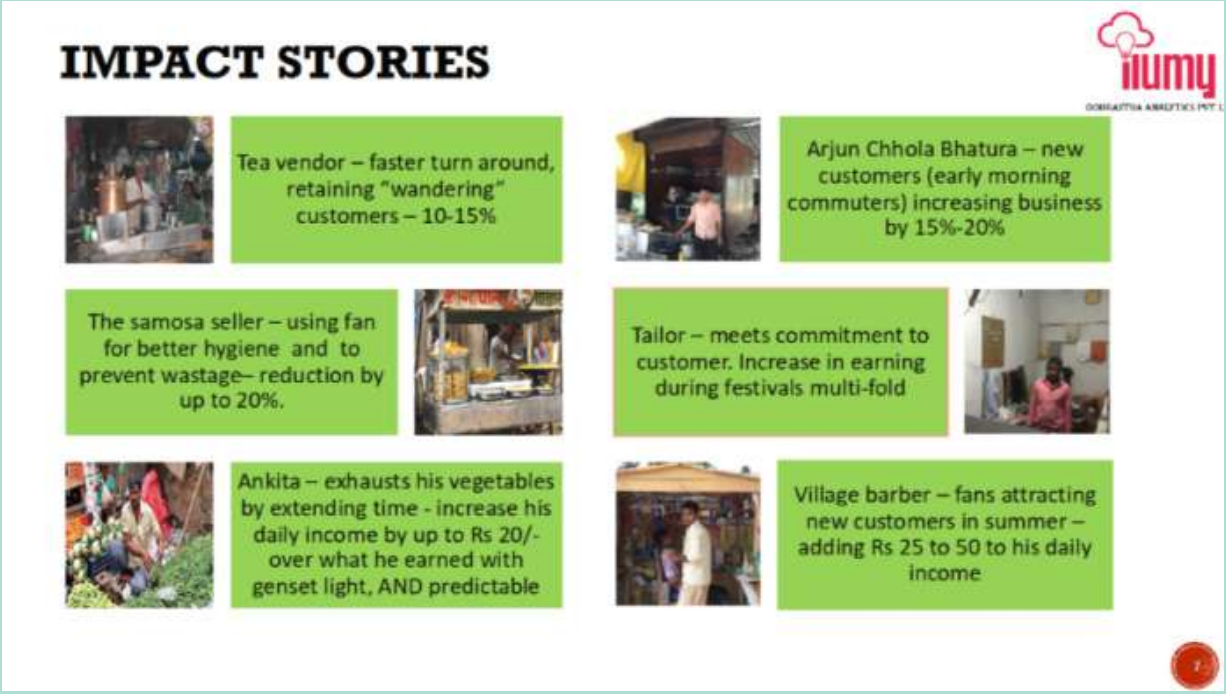


Figure 42. Word cloud outlining steps taken by enterprises during the COVID-19 crisis

(Sample size: 33 enterprises)

Case Study 9: Empowering rural enterprises in Jaunpur through iLUMY – Doorastha Analytics



Problem statement

A village market in Jaunpur district of Uttar Pradesh typified the condition of several other rural markets in the country. This market has a public grid, but quality and reliability of power were poor.

- Less than 12 hours of power available daily, and power cuts were frequent in the evening hours when the business was most active.
- Power when available has variable voltage levels of 90V to 180V.
- Faults take a week to get rectified.
- Power interruptions during monsoon season. For example in 2019, grid power was totally cut off for three weeks at a stretch due to heavy rains and floods.
- Shop owners fall back on expensive inverters as options (very rare), or shared diesel generator (DG) based service providers (almost all).
- DG service providers had a fixed charge per user for 3 hours of operation in the evening. Several consumers complained about the service providers providing the service as per their schedule rather than what the consumer needs.
- For the DG set operator, daily purchase and re-fuelling, frequent breakdowns, increasing cost of diesel and the challenge in collecting payments were major issues. One person spends four hours every day moving around the market for collections.

The intervention

Doorastha Analytics took a human centred design approach to address the need, and as an intervention.

- Two separate DC solar microgrids were set up in the village keeping the safety aspects in mind.
- Microgrid is available 24x7.
- Approximately 100 consumers are connected to the grid with each having a pre-paid smart meter (iLUMY) and provided with a free light source with provision to use a second one, a mobile charger, and a light DC load like a fan.
- The operator was provided with a mobile app, which is being used for recharging of the meters, and automatic maintenance of the ledgers.
- A grid controller to monitor all aspects of the grid was installed in each of the grids for monitoring purposes.

Impact

- About 100 consumers moved from the DG based supply to solar driven micro-grid, thus reducing the pollution caused by the DG sets.
- Doorastha offering started at minimum 25% cheaper than the earlier service, which resulted in the saving a minimum INR 60/- per month for each subscriber. Subscribers consuming more stands to benefit more.
- Uninterrupted 24x7 supply has brought in predictability and a more thriving evening market.
- Micro-entrepreneurs have been able to increase their income by 10%–20%.
- Grid operator productivity improved by more than 10 times through reduction in collections drudgery.
- Reduction in 2000 kg of CO_2 emissions every year.

Case Study 10: The ABC model – Omnigrid Micropower Company (OMC)

Problem statement

Atrauly is a village in Sandila Tehsil of Hardoi district, Uttar Pradesh. Atrauly has a population of 8116 (4228 males, 3888 female) as per the Population Census 2011. Atrauly was notionally electrified in 1993, being along the LT distribution network between Bharawan and Kothawa. However, in 2012, the availability of power was limited to approximately 4 hours a day, with unpredictable schedules and poor quality of voltage and frequency. The problem of unavailability of grid electricity supply was especially acute during peak hours.

The intervention

The OMC power plant in Atrauly was commissioned with an initial PV capacity of 9 kWp in November 2012, connecting one telecom tower, a gas station (petrol pump) and a college from the beginning. The PV capacity of the plant was expanded twice to keep up with the demand, and now has a capacity of 48 kWp. With escalating aspirations of customers, OMC decided to shift its energy delivery strategy from appliances to a minigrid model, with domestic voltage AC supply through the OMC Power Distribution Network (PDN).

OMC employs the ABC model.

A - Anchor loads

- Mobile towers and transmission hubs
- Anchor loads from telecom towers provide for stable, long-term, contracted revenues through PPAs.

B - SMEs and local businesses

- Petrol pumps, shopping centres, irrigation pumps, mills
- Hospitals, banks, schools, colleges
- Small and medium enterprises – workshops, etc.
- Metered, 24x7 on, post-paid customers. Graduated power packages, daytime only, pre-paid customers

C - Community households

- All OMC household customers and shop lighting customers have a wired connection or pre-paid, graduated power packages, with the choice of any 8 hours of supply during the day.

Impact

- More than 80% of served households report that women have more time for domestic chores, leisure, and socializing.
- Average time for schoolwork has increased by 2 hours per day.
- More than half already experience that hospitals, schools and markets are open longer.
- 83-88% of customers are satisfied with the reliability of quality and price of electricity.
- OMC power plants reduce diesel usage by telecom towers.

Case Study 11: Wind–solar hybrid power generation for a rural petrol pumping station – WiSH Energy

Problem statement

There were frequent power cuts to the tune of almost a day in Koganoli (a village in Belgaum, Karnataka). The location also had strong monsoons with cloud cover.The petrol pumping station operates 24x7 on diesel and the diesel expenses were too high to be financially sustainable.

The intervention

WiSH Energy conducted a detailed site survey and installed a 19.5 wind-solar hybrid off grid system in the rural petrol pumping station. The combination of solar and wind system solves the intermittency problem of renewables to an extent and makes it viable for pumping stations. Wind speed is at its highest during early mornings and evenings. The sun is at its peak during the day. Summers have high solar energy potential. Monsoons and winters have high wind energy potential.

Impact

- WiSH Energy was able to resolve the voltage fluctuation problem by deploying an off-grid system.
- 100% reduction in diesel cost and consumption to meet the needs of the pumping station's infrastructure.
- Annual energy savings of up to INR 5,50,000 through the replacement of diesel.
- This solar-wind hybrid system can reduce up to 1.5 tonnes of oxynitride and 121 tonnes carbon dioxide emissions a year in the long run.

Case Study 12: A sustainable solution for Kadaknath breeding – Pushan Renewable Energy

Problem statement

Kadaknath is an Indian breed of chicken originating from Dhar and Jhabua districts of Madhya Pradesh. The Kadaknath breed is not a natural brooder, as the birds do not sit enough on the eggs. Setting up a small scale hatchery at the village/cluster level can help poultry farmers to get hassle free supply of Kadaknath chicks on regular basis. Incubators based on full or partial grid power do not function properly. The brooder for chicks needs continuous light and heat. If grid power goes for a day, the whole batch of chicks may die.

The intervention

Off-grid solar powered incubators are the solution for incubation. Pushan Renewable provides off-grid solar egg incubators with brooders, financing through local banks/financial institutions, transportation, on-site installation, after sales service and training on product usage.The temperature is maintained constant for 24 hours during the 21 days incubation period in the solar egg incubator and brooder.

Impact

- Women and new entrepreneurs generate additional income of INR 2,000-10,000 per month by using the solar-powered poultry incubator.
- The solar-powered egg incubator provides a sustainable solution where rural women can keep their own mother stock for continuous production cycle.
- The same system can be used to hatch other speciality poultry like Quail.

Case Study 13: Solar-powered rope-making machine – SELCO

Problem statement

Rope making is a versatile livelihood activity. It uses a variety of raw materials including coir of coconut husk. Small scale rope making entrepreneurs are affected by competition from big industries in the form of mass production at factories.

- The rope making process is highly labour intensive. The shortage of labour would not only increase the work of the existing workers but also would hurt the production rate.
- It involves physical drudgery. To produce one batch of rope, the wheel set has to be turned for at least 360 times. Users often experience shoulder pains after work, which in the long run could lead to health issues and disability.
- Coir industry hotspots also suffer from frequent power cuts, leading to loss of productivity.

Mr. Ramasamy, a rope making entrepreneur from Nadhayekoundanur, Tamil Nadu, is involved in rope making for more than 50 years. Four people, including him, are involved in making 3-4 yarns for coir rope manually. He earns INR 10,000/- to INR 12,000/- a month after the raw material cost and production charges.

The intervention

Looking at the problem of rope makers, SELCO came up with a solar powered rope making machine after thorough understanding of the manual rope making process and the existing energy gap. A 0.5 HP motor, 4 spindle rope spinning machine was introduced. The space in between the hooks on the devices is similar to that found on the manual machine, hence the learning curve for the users is low. As a pilot phase, SELCO installed a solar-powered rope-making machine at the place of Mr. Ramaswamy.

Impact

After the installation of solar-powered rope-making machine, the following benefits were observed:

- Increased productivity by 10%.
- Saved labour cost at the tune of INR 6000/- a month.
- Mr Ramasamy's income increased by 40%. He earns around INR 19,000 to INR 20,000 a month today. Reduced the drudgery and operational costs.

Seeing the benefits Mr Ramasamy agreed to buy the solar rope-making machine. Loans have been disbursed to five other customers under the MUDRA scheme.

Case Study 14: Cluster model for smallholder and tribal farms – Oorja Development Solutions

Problem statement

Over 100 million farmers in India rely on 9 million operationally expensive and polluting diesel-powered pumps for irrigation. They face volatile fuel prices, low pump efficiency, and frequent engine breakdown, amounting to high irrigation costs of INR 6,000-8,000 per acre per year. Diesel surface pumps often cannot draw water during the dry season (March to June). Inadequate irrigation and lack of energy sources force India's smallholder farmers to practise deficit irrigation of crops resulting in declining crop yield, prevent them from growing high-value crops, and inter-season cropping, further limiting their meagre opportunities for earning income.

The intervention

Oorja provides on-farm energy services to smallholder farmers, and tribal below the pyramid communities in the under-served and inaccessible areas of North and North-eastern states in India. It bridges the gap by investing in commercially-available solar technologies, combining them with off-the-shelf metering and remote monitoring systems, and selling services using a pay-per-use distribution model.

Under 'Oonnati', its flagship irrigation service, Oorja installs BLDC or AC submersible solar water pumps of 3-5 HP capacity delivering up to 250 m^3 of water daily for shared use by 15-20 farmers. Water is metered using a flowmeter and sold on a per m^3 basis, achieving 20% cost saving relative to diesel pumping. In July 2020, Oorja launched the agro-processing service 'Oojjwal' for solar-powered flour milling in two villages of Bahraich district, Uttar Pradesh.

For lean operations, Oorja uses a cluster model where each cluster comprises 6 solar pumps, 2 agro-processing units and 1 cold storage. Each cluster is serviced by three operators hired from the village community and one solar technician/customer service agent, creating jobs locally.

Impact

- 'Oonnati' irrigation service has been successfully adopted by 130+ marginal farmers comprising 15 community solar irrigation pumps in Uttar Pradesh and Assam.
- Farmers were able to increase the area under irrigation and water their farmland sufficiently, allowing them to increase crop yields by up to 15-30%.
- They were also able to save around 20% on fuel costs owing to displacement of use of diesel pumps and diversify their cropping to grow high-value crops, increasing their total annual income by around 40-50%.
- Oorja hires directly from local communities creating dignified employment and transferable skills in rural areas, so far it has created seven full-time jobs.
- 'Oojjwal' has helped reduce drudgery of farmers who are in charge of milling agricultural produce and earlier had to travel about 5 km along the main highways to access diesel-powered mills.

Financial model

Under the 'Oonnati' irrigation vertical, revenues accrue from one-time, non-refundable membership fees charged to each farmer, and from water sales at fixed tariffs per m3, which is post-paid in cash to the local pump operator. Similarly, under 'Oojjwal', village residents pay to grind grains and oilseeds, paying per kilogram of produce processed.

Case Study 15: Solar-powered fences mitigate human–elephant conflict in Assam – Aaranyak

Problem statement

Assam has always been a stronghold of Asian elephant populations. But with shrinking habitats, changing land-use patterns, urbanization and a burgeoning human population, human elephant confrontations have increased manifold, often leading to undesirable interactions.

The negative interactions are in the form of crop and property damages, loss of human lives, retaliatory killings and poaching to name a few. Most of the affected people are often poverty-stricken farmers and villagers.

About 750 people and 250 elephants died unnatural deaths in the state between 2010 and 2018 as a result of human elephant conflict (HEC). Villagers have installed illegal electric fences surrounding their crop fields or habitations. They draw electricity from high-tension wires or domestic lines illegally, for fencing the desired area and when elephants come in contact with these, they are electrocuted to death. Of late, human-induced elephant deaths using illegal electric fencing powered through mains or high-tension sagging wires are on rise in the state.

There have even been instances of human deaths when people have accidentally bumped into these fences.

The intervention

Aaranyak has been studying HEC across Assam. In 2014, in a site called Subankhata, on the eastern part of the Manas Tiger Reserve, Aaranyak held a dialogue with local communities and convinced them to convert their illegal electric fences into solar-powered electric fences that are non-fatal.

With active participation from the villagers, a 14 km long fence was erected that benefitted about 1,000 households and approximately 100-odd elephants that inhabit the area.

The fences are erected in such a manner that they encompass villages, without hampering the passage of elephants, thus fostering coexistence between both species.

A total of 24.5 km of solar-powered electric fences has been erected at two sites in Baksa district and 7.5 km in Nagaon district with support from the United States Fish and Wildlife Service and Elephant Family India Foundation

Impact

- With this effort, about 10,000 households have benefitted.
- Six years down the line, the fences are still functional and no incidents of elephant or human deaths have occurred in the area.
- Solar-powered electric fences have a positive impact on the health and social life of villagers and secure the villagers' crops and houses. They can now be at peace.

Case Study 16: An affordable lighting solution for urban slums, and rural and remote areas – NBIRT

Problem statement

Many rural households, particularly tribal houses and slum dwellers in India neither have reliable electricity supply nor do they have proper access to sunlight within their rooms during daytime. These households use kerosene lamps or electric lamps during the night by borrowing electricity from local shops or from diesel generator operators. They spend a considerable amount of their income (INR 300-800 on kerosene and INR 100-400 on electricity per month) in this.

The intervention

- Micro Solar Dome (MSD) is a day and night lighting single device developed by Kolkata based NB Institute of Rural Technology. It can be used for space heating purposes in cold regions as well. MSD is leak proof. It can be integrated with solar PV and its inherent solar charging provisions within the device allows it to be used for 4 hours continuously after sunset.
- Till date, about 10,000 beneficiaries have been supplied with MSD all over India in a period of 4 years.
- PV integrated MSD has been included as a part of off-grid solar lighting appliances by MNRE and is eligible for subsidy.

Impact

- After the installation of MSD, the beneficiaries saved INR 400-900 per month on diesel and electricity expenses.
- Children can study during nights. Some people generate income by giving tuitions or by working in the night.
- The provision for mobile charging allows rural people to maintain communication.

During disasters, power outrages last longer and firewood and kerosene are not readily available. MSD is beneficial in disaster management.

Case Study 17: Tackling household air pollution with zero cost smokeless cookstoves – Smokeless Cookstove Foundation

Ms Kokila Subhash Patil, an 'Aanganwadi cook' and is cooking for over 150 children on this chulha on a daily basis. She is able to save one LPG cylinder per month reducing fuel consumption by INR 850 per month.

Problem statement

Household air pollution (HAP), generally caused by solid fuels used in traditional cooking methods, is responsible for over 3.8 million premature deaths every year. India alone accounts for about 1 million deaths or about 25% of the total death burden of HAP amongst women and children globally. Cooking on open fires and stoves without chimneys, using basic fuels such as wood, animal dung, crop waste and coal, emits hazardous smoke that causes irreversible ill health and killer diseases. Small soot or dust particles penetrate deep into the lungs, causing lung cancer, child pneumonia, and chronic obstructive pulmonary disease.

The intervention

The Smokeless Cookstove Foundation (SCF) is a non-profit organization working towards curbing the problem of HAP. The SCF's training programme called the Smokeless Cookstove Revolution, seeks to train the rural, migrant and tribal population with the skill of making a 'virtually zero-cost, efficient and improved cookstove' that has a considerably reduced smoke output based on the principles of Rocket Stove Technology. The stove uses far less fuel than traditional chulhas, reducing the cooking time. The family members can use that time for furtherance of their livelihood (daily wage, education, etc). The raw materials used include locally available mud or clay, cut dry grass, rice puffs, cow dung, and bricks. Special metal moulds with specific dimensions are used to make the base for the chulha – also known as the doughnut. The metal mould can be manufactured for under INR 500 and thereafter be used to make several hundred stoves.

While the chulha does not compete with other models of the improved cookstoves available in the market, the solution provides immediate adaptability as it is not very different from a traditional chulha and is a 'no-cost' solution.

Impact

The SCF conducted three training sessions in the months of June, July and September 2018, in 30 villages of Khandwa, Madhya Pradesh. Surveys were conducted in 16 villages in the region, effectively from 49 respondents from a pool of 100 households (HHs) installed with the SCF Chulha.

- Of the surveyed HHs (49 in all), on an average, the cooking time reduced by 33% or1.30 hours lending the users of SCF chulhas to use this time in their daily wage work.
- As for productivity, the daily average consumption of firewood reduced by ~47%, which translates to a family saving about 96 kg of firewood in a month and about 1,170 kg in a year. This indicatively translates to about 2.9 trees saved per household per year.
- About 96% of the respondents reported reduction in watering of eyes, 84% in coughing, and 67% reported reduction in breathing problems as well.

84% of the people indicated that they have completely switched over to the improved SCF Chulha and 96% indicated a positive ease of use for the new chulha.

Case Study 18: Making Fangli and Patan villages switch to improved biomass cookstoves – CSIR-NEERI

Problem statement

Earlier in January 2018, Mahindra Susten reported to CSIR-NEERI about continued use of traditional inefficient mud cookstoves with solid biomass fuel by majority of households in the Charanka and Fangli villages of Patan District, Gujarat. Use of these cookstoves emits a range of toxic products like PM2.5, carbon monoxide(CO), aldehydes, among others. This deteriorates the indoor air quality in non-ventilated kitchens, the primary cook being the most vulnerable to exposure and consequent health issues.

CSIR-NEERI monitored the concentration of PM2.5 and CO in the kitchen emitted from traditional cookstoves for a duration of 24 hours in sample households (pre and post ICS intervention). The results highlighted severe concentration of pollutants in the kitchen micro-environment creating stimulus for intervention of an improved cookstove (ICS), which can reduce the pollutant concentration to safer limits.

The intervention

At CSIR-NEERI, NEERDHUR, a multi-fuel ICS has been developed with high overall thermal efficiency, reduced fuel consumption, and reduced emissions through design improvements and technological innovations. At present, NEERDHUR cookstove is approved by MNRE on the basis of its performance testing conducted by Improved Cookstove Test Centres.

- Using CSR initiatives of Mahindra Susten, CSIR-NEERI demonstrated and deployed 400 units of NEERDHUR - domestic natural draft multi-fuel ICS in the these villages.
- Basic training for using NEERDHUR was given to the households (mostly women) for realizing maximum gains in terms of fuel saving and reduced emissions.

The impact

Post installation of NEERDHUR ICSs, the follow up surveys done after 3 months of usage revealed significant emission reductions.

- ICS adoptions were 53.3% and 54.3% in Charanka and Fangli, respectively, which actually doubled in 3 months by spreading awareness about the benefits of using ICS.
- The benefit-cost ratio was found in the range from 3.2 to 4.0 and can be improved to 4.5 to 6.2 by adoption efforts through awareness.

Case Study 19: Biomass-based steam generation plant in Punjab – PRESPL

Problem statement

India produces over 500 MT of agro-residue biomass every year, most of which is burnt in the open fields during the harvesting period as the farmer prepares his fields for sowing the next crop. This causes air pollution and health hazards leading to poverty and sickness in the rural population. The effects of pollution are also felt in the nearby urban areas.

The intervention

Punjab Renewable Energy Systems Private Limited (PRESPL) has installed a 13 TPH capacity biomass boiler on BOOT (Built, Own, Operate and Transfer) basis for Sun Pharmaceuticals Pvt. Ltd to harness the energy from agro-waste. This fully automated Forbes Vyncke boiler uses the surplus biomass agro residues such as paddy straw as fuel to provide process steam to the plant, while at the same time efficiently burning the residue in a controlled environment thus reducing pollution. PRESPL generates employment opportunities for the local population and additional income to farmers for this agro-residue waste, which they would have otherwise simply burnt.

The impact

- Approximately 4 lakh unit of process steam has been supplied to the industry through biomass in the past three years.
- The health benefits due to less air pollution result in better quality of life to the locals.
- GHG emission reduction was estimated at 14,000 tCO_2/annum.
- The project created directly 50 and 200 jobs indirectly. Village level entrepreneurs are provided social and financial security.
- Achieved energy bill savings of 30% for the client compared to polluting and non-sustainable fossil fuel (INR 0.3 per kcal).

Case Study 20: Upgrading health centres: Corona Care Centre (CCC) and Isolation Ward with solar power in East Garo Hills, Meghalaya – Envo Renewables

Problem statement

A series of measures have been taken by the Government of Meghalaya to break the chain of COVID-19 transmission. One among many is to isolate all suspect and confirmed cases of COVID-19. However, as the numbers of cases increased, it was important to appropriately prepare the health systems and use the existing resources judicially.

The intervention

Envo Renewable Energy Services Pvt. Ltd. (ERES), as a solution provider, put an important mechanism for triaging and decision making for identification of the appropriate COVID dedicated facility in bringing renewable energy intervention for the health centres that will help to provide proper care to COVID-19 patients. Powering the Corona Care Centre and Isolation Ward with solar energy will help to cope with the issues caused by the frequent power cuts during the quarantine time and treatments of COVID-19 patients.

ERES in partnership with SELCO Foundation and District Medical and Health Officer Office, East Garo Hills, National Health Mission (NHM), Government of Meghalaya has successfully installed and commissioned a 4 kW solar inverter based hybrid system at Corona Care Centre (CCC) and a 3 kW solar inverter based hybrid system at Isolation Ward (IW) and Therapeutic Care Centre of the Civil Hospital in Williamnagar, East Garo Hills, Meghalaya.

About Corona Care Centre

Corona Care Centre (CCC) is designated for admitting both confirmed and the suspected cases. These facilities must have separate areas for suspected and confirmed cases with preferably separate entry and exit. Suspect and confirmed cases must not be allowed to mix under any circumstances. The isolation ward will be assigned for such cases.

The CCC shall offer care only for those that have been clinically assigned as mild or very mild cases or COVID-19 suspect cases. Patients will be hospitalized and kept in the Isolation Ward in a designated facility till such time they are tested negative.

Impact

A 4 kW system in the CCC and a 3 kW system in the Isolation Ward and Therapeutic Care Centre are powering all the critical loads for the Health Centre including luminaries, mobile charging, computers, internet facility, refrigerator, deep freezer and medical equipment like oxygen concentrator, needle destroyer, semi-auto analyser and suction apparatus to provide the basic care in the Isolation Ward.

The CCC has 40 beds and the Isolation Ward and the Therapeutic Care Centre have 26 beds. The CCC has already taken in patients for quarantine.

Storing medicines has become easy now. The health workers are able to do uninterrupted (24x7) rapid testing without any glitch during this pandemic.

Health workers can access improved quality of power supply to treat their patients without depending on grid based electricity.

Case Study 21: Solar-powered COVID Walk-in Sample Collection Kiosk (WISK) – Envo Renewable Energy Services

Problem statement

The protection of health workers is a big concern worldwide while dealing with COVID-19 patients. The Walk in Sample collection Kiosk (WISK) is an easy method for collecting swab samples. Suspected patients have to walk into the COVID (WISK) and a nasal or oral swab is taken by health care professionals from outside through built-in gloves. The Kiosk is automatically disinfected without the need of human involvement, making the process free of infection spread. The Kiosk has a light unit, gloves, exhaust fan, and sanitizer machine. The shielding screen of Kiosk cabin protects the health-care worker from the aerosols and droplet transmission while taking the sample. This reduces the requirement of INR 1000 plus worth personnel protection equipment (PPE) that has to be changed by health workers after each sample collection.

Powering WISK was one of the major problems due to frequent power cuts during the time of sample collection from people with symptoms of COVID-19.

The intervention

Assam Innovation and Research Centre, along with Envo Renewable Energy Services Private Ltd. has designed and developed three numbers of WISK, which are powered by

solar energy. In this version, the kiosks are equipped with 150 W solar panels with 100 Ah batteries for autonomous power generation providing easily accessible services. SELCO Foundation, in partnership with Sauramandala Foundation, supported Envo Renewable Energy Service Private Ltd. (ERES) and Assam Innovation and Research Centre in theimplementation of the solution with the local districts of Meghalaya. As a pilot project three kiosks were given to the Health and Family Welfare Department, Government of Meghalaya, to use it as a sample collection kiosk.

Impact

The solar PV system in COVID WISK is powering the loads, including a light, fan, and sanitizer machine. The energy access will be available 24x7 in WISK to collect samples from COVID-19 patients.

Case Study 22: Solarizing the COVID-19 Testing Van – SELCO

Problem statement

The health indicators in rural parts of India are far worse than the health indicators of general population. Most tribal people live in remote rural hamlets in hilly, forested areas where illiteracy, trying physical environments, malnutrition, inadequate access to potable water, and lack of personal hygiene and proper sanitation make them more vulnerable to diseases like COVID-19. Many of the migrant labourers have returned to their villages from cities carrying COVID-19 symptoms. Inaccessibility to the testing facility for COVID-19 suspected patients located in remote places is a major issue.

When an individual cannot access the testing facility in a city due to lockdown, a mobile testing centre which reaches to their village solves the problem at a great extent. The district administration of Udupi, Karnataka, has started the initiative of mobile testing vans for conducting random tests. The Mobile COVID-19 Swab Collection vans have two people at every given point with some more people joining in at panchayats. As the disease is contagious, the staff are completely sealed inside the vehicle and cannot roll down their windows for ventilation. With the summer season at its peak (temperatures reaching 40 °C), this task was difficult for the health staff working in the van with it being parked under **sunlight for hours.**

The intervention

- The health department approached SELCO through Bharatiya Vikas Trust (BVT), to solar power the loads in the vehicle. The request was raised 10 days prior to the installation and with agreements and financing worked out.

- Two fans, one light (75 W module), a mobile charging unit, a 30 Ah battery and one 10 Amp charge regulator were installed in the van for operation till noon.

- This intervention was followed by powering of two more testing vans, border police check posts, and primary health centres in the district.
- Post COVID-19, the vans will be used for other purposes as they belong to the health department and the solar system will be moved to a sub-entre or a Primary Health Centre.

Impact

- Increased comfort and well-being for the frontline workers as they were working with no ventilation before the installation of the solar energy system.
- The health workers were able to test a minimum of 100 people comfortably in the targeted regions.

04

4. POLICY

Over the past few years, government policies and programmes such as the Saubhagya and Ujjwala have contributed to considerable development in the energy scenario of the country. This has also prompted DRE enterprises to move towards newer markets. More number of organizations working in the sector are moving towards supplementing rural livelihoods with productive applications.

This section captures the perception of CLEAN members towards central and state government initiatives, areas of growth and opportunities in the sector, and requirement of member enterprises at the policy level.

The section also presents an analysis of benchmark costs and priority sector lending over the past few years and highlights the policy-level initiatives taken in response to combat the COVID-19 crisis.

4.1 Updates on Government Schemes/Programmes

4.1.1. Updates on MNRE schemes/programmes

- **Draft Policy Framework for Developing and Promoting DRE Livelihood Applications in Rural Areas:** In October 2020, the Ministry of New and RenewableEnergy proposed a draft policy framework aimed at promoting DRE enabled livelihood applications in rural areas. Given the availability of a plethora of innovative, energy efficient and economically viable DRE enabled livelihood applications, the policy aims to scale deployment of these applications. Further, the policy aims to bring together Ministriewhich are already implementing programs supporting rural livelihoods directly or indirectly. Integration with these schemes will help in scaling deployment of the applications.
- Off-grid Solar PV Applications Programme Phase III has been extended up to 31 March 2021.
- Decentralized Solar Thermal Applications Programme has been discontinued from March 2020.
- Programme on Energy from Urban, Industrial, and Agricultural Wastes/Residues is extended up to 31 March 2021 or till the date recommendation of 15th Finance Commission comes into effect.
- Atal Jyoti Yojana Phase II has been put on hold for 2 years, i.e. for 2020/21 and 2021/22 with effect from 1 April 2020.
- Scheme to support the promotion of biomass-based cogeneration in sugar mills and other industries has been discontinued from March 2020.
- Biogas Power (off-grid) Generation and Thermal Applications Programme is extended up to 31 March 2021 or till the date recommendation of 15th Finance Commission comes into effect.
- New National Biogas and Organic Manure Programme is continuing for the year 2020/21.

4.1.2. Other updates

4.1.2.1. Garib Kalyan Rojgar Abhiyan

- INR 50,000 crore has been allocated for building durable rural infrastructure under the Garib Kalyan Rojgar Abhiyan. The Abhiyan will be a convergent effort between 12 different ministries/departments, including MNRE. 25 works and activities are to be targeted. These include construction of panchayat and Anganwadi centres, solid waste management, rural housing, etc.
- PM KUSUM will also come under this scheme. The scheme covers grid-connected RE power plants (0.5–2 MW)/solar water pumps/grid-connected agriculture pumps
- Districts of Bihar, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, and Uttar Pradesh will come under this scheme.

4.1.2.2. Agri-infrastructure Fund

- The central government has set up an INR 1 lakh crore Agri-infrastructure Fund (AIF) to provide financial support to agri-entrepreneurs, start-ups, agri-tech players, and farmer groups for infrastructure and logistics facilities. With this farmers can avail concessional financing under AIF for Com-B and Com-C of PM-KUSUM.
- DRE enterprises working in the agriculture sector may be able to use this fund to set up cold-storage, warehouses, and agro-processing units.
- Agriculture Infrastructure fund can be availed by an individual farmer, group of farmers, water-based organisation by registering over an online portal[7] under the Department of Agriculture, Cooperation & Farmers Welfare.

4.1.2.3. Anti-COVID Fund under Atma Nirbhar Bharat Abhiyan

INR 15,000 crore has been allocated for setting up anti-COVID health facilities and medical infrastructure. DRE enterprises working in health care may be able to make use of this fund, especially those working in areas with no or unreliable access to the grid.

4.1.2.4. Reserve Bank of India's Capital Support

- The RBI announced capital support for National Housing Bank (NHB), National Bank for Agriculture and Rural Development (NABARD), and Small Industries Development Bank of India (SIDBI). The total budget of INR 50,000 crore will be granted from which INR 25,000 crore will go to NABARD and INR 15,000 to SIDBI for providing refinancing to banks for SME loans.
- This can infuse liquidity in the market, which helps these institutions to give loans to DRE enterprises.

7- http://agriinfra.dac.gov.in/

4.2. Overview of Government Program-s

Through this year's survey, CLEAN aims to analyse the perspective of CLEAN member enterprises on central and state government programmes relevant for the sector. Further, it also aims to highlight the participation levels of these enterprises in such programs.

4.2.1. Central Government Programs

Central government programmes play a major role in providing growth and direction to the sector. These programmes also have an impact on the business and the larger industry. This section highlights the perception of CLEAN member enterprises towards Central Government programmes.

- Around 57% CLEAN member enterprises have reported that they did not feel any sort of an impact being created by the policy initiatives undertaken by the central government.
- Out of the 19% member enterprises, which reported a positive impact, some also reported that this was due to their participation in central government programmes. These enterprises reported that they have taken part in central government schemes such as the Off-grid Phase III, Saubhagya, and Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY).
- Some member enterprises reported an indirect positive impact from recognition and certification given by the GoI. This recognition helped them in successfully raising capital.

A break-up of the sub-sectors can be seen in Figure 44.

- A comparatively larger number (24%) of CLEAN member enterprises reported a negative impact on their business due to central government schemes/programmes.
- From CLEAN's conversations with enterprises over the last year, this could be due to shortcomings in the programme design, which leave a majority of DRE sector enterprises unable to participate in these schemes/programmes.

A breakup of the sub-sectors can be seen in Figure 45.

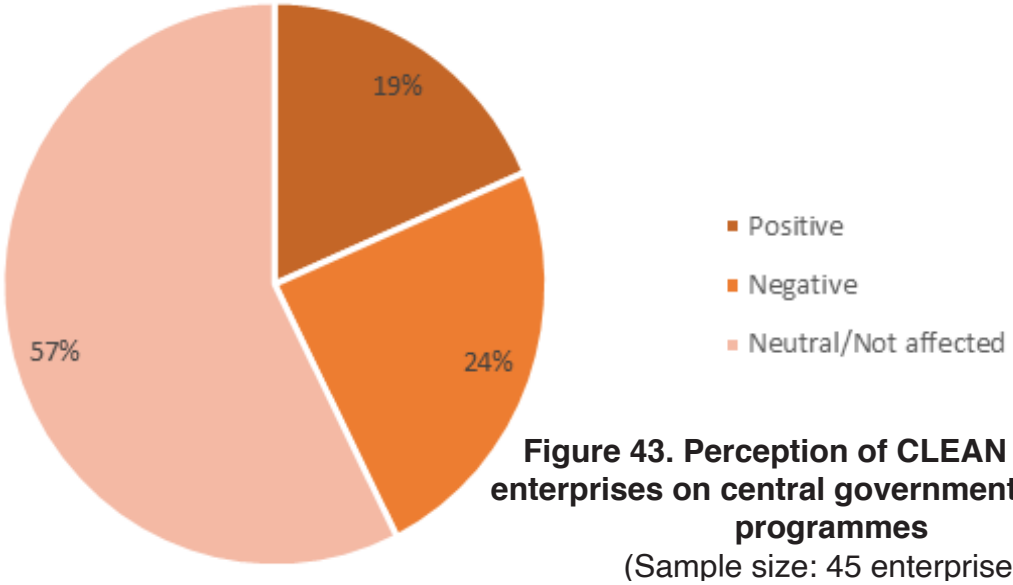


Figure 43. Perception of CLEAN member enterprises on central government schemes/ programmes
(Sample size: 45 enterprises)

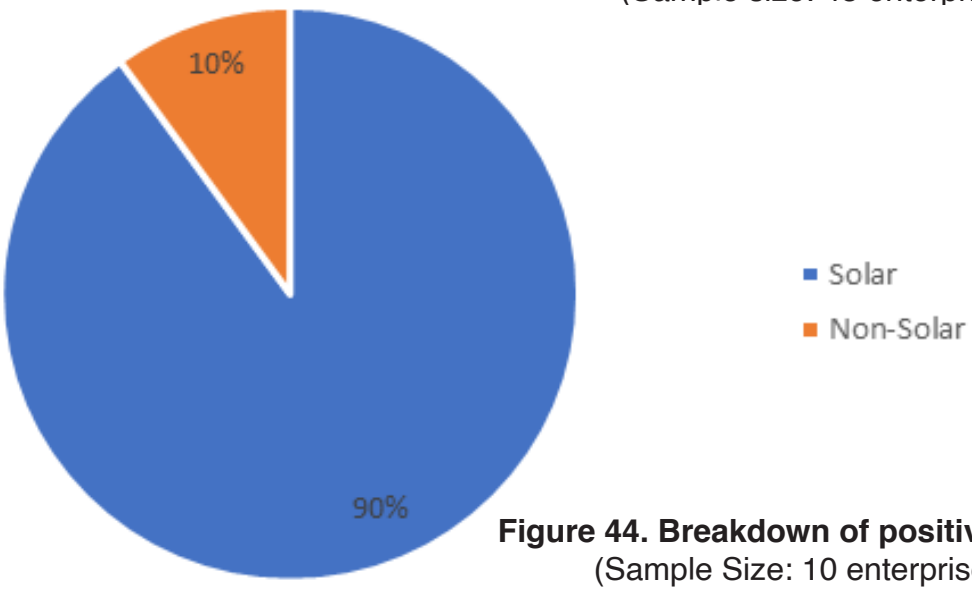


Figure 44. Breakdown of positive impact
(Sample Size: 10 enterprises)

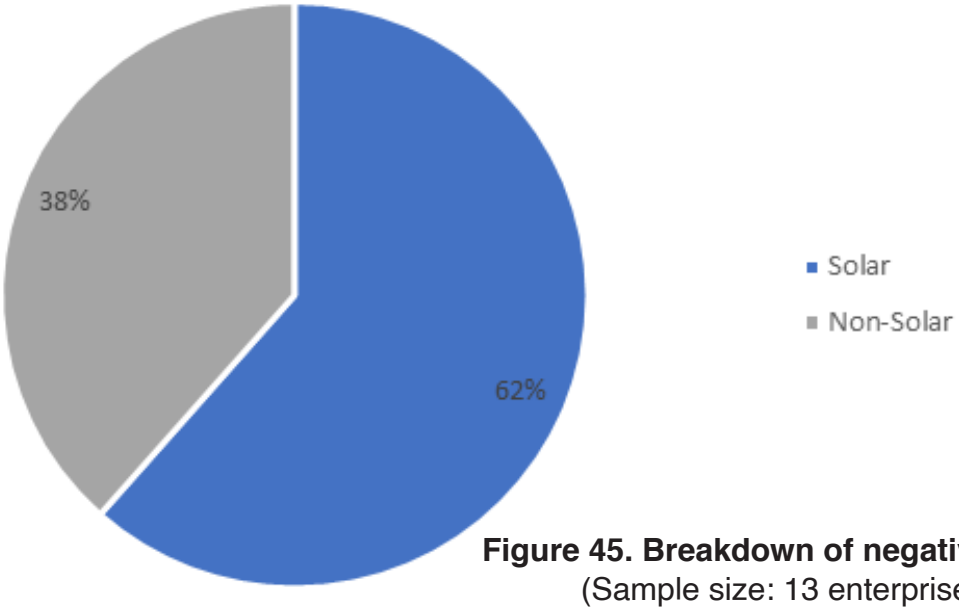


Figure 45. Breakdown of negative impact
(Sample size: 13 enterprises)

4.2.2. State Government Programmes

- CLEAN member enterprises responded similarly towards the initiatives taken by the State government. 65% CLEAN member enterprises reported that they felt no effect of the state-led initiatives. There have been a limited amount of state-level schemes/ programmes designed for the sector over the last few years.
- 20% of member enterprises reported that they felt a direct or indirect positive impact from state government initiatives. These enterprises highlighted the role of state nodal agencies (SNAs) in enabling a positive impact on their businesses. Figure 47 showcases the break-up of sub-sectors reporting a positive impact.
- Member enterprises particularly highlighted the role played by MEDA, UPNEDA, OREDA, RRECL, and Panchayat and Rural Development Department, Assam.
- There is also scope for larger involvement of state-level departments from health-care, education, livelihood missions, etc. Given the overlapping nature of some of the challenges faced at the grassroots level, inter-departmental collaboration will go a long way in tackling them effectively.
- They can help in carrying out awareness campaigns to orient end-consumers to DRE applications and induce demand creation and adoption, skill development and training of human resource, identification of target beneficiaries, etc.
- While the SNAs work at the state level, they are largely guided by the schemes/ programmes of the central government. This points to the need for greater involvement of state governments in the DRE sector. This would align well with the recent direction the GoI has been taking in policy frameworks, e.g., the Atma Nirbhar Bharat Abhiyan and Make in India initiative.
- A comparatively smaller percentage (15%) of CLEAN member enterprises have expressed dissatisfaction with state government initiatives. Figure 48 shows a break-up of the sub-sectors showcasing the negative impact.

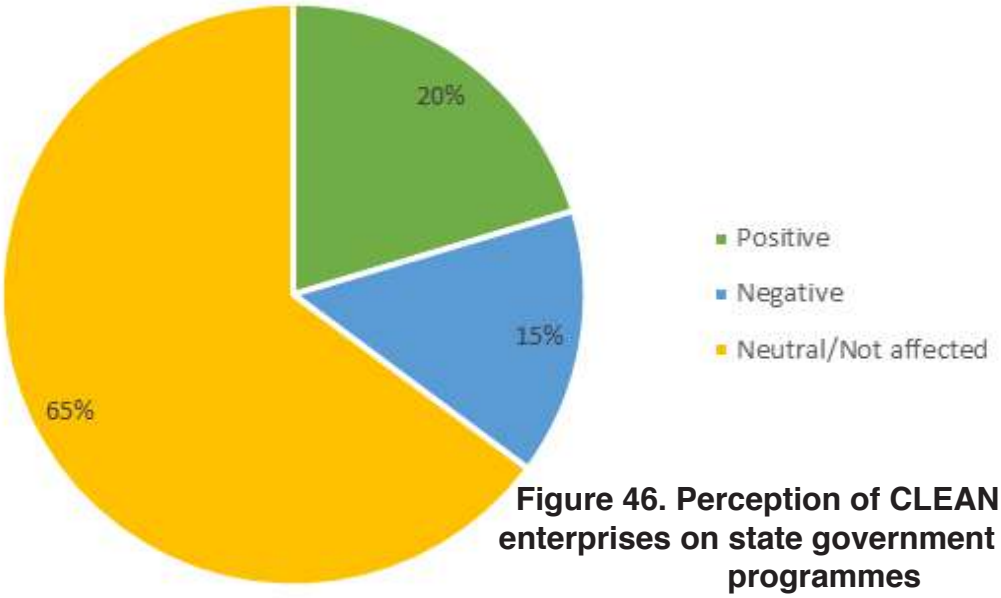


Figure 46. Perception of CLEAN member enterprises on state government schemes/ programmes
(Sample Size: 45 enterprises)

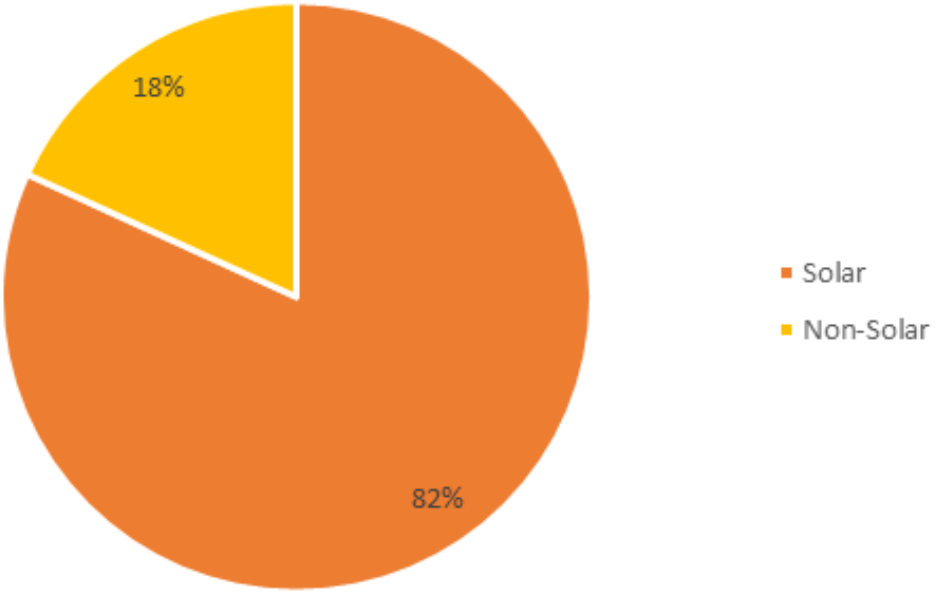


Figure 47. Breakdown of positive impact
(Sample Size: 11 enterprises)

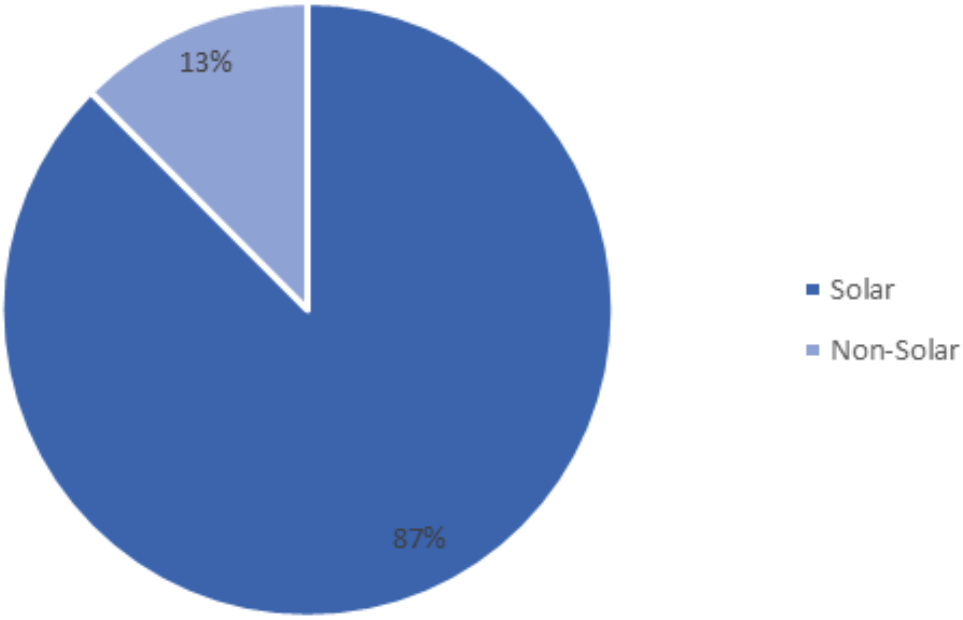


Figure 48. Breakdown of negative impact
(Sample Size: 8 enterprises)

4.3. Overall Perception of DRE Policy Frameworks

- In terms of the overall outlook towards the policy framework of the DRE sector, the majority, 36% of CLEAN member enterprises, have remained neutral/un-impacted by policy frameworks.
- This was followed closely by 24% of member enterprises reporting satisfaction with the existing policy frameworks developed for the DRE sector.
- While the total budgetary allocation by MNRE for DRE energy access has increased by 100% from 2019/20 to 2020/21,[8] this has largely been for solar-based applications.
- CLEAN strongly believes that there is a wide scope for bioenergy, wind, pico hydro, and other hybrid technologies. Framing policies in the future around these subsectors will help in achieving the social, economic, and environmental goals of the country.

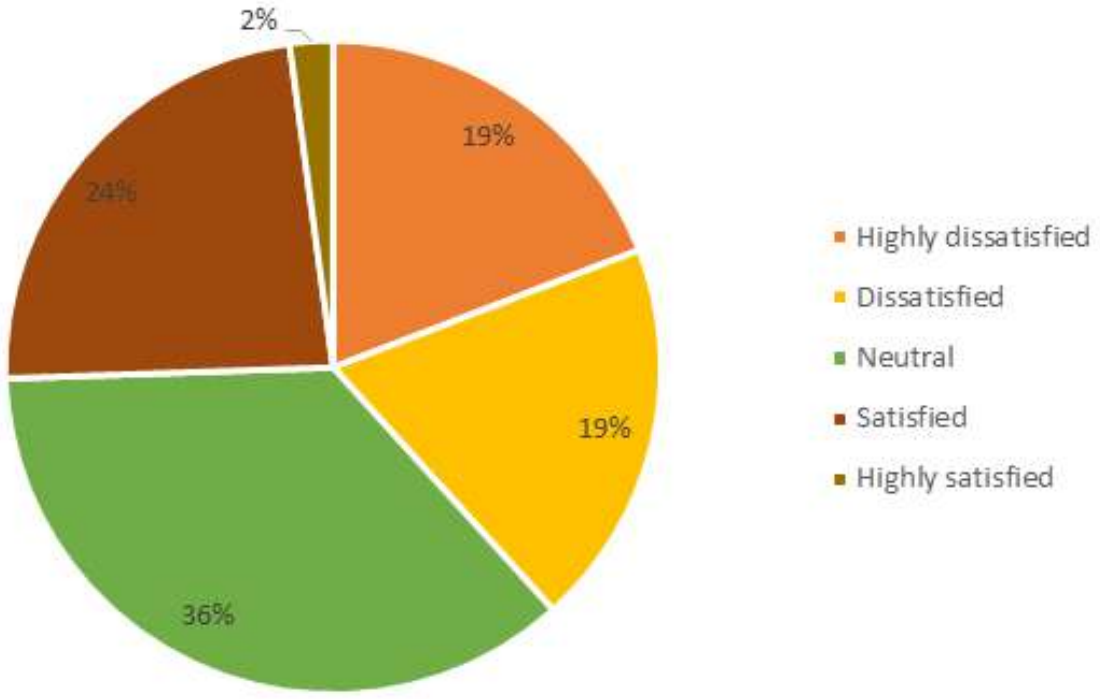


Figure 49. Overall perception of policy frameworks
(Sample size: 47 enterprises)

8- http://shaktifoundation.in/wp-content/uploads/2020/08/DRE-Annual-Compendium.pdf

4.4. Framing Future DRE Policies

- In terms of applying suitable financial instruments/incentives for DRE policy frameworks, 31% of CLEAN member enterprises have highlighted the need for provision of longer tenure loans for DRE products.
- 29% of member enterprises have expressed that capital subsidies on DRE products are a suitable incentive for policy frameworks. These come largely for products, which have high capital cost and a target consumer base in rural and under-served areas.
- CLEAN member enterprises have time and again pointed out that there are a number of sub-sectors under the DRE umbrella. Hence, a one-size-fits- all financial mechanism is not necessarily suitable for the sector as different sub-sectors have requirements of their own.
- For example, while both solar-based cookstoves and improved biomass cookstoves fall under the clean cookstoves category, the high capital cost of solar-based cookstoves requires capital subsidies whereas the low capital cost of improved biomass cookstoves can do away with capital subsidies to increase ownership in end consumers.
- Thus, different sub-sectors have different financial/incentive requirements, which need to be kept in mind while framing successful programmes.
- Member enterprises have highlighted that capital subsidies provide direct financial relief for ongoing projects. Given that many of these enterprises fall under the MSME category, raising capital can be challenging as it is useful. Subsidies help in positive cashflow and are beneficial for end-users as well.
- Enterprises also mentioned how longer tenure loans will help in rotation of money resources in many projects. Considering the sector's social, environmental, and economic impact, lower interest rates will be a boon.

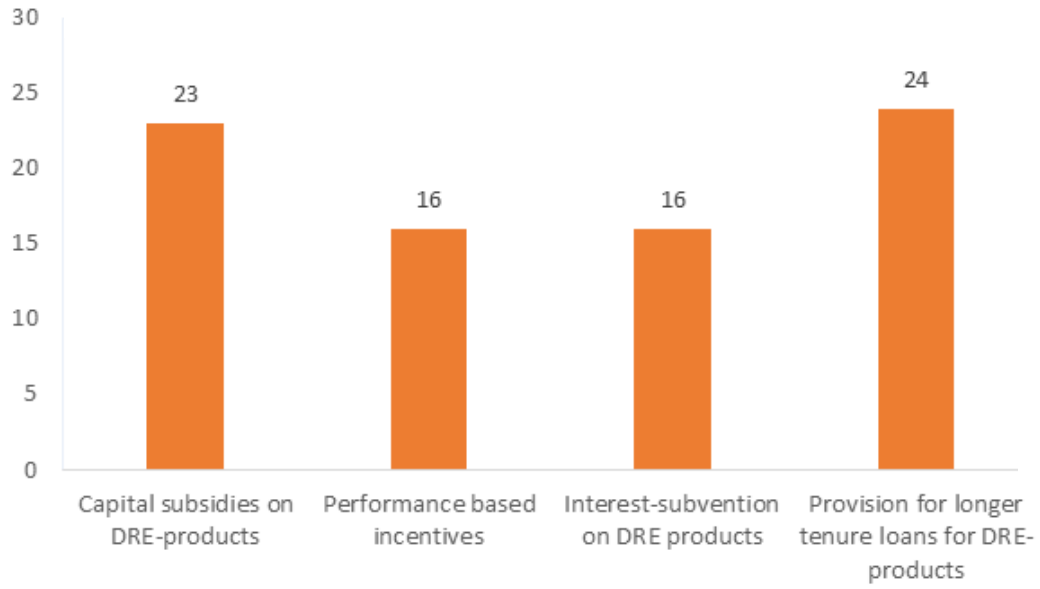


Figure 50. Suitable financial instruments/incentives for DRE policy frameworks
(Sample Size:43 enterprises)

4.5. Potential Areas for Budgetary Allocations in the Future

- Given the current national context, CLEAN member enterprises foresee maximum opportunities and potential in rural development, specifically in rural development, health care, and agriculture. Other important areas of growth include education, food processing, and textiles.
- These come from areas that face hindered development and livelihood generation challenges due to unavailability of reliable power at the last mile.
- Many of these are areas, which were highlighted in the State of the DRE Sector Report 2018/19. This could mean that while there is large potential for opportunities here, not much has been done to leverage this potential in the past one year.
- While the various government stakeholders are largely in consensus regarding this potential, concrete steps towards using this are yet to be made.

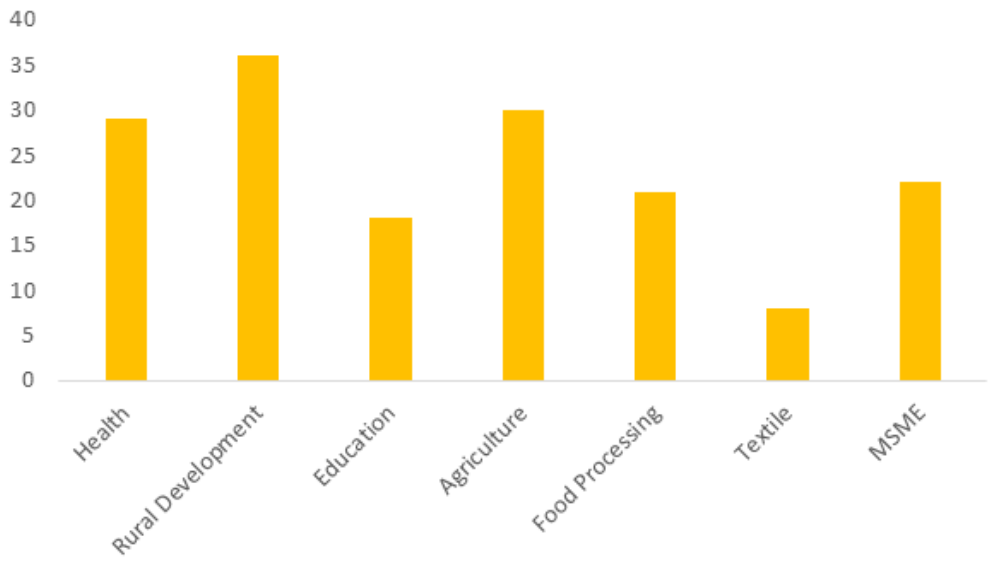
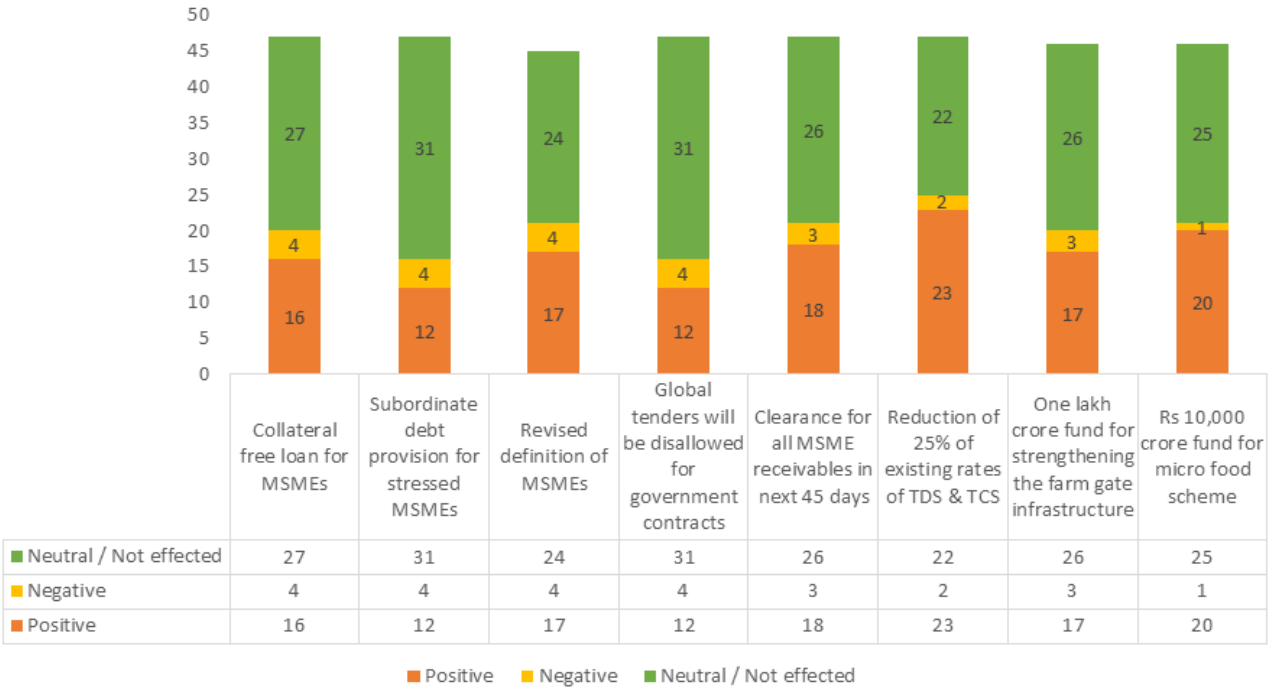


Figure 51. Potential areas of growth
(Sample size: 44 enterprises)

4.6. Impact of Initiatives Taken in Response to COVID-19 Crisis

- In April 2020, CLEAN conducted a survey with its members to understand how the outbreak of COVID-19 has impacted the Indian DRE sector and what the key challenges the enterprises are facing.[9]
- The national lockdown had an impact on various areas of business. Enterprises had reported a huge lack in availability of non-capitalized assets. As enterprises struggled to deliver on existing sales and generate new ones, a significant drop was experienced in terms of demand from customers. Moreover, defaults in payments by customers/clients had been reported by enterprises.

9-https://energy.economictimes.indiatimes.com/news/renewable/COVID-19-disruption-in-dre-supply-chain-will-impact-several-development-outcomes/75383088



	Collateral free loan for MSMEs	Subordinate debt provision for stressed MSMEs	Revised definition of MSMEs	Global tenders will be disallowed for government contracts	Clearance for all MSME receivables in next 45 days	Reduction of 25% of existing rates of TDS & TCS	One lakh crore fund for strengthening the farm gate infrastructure	Rs 10,000 crore fund for micro food scheme
Neutral / Not effected	27	31	24	31	26	22	26	25
Negative	4	4	4	4	3	2	3	1
Positive	16	12	17	12	18	23	17	20

Figure 52. Perception of COVID-19 related policy frameworks
(Sample size: 45 enterprises)

- Enterprises have experienced a decrease in their workforce and are concerned about the safety of their employees if they have to continue their services during the health emergency. Enterprises have also reported stalling in hiring and training activities.
- While the central government has not announced specific packages for providing relief to the DRE enterprises, there are many packages in the Atma Nirbhar Bharat Abhiyan, which can be used by DRE enterprises.
- The most widely appreciated step was the reduction of 25% of existing rates of Tax Deducted at Source (TDS) and Tax Collection at Sources (TCS) till 31 March 2021. 48% respondents expressed that this was a positive step taken by the central government.
- While the packages are great initiatives taken by the central government, CLEAN member enterprises are uncertain to what extent they will be able to participate in these programs.
- All of this seems to point towards the need for more specific policy measures, which accommodate the needs of a larger number of enterprises. This will go a long way in ensuring that these enterprises have a fair chance to participate in the programmes being developed by the government.

4.7. Benchmark Costs

The Ministry of New and Renewable Energy has been issuing benchmark costs for off-grid applications over the past few years. This section highlights the key trends from the sector identified from the notifications from 2018 to 2020.

4.7.1. Solar pumps

- The present analysis focuses on the compared cost of these pumps for the past three years. A decreasing trend has been noticed in the benchmark cost of solar pumps.
- In 2018, benchmark costs for solar pumps were defined only for 3 hp and 5 hp pump capacity.
- From 2019 onwards, solar pumps were divided into 0.5 hp, 1 hp, 2 hp, 3 hp, 5 hp, 7.5 hp, and 10 hp pump capacity.

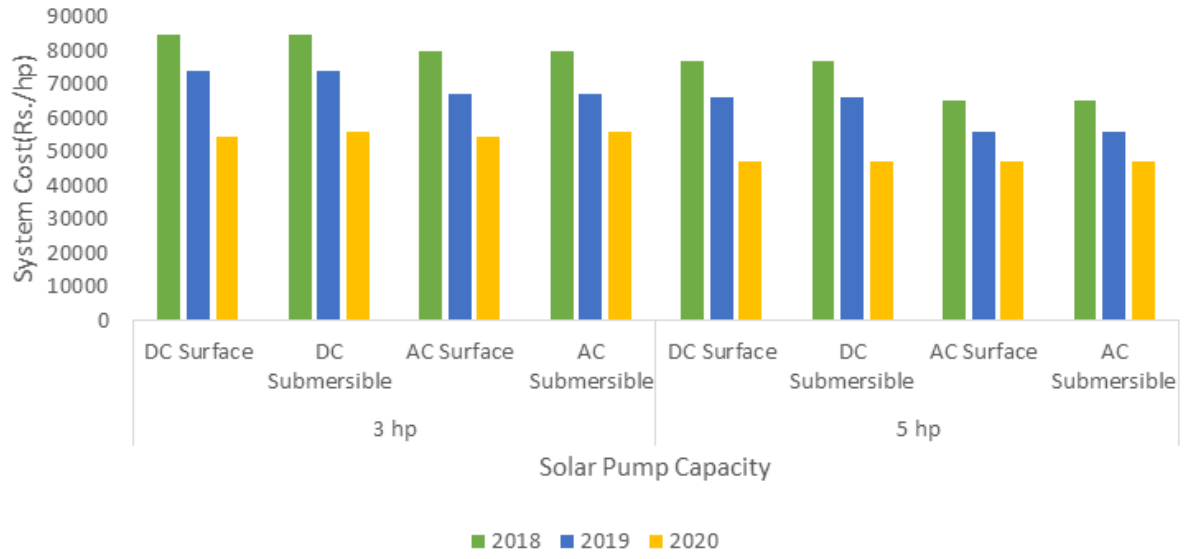


Figure 53. Solar pump benchmark cost analysis: 2018 to 2021

- From 2019 to 2020, there was no change in benchmark cost for 0.5 hp pump capacity and the cost for 0.5 hp pump is given as system cost not per hp cost.
- There is a dip in the benchmark costs of all pumps from 2018 to 2020.
- Maximum decrease in benchmark cost was for DC submersible solar pumps of capacity of 5 hp with decrease of 28% from 2019 to 2020.
- A comparison of AC pumps with DC pumps shows a further decrease in benchmark cost for DC pumps.
- Upon increasing the capacity of pumps, the benchmark cost decreases up to 5 hp after which an increase can be seen.

4.7.2. Stand-alone solar power plants/packs (up to 10 kW)

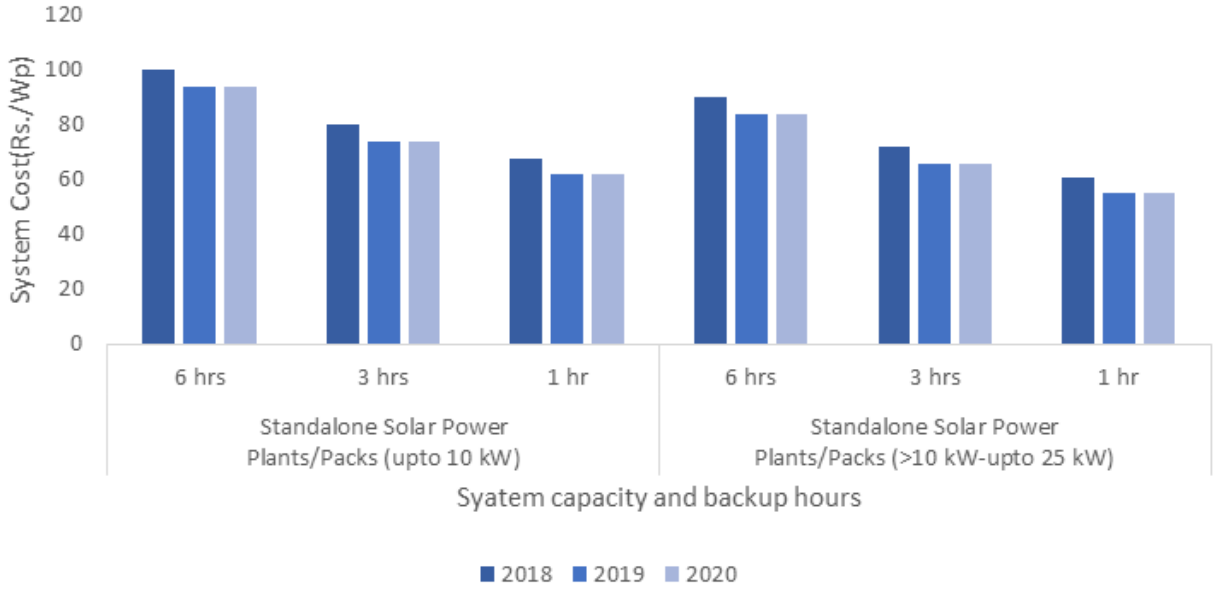


Figure 54. Solar power packs analysis: 2018 to 2020

- For DRE enterprises to continue making impact, there is a need for a balance in benchmark costs with checks at the product and implementation levels.
- There is also a need for innovation and scaling of products to reduce the overall cost without compromising the quality standards.
- Technical bids before price bid in government projects can be done to ensure good quality of products that are being used in projects. It will also prevent manufacturers from quoting lower price by compromising the quality standards.
- Setting up more manufacturing plants for solar cells and modules to make it viable for enterprises as the government is increasing import duty on these modules and cells.

4.7.3. Solar streetlights and lamps

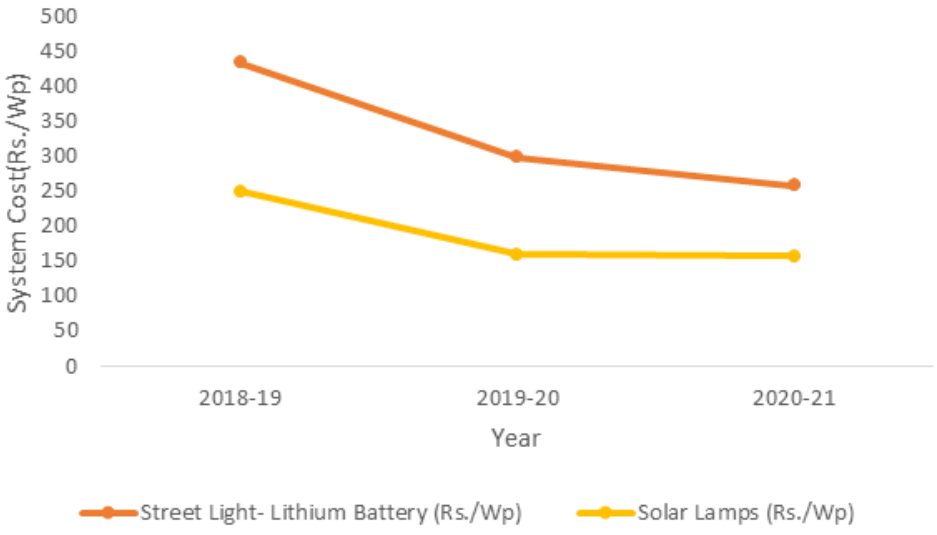


Figure 55. Benchmark cost of solar streetlights and solar lamps (General States): 2018 to 2021

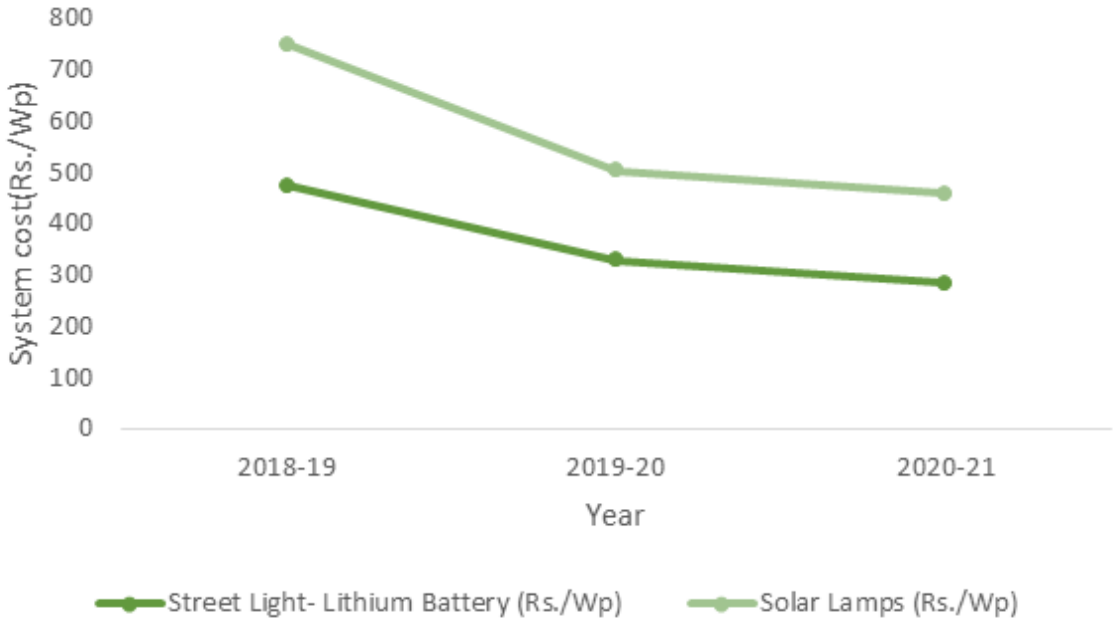


Figure 56. Benchmark cost of solar streetlights and solar lamps (NE/Hill States): 2018 to 2021

- Solar streetlights and lamps both show a decreasing trend from 2018 to 2020. There was a drastic decrease in benchmark cost for solar streetlights and solar lamps from 2018 to 2019 with values 31.26% and 36.0%, respectively.
- There is almost negligible change in benchmark costs for solar lamps from 2019 to 2020.

Note: The analysis was done only for general states, not for north-eastern states/Hill states/ Islands/UTs. The north-eastern states/Hill states/Islands/UTs show the same trend with slightly higher benchmark costs for the system. The table containing prices is shown in Annexure III.

CLEAN member enterprises have mentioned the following challenges arising due to decreasing benchmark costs.

- The prices quoted by industry peers in large government tenders are used for small projects, which misleads the actual cost of these systems.
- Lower benchmark costs lead to decreased profit margins for enterprises who have to cut back on costs, to keep up with competitive prices, without compromising on quality.
- Further, decreasing prices lead to cost-cutting measures, which may lead to inferior quality products. This negatively impacts the perception of end consumers, financiers, and other important stakeholders towards applications they might not be well acquainted with in the first place.
- An indirect impact can be foreseen in terms of enterprises being forced to switch industries in search of better profits.

- Some enterprises and system integrators have tried to scale the sales of their products and increase energy efficiency in order to reduce total costs. This, however, is hard to achieve.

Recommendations

- For DRE enterprises to continue making impact, there is a need for a balance in benchmark costs with checks at the product and implementation levels.
- There is also a need for innovation and scaling of products to reduce the overall cost without compromising the quality standards.
- Technical bids before price bid in government projects can be done to ensure good quality of products that are being used in projects. It will also prevent manufacturers from quoting lower price by compromising the quality standards.
- Setting up more manufacturing plants for solar cells and modules to make it viable for enterprises as the government is increasing import duty on these modules and cells.

Table 4. Example of solar streetlight cost: 2019/20

Component	Cost
Solar panel (75 W)	INR 1900
LED Luminaire with mppt charge controller (12 W)	INR 1500
Pole structure	INR 3500 (approx. on actual specs)
Civil work and installation	INR 1000/system (approx.)
Total basic cost: INR 11,700 + GST and additional transport costs	
Benchmark cost: INR 19,400 (all inclusive; including transport costs, taxes, and 5-year maintenance warranty)	

05

5. EMPLOYMENT AND SKILLS

This edition of the State of the DRE Sector Report has highlighted many areas where DRE technologies play a significant role in supporting and creating livelihood opportunities. This section of the report focuses on employment, skills, and training activities of DRE enterprises over the past year.

5.1. Employment Generated by CLEAN Member Enterprises

The CEEW Powering Jobs census 2019 predicted that there will be a two-fold increase in the jobs in the direct formal DRE sector from 2017/18 to 2022/23. They have estimated 190,000 direct formal jobs in 2022/33 from 95,000 direct formal jobs in 2017/18. This shows that there will be a yearly increment of 14.86% in direct formal jobs.[10]

These estimates were published prior to the COVID-19 crisis and might have been impacted by the same. The following sections present insights on employment, skills, and training from the DRE sector. Further, the impact of COVID-19 is also highlighted. According to CLEAN's survey of over 60 DRE enterprises, 71% of DRE enterprises reported that they would be unable to sustain themselves beyond 2–4 months. Only 5% of enterprises said that they would be able to sustain beyond 18 months due to disruption in the DRE supply chain.

- Figure 57 highlights the employment being generated by CLEAN member enterprises. The 42 enterprises, which participated in the survey, reported a total of 1429 employees. In comparison to the previous year, 42 enterprises had reported a total of 6910 employees.[11] This shows a severe decline in employment over the past one year, which can largely be attributed to the COVID-19 crisis.
- Out of this, 70.8% constitutes full-time employees. A majority, i.e., 79.6% of these are male employees. Female employees constitute only 20.3% of the total.
- Commission-based employment is an area where the female employees eclipse male employees. Women constitute 55.6% of the total commission-based employees. Similar to the State of the DRE Sector 2019 report, full-time employees form the major chunk of employment generated by the sector. Commission-based and contract-based employees form only 15% and 9%, respectively, of the total employment being generated.
- Female employees form 20.3% of the total number of employees. Out of the 42 respondents, an average of 24.75 enterprises have women working in their organization.

10- "Powering Jobs Census 2019: Focus on India | CEEW." https://www.ceew.in/publications/powering-jobs-census-2019-focus-india. Accessed on 9 September 2020.

11- "State of the Decentralized Renewable Energy Sector in India 2019 | CLEAN" https://shaktifoundation.in/wp-content/uploads/2019/09/State-of-DRE-Sector-2018-19-1.pdf. Accessed on 9 September 2020

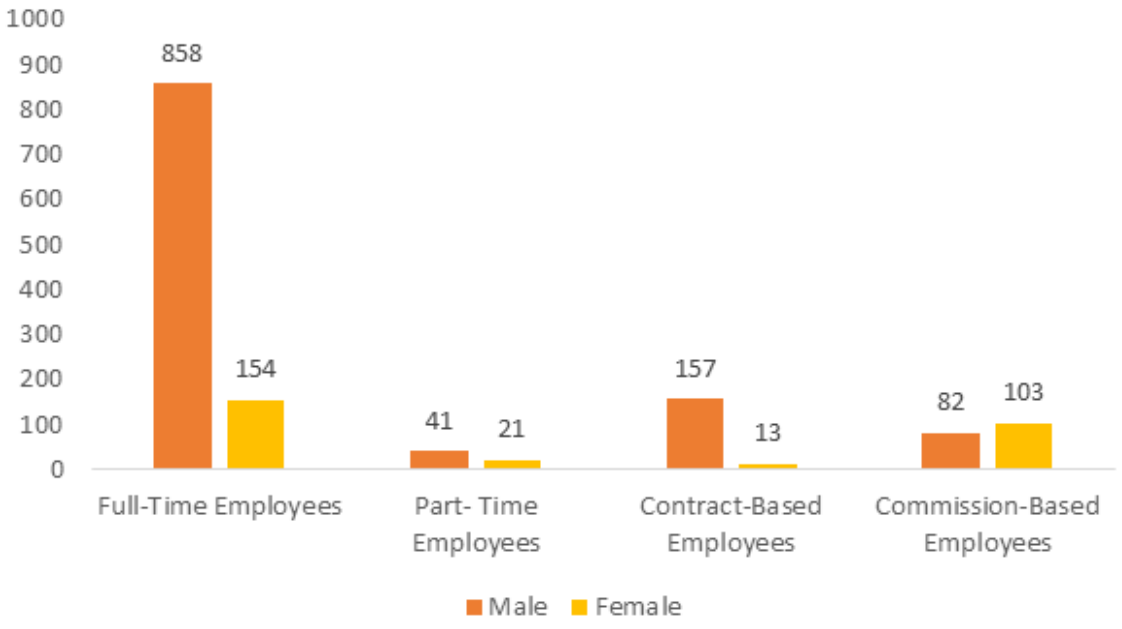


Figure 57. Employment generated by CLEAN enterprises
(Sample Size:42 enterprises)

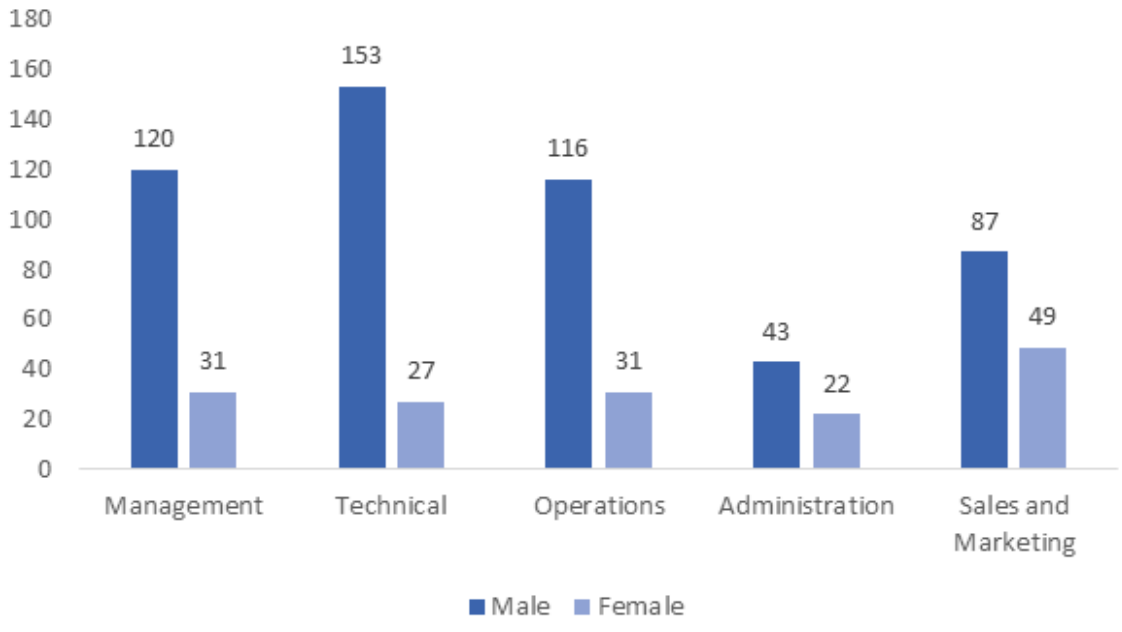


Figure 58. Break-up of employees across departments
(Sample Size:39 enterprises)

5.2. Operations and Maintenance and After-sales Human Resources

Operations and maintenance (O&M) and after-sales services play an important role in the adoption and acceptability of DRE applications among end consumers. Further, they also contribute to employment in the sector.

Given the comparative unfamiliarity of end consumers to DRE applications, they prefer purchasing products that come with installation and after-sales services. Figure 59 shows how CLEAN member enterprises address O&M and after-sales requirements.

43% (product based) and 33% (service based) of enterprises reported that they use only in-house technicians for handling installations.

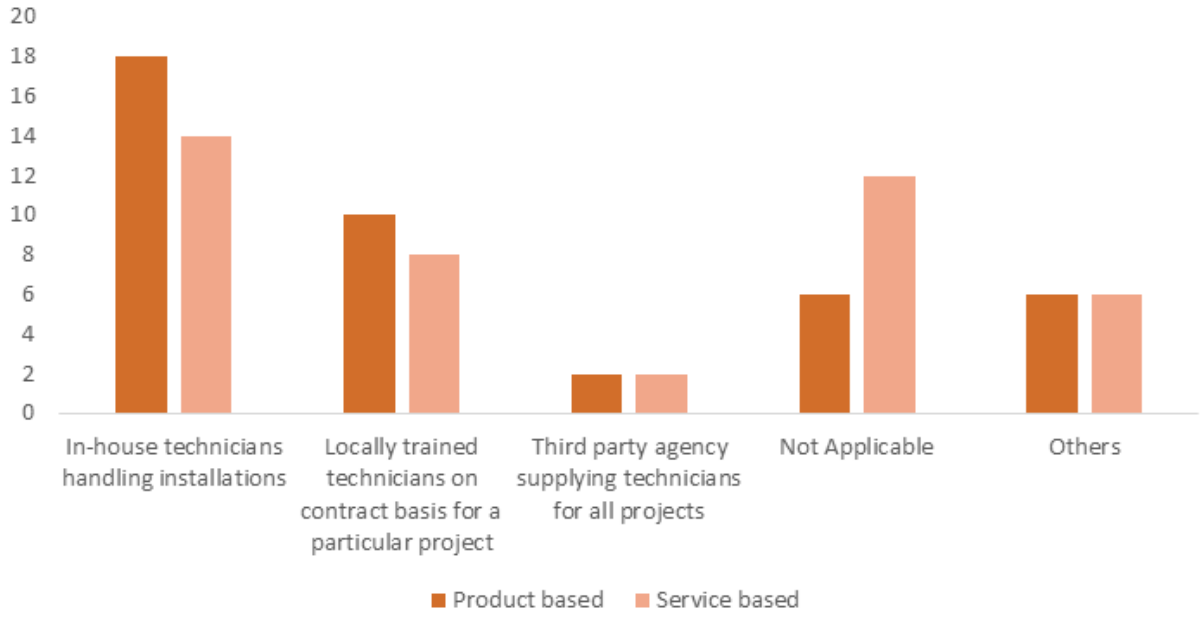


Figure 59. Addressal of O&M and after-sales services
(Sample Size:42 enterprises)

5.2.1. Areas with capacity building requirements

Many of the DRE sector enterprises are still at an early stage of development and naturally have some capacity building requirements, which will help them in growing their businesses.

- Figure 60 highlights a ranking of common areas with capacity building requirements. It is seen that all of them have been highlighted as equally important.
- 41.8% of enterprises reported a requirement for capacity building regarding geographical factors, which could directly or indirectly be responsible for the failure of the system.
- Similarly, 45.2% of enterprises expressed a requirement for information about the market trends related to changing demand.

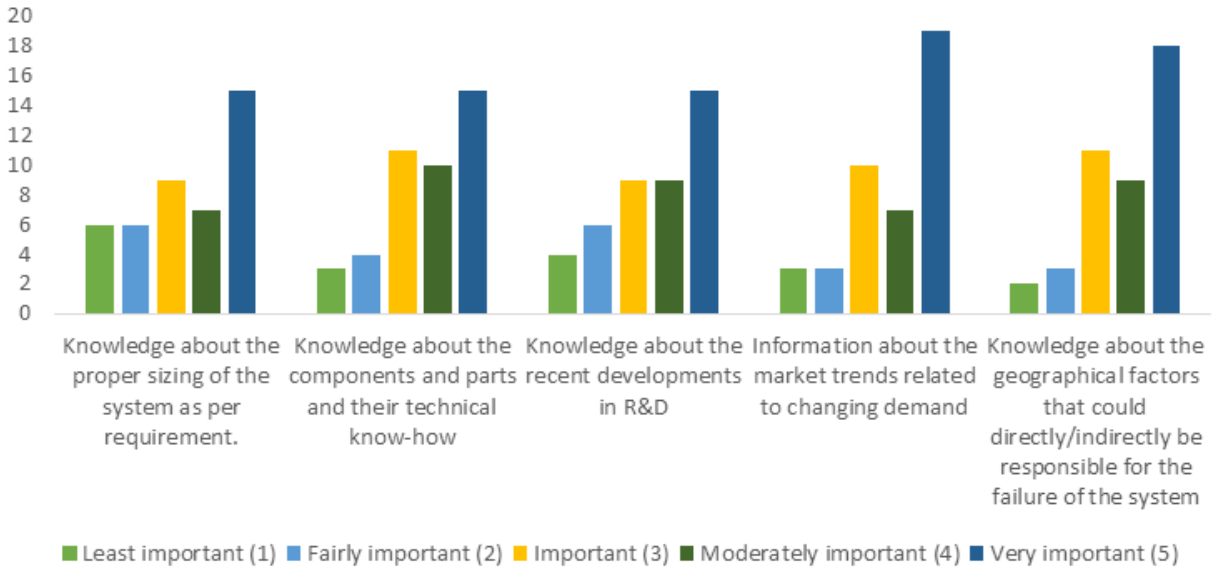


Figure 60. Areas with capacity building requirements
(Sample Size:44 enterprises)

Capacity building requirements for the development of the sector is being assessed regularly. With the transition towards productive and livelihood applications, it was important to understand the capacity building needs of the enterprises.

- Figure 61 highlights the areas with requirements for training mentioned by CLEAN member enterprises.
- 74% enterprises reported that they require sales and marketing related training. This was followed by 51.1% enterprises reporting that they require capacity building training in after-sales service/customer relationship management.

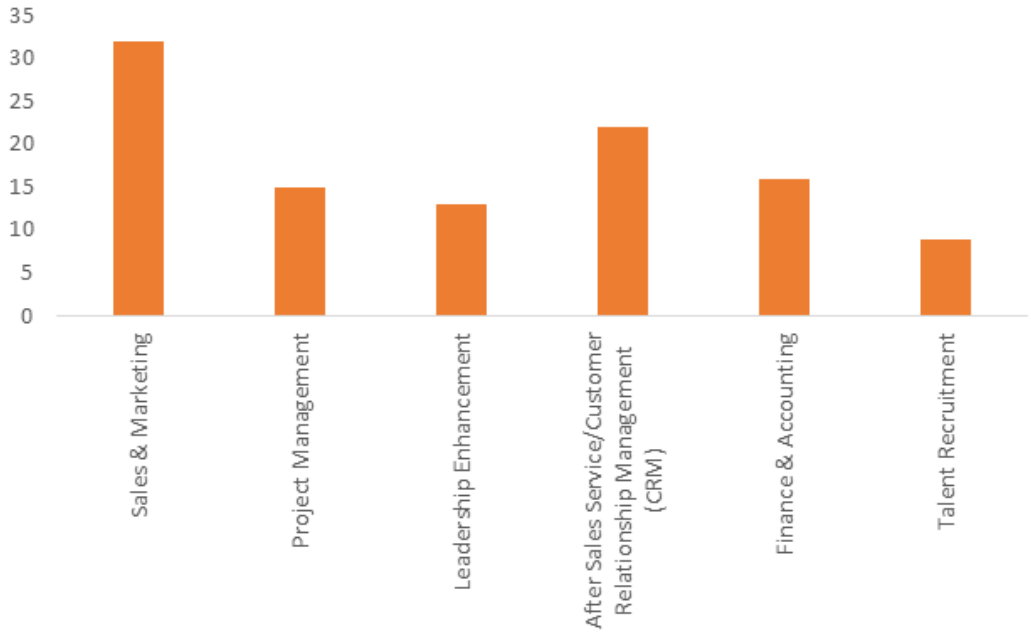


Figure 61. Training requirements of enterprises
(Sample Size:43 enterprises)

5.3. Boosting Employability at the Grassroots

- In order to increase the quality of human resources available at the grassroots level, NGOs and training institutions have highlighted skill-building activities across various segments.
- These vary for different sub-sectors. For improved cookstoves, skill gaps exist to a larger extent in market insights. For solar (PV and thermal), skill building for technical solutions was prioritized. For bioenergy (biomass and biogas), product information and technical solutions-related skill-building training were ranked higher.

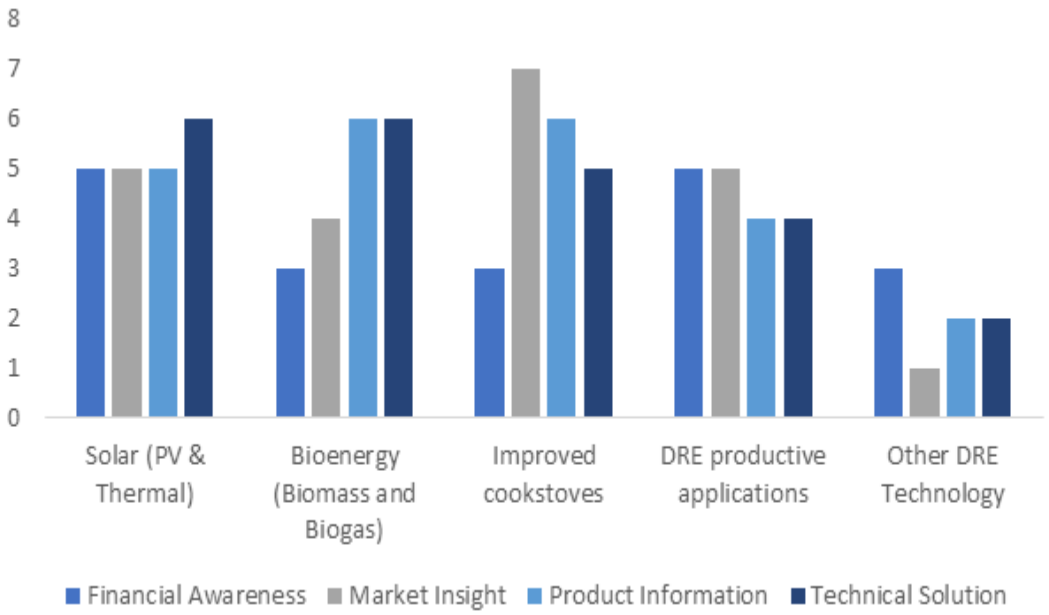


Figure 62. Training requirements across sub-sectors
(Sample Size:10 NGOs)

- Out of the 10 NGOs participated in the survey, five (50%) provide capacity building and training activities.
- Some of these training activities include training of rural enterprises for agro-waste processing, setting up manufacturing units, installation and maintenance of DRE applications, and Skill Council for Green Jobs training for a variety of programmes.

5.4. Impact of COVID-19 on HR-related Activities

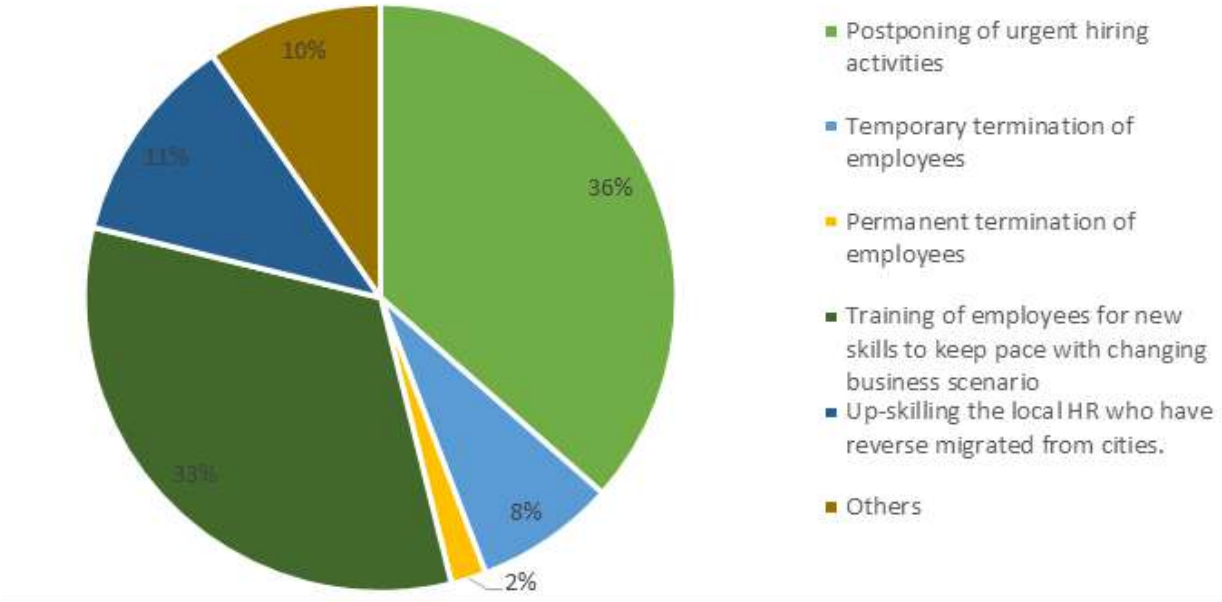


Figure 63. HR-related actions taken by enterprises due to COVID-19
(Sample size: 33 enterprises)

- Some of the enterprises mentioned that the business has not been much impacted; hence no such action needs to be taken. The affected enterprises reported that they are contemplating on taking cost-reduction measures.
- Around 57% of enterprises reported that they are postponing the hiring activity for cost reduction in their business. Very few enterprises have reportedly chosen to temporarily terminate its employees; some of the enterprises have decided to train their employees with the new skills to keep pace with the challenging business scenario.
- About 53% of enterprises chose skill development of current employees and 14% of enterprises decided to temporarily terminate their employees.

Case study 23: Technical training and awareness workshops on solar lighting and solar water heating appliances - SCALE

Problem statement

Huge potential for solar lighting exists not only in Uttarakhand and Uttar Pradesh but all over the country, specifically in the North-East Region, Rajasthan, Bihar, Maharashtra, and Odisha.

Market survey revealed that:

- Most of the solar lights were imported, and cheap components were used in those.The after sales-service for solar lighting appliances was almost non-existent.
- Lighting hours for many solar lighting appliances were generally three to four hours.
- Trained/skilled staff for the repairs of solar lighting systems were not available.
- No dealers/retail outlets in most of the rural and semi-urban areas.

The intervention

Based on this feedback, SCALE adopted a two-way working strategy:

1. They initiated training of local youths for manufacturing and support.
2. They developed solar lanterns, solar home lights, solar mobile charging stations, and solar streetlights, which can provide high luminescent light for considerable hours per single solar charging of the battery.

To create an avenue for income generation and for creating solar awareness, SCALE has set up Uttarayan Cooperative for Renewable Energy (UCRE) at Haldwani in Uttarakhand and Uttarayan Cooperative for Renewable Energy and Environment (UCREE) in Noida, Uttar Pradesh. Through these, they manufacture and sell their solar products that are indigenously designed and developed by them.

SCALE has also carried out over 40 capacity building programmes (full details here), which have played a big role in popularizing solar-energy-based products in remote villages in Kumaon region, which have no access to electricity.

The impact

One of the USPs has been the quality of SCALE-designed products and SCALE-trained manpower. Out of the installation base of 20,000 units, the failure rate has been just 3.5%–4.0%. In addition, the turnaround time for installation and after-sales service has been a mere 3 days. This has been an outstanding achievement considering the challenging terrain in Uttarakhand and the user profile.

In the past 18 years of its incessant contribution to skill building, SCALE has trained over 40,000 girls and boys in the areas of computers, telecom, tailoring, and renewable energy. Over 4000 have been earning livelihoods through SCALE-created jobs, setting up of small enterprises, outsourcing employability, as faculty trainers, amongst others.

06

6. WAY FORWARD

Decentralized Renewable Energy (DRE) solutions have an important role to play in achieving universal energy access. In fact, they go beyond providing just basic access to energizing livelihoods. The case studies presented in this publication go on to prove that DRE solutions are rapidly emerging as promising solutions for rural livelihoods, communities, and enterprises. They unlock the co-benefits in other areas of sustainable development goals (SDGs) such as jobs, health, food security, education, and gender.

CLEAN has identified certain priority areas to accelerate the uptake of DRE solutions in the country. The huge potential DRE has is acknowledged by stakeholders who feel the need to come together and strengthen it further.

Sector-wise market access potential and market linkages

Responses indicate that the food processing, micro enterprises, dairy, and horticulture sectors have a lot of potential to integrate DRE technologies. So, focus should be on these sectors to create products suited to the relevant consumer groups. DRE interventions in the health sector are also expected to grow. Some major issues that need to be tackled to improve the market reach of DRE products are consumer awareness, end-user financing, government tenders, and product availability at the consumer end. In terms of market linkages, the last-mile delivery networks are a viable option to explore for the enterprises to market their products. Enterprises can also use digital media and local entrepreneurship as efficient marketing tools.

Awareness generation vital for financing in the sector

Members feel that DRE interventions in the health and agriculture sectors would be impactful and contribute to sustainability. Financially supporting the members through debt, grant, and CSR funds will play a major role in uplifting these small and medium enterprises. Debt is the demand of most of the enterprises. The respondents have been looking for investors who provide debt for the business or support their customers through end-user financing. There is a need for creating awareness among investors about DRE applications to gain their trust in the sector. Majority of the members have shown interest in working in the aspirational districts. Interlinking the projects with right financial partners and implementing partners will help enterprises towards efficient interventions in these districts.

As per the investors, the awareness programmes driven by DRE enterprises for the local community will be the most effective way to increase demand for the product within the community. Financial support can be provided if there is demand by the customer for any product. Third-party involvement through guarantee funds and government subsidies can act as a booster for the investors in financing the DRE products.

Newer and better DRE technologies

A larger number of enterprises are initiating projects to support public and health infrastructure using their DRE products/technologies. The number of such infrastructure is expected to increase dramatically in the near future. Standardization and testing of many products such as cold storages, solar water pumps, and agro-processing machines are the need of the hour according to the reports from members. Members have expressed the need for support to continue doing research and development for a better consumer experience with customizable, energy efficient, and grid-synchronization features. Research is also required in health-care-related applications, especially in the rural context due to the unreliable grid infrastructure. A lot of companies are interested in integrating technologies like IoT and Blockchain into their projects or have already made headway in this direction. With the eventual need for phasing out fossil fuels and the importance of DRE, enterprises are also keen to enter the e-mobility market with their own products.

Need for stronger policy framework across all DRE technologies and importance of benchmark costs

CLEAN strongly believes that there is a wide scope for bioenergy, wind, pico hydro, and other hybrid technologies. Framing policies in the future around these sub-sectors will help in achieving the social, economic, and environmental goals of the country. The state nodal agencies call for more involvement from state governments rather than the central government as they work at the state level. There are a number of sub-sectors under the DRE umbrella. Thus, different sub-sectors have different financial/incentive requirements, which need to be kept in mind while framing programmes. A suitable incentive for policy frameworks can be provision of longer tenure loans and capital subsidies on DRE products.

There is a need for a balance in benchmark costs, innovation, and scaling of products to reduce the overall cost without compromising on the quality standards. Technical bids before price bids in government projects can be done to ensure good quality of products that are being used in projects. It will also prevent manufacturers from quoting lower prices by sacrificing the quality standards. There is also a need to set up more manufacturing plants for solar cells and modules to make these products viable for enterprises as the government is increasing import duty on them.

Capacity building for skilled human resources

There is a requirement for capacity building for enterprises regarding geographical factors, which could directly or indirectly be responsible for the failure of the system. Sales and marketing-related training and customer relationship management need to be the focus areas. In order to increase the quality of human resources available at the grassroots level, NGOs and training institutions have taken up skill-building activities across various segments. Some of these training activities include training of rural enterprises for agro-waste processing, setting up manufacturing units, installation and maintenance of DRE applications, and Skill Council for Green Jobs training for a variety of programmes.

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Annexure 1: List of CLEAN Members

1. Aaranyak
2. Abhidna Food Products
3. Agni Solar Systems
4. AlphaSine
5. Altier
6. Amperehour Solar Technology
7. Amplus Energy Solutions
8. aQysta
9. Bask Research Foundation
10. Bhaskar Solar (earlier named as Environ Solar)
11. Blackfrog Technologies
12. BlueMatch Impact Solutions
13. Bruhat Energy Solutions & Technologies
14. Caspian Impact Investments
15. Council on Energy, Environment and Water (CEEW)
16. Centre for Development Orientation and Training (CDOT)
17. Chakraakaar Lifestyle Solutions
18. Chirasthaee Urja Samadhan (CUS)
19. cKinetics Consulting Services
20. CSIR-National Environmental Engineering Research Institute (NEERI)
21. CSR Consultancy Services
22. Cummins India
23. Cygni Energy
24. D.light Energy
25. Delectrik Systems
26. DESI Power
27. Desi Technology Solutions
28. Devidayal Solar Solutions
29. Dharma Life/ Gajam India
30. Dhosa Chandaneswar Bratyajana Samity
31. Don Bosco
32. Doorastha Analytics
33. Earth Day Network India
34. Ecoforge Advisors
35. Ecoideaz Ventures
36. Ecosense Appliances
37. E-Hands Energy India
38. Ekak Innovations
39. Emsys Electronics
40. Enphase Solar Energy
41. Envirofit India
42. Environmental Defense Fund
43. ENVO Renewable Energy Services
44. ERC Group
45. Fair Climate Fund
46. Forum for the Future
47. Free Power Technology
48. Free Spirits Green Labs
49. Frontier Markets Consulting
50. Gautam Solar
51. Genii Engineering & Services
52. Gloworld Energy
53. GOGLA
54. Gram Oorja Solutions
55. Grameen India Innovations
56. Grassroots and Rural Innovative Development
57. Grassroots Energy Technologies India
58. Greenland Solutions
59. Greenlight Planet India
60. Greenway Grameen Infra
61. GSES India Sustainable Energy
62. GTNFW-SEWA
63. h2e Power Systems
64. Hamara Grid
65. Heron Solaris
66. Himalayan Rocket Stove
67. Husk Power Systems
68. India Resources Trust
69. Indian Network on Ethics and Climate Change
70. Inspire Energy Care
71. Integrated Research and Action for Development
72. iNVENCO
73. IT Power Consulting
74. Jansamarth
75. Jigyasa Micro Finance
76. JJ PV Solar
77. Luxlighting Technology
78. Meghraj Capital Advisors
79. Mera Gao Power
80. Mesha Energy Solutions
81. Micro Energy Credits
82. Millenium Synergy
83. MLINDA
84. Naturetech Infrastructure
85. N B Institute for Rural Technology (NBIRT)
86. NERD society
87. OMC Power
88. Onergy
89. Oorja Development Solutions India
90. OORJAgram India
91. Phoenix Products
92. Playsolar Systems
93. Pluss Advanced Tech nologies
94. pManifold Business Solutions
95. Pollinate Energy
96. Power for All

97. Practical Action Foundation
98. Prakruti Renewable Power
99. Punjab Renewable Energy Systems
100. Pushan Renewable Energy
101. RAL Consumer Products
102. Ravi Engineering and Chemical Works
103. Reliable Skill Corporation
104. Rencut India
105. Renewable Energy Applications and Products
106. Resham Sutra
107. Riya Solar
108. S4S Technologies
109. Samavit Vikas
110. Samuchit Enviro-tech
111. Saudagar Agro Industries
112. SCORE Livelihood Foundation
113. SELCO India
114. Shramik Bharti
115. Sileaf Technologies
116. Simi Stove
117. Simpa Engie
118. Sistema.bio
119. SKG Sangha
120. Smart Power India
121. Smokeless Cookstove Foundation
122. SNL Energy Solutions
123. Society to Create Awareness Towards Life and Environment (SCALE)
124. Solar Hitech Solutions
125. Solar Urja through Localization for Sustain ability (SoULS)
126. Sologix Energy
127. Steelbird Hi-tech India
128. St. Thomas Charitable and Educational Trust
129. SunMitra Solar
130. Sunrise Energy Corporation
131. Supernova Technologies
132. Suraj Solar Enterprises
133. Sakhi Unique Rural Enterprise
134. Sustaintech India
135. Swami Samarth Electronics
136. Swayambhu Innovative Solutions
137. SwitchON Foundation
138. Synergy Engineering & Environmental Solution
139. Tarini Enterprises
140. Techno Village
141. Technology Informatics Design Endeavour
142. Udaipur Urja Initiatives Producer Company
143. Udyama
144. UNesar
145. Urjaa Samadhan
146. USolar Clean Energy Solutions
147. Villgro Innovations Foundation
148. Vineeti Technologies
149. Water Energy Food Transitions (WEFT) Research
150. WiSH Energy Solutions

Annexure 2: DRE in News

AREAS Invites Proposals for Decentralised RE Solutions for Rural Applications

By Ayush Verma / Updated On Tue, Sep 29th, 2020

ENERGY

Future of electricity in India lies in local solutions

Utilities in India have a mandate to supply power, which becomes increasingly difficult through the centralised grid and is technically and economically challenging for more remote places

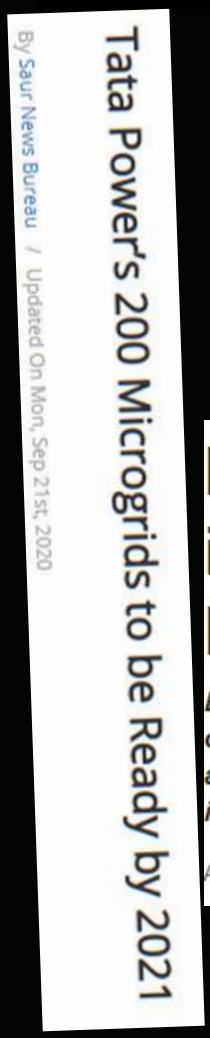
By Pratha Jhawar
Last Updated: Thursday 03 September 2020

NEXT BLOG >

DECENTRALIZED RENEWABLE ENERGY CAN DRIVE MODERN ELECTRICITY SYSTEM IN INDIA

Swati Madan, Project Officer, Energy Transitions - India, The Climate Group

Blog Reading time: 5 minutes 19 November 2019



Tata Power's 200 Microgrids to be Ready by 2021

By Saur News Bureau / Updated On Mon, Sep 21st, 2020

Covid-19: Disruption in DRE supply chain will impact several development outcomes

Disruption in supply of clean energy products and services by DRE enterprises will impact reliable energy supply and energy-dependent sectors like healthcare, agriculture, livelihoods, and others.

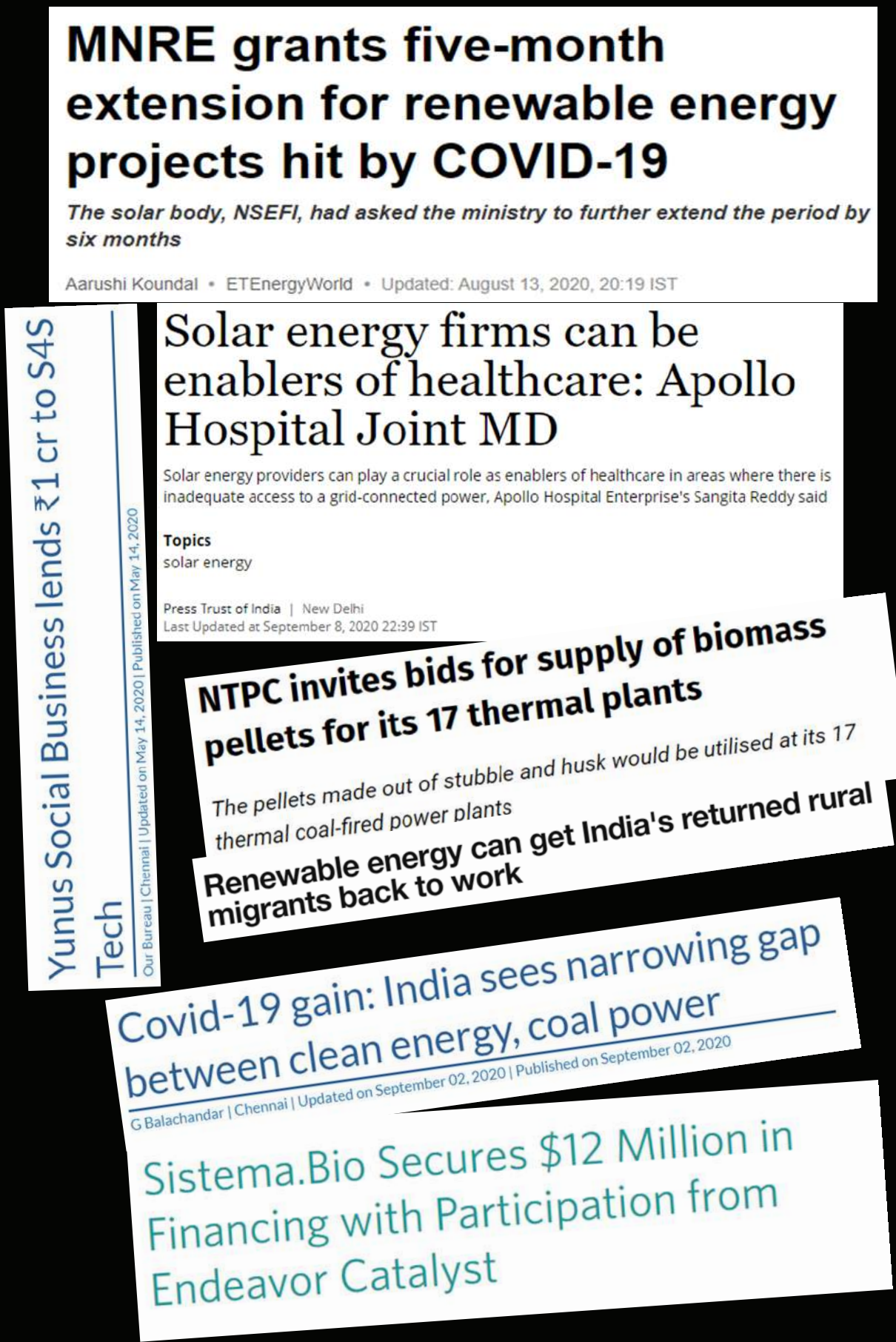
ETEnergyWorld • April 25, 2020, 23:01 IST

Boost for renewable energy: RBI issues revised priority sector lending guidelines

Bank finance to start-ups up to Rs 50 crore, loans to farmers for installation of solar power plants for solarisation of grid-connected agriculture pumps, and loans for setting up compressed bio-gas (CBG) plants have been included as fresh categories

ANI • September 04, 2020, 17:04 IST


NRE Issues New Benchmark Costs for Rooftop Sola
rojects in FY 2021
e applicable for all LoAs to be issued after July 31, 2020
Solar Projects are Helping Generate Income, Create Jobs and New Skills in Rural Areas
Socio-economic development, an incidental contribution of the solar sector
JAN 14, 2020 / NITHIN THOMAS PRASAD / MERCOM RESEARCH FOCUS, OTHER
Agriculture | Decentralised cold storages are a key to a self-reliant rural India
Prime Minister Stresses the Need to Boost Domestic Production of Solar Components
Modi also asked the Ministry to ensure transparency in DISCOM operations and performance reports
MAY 29, 2020 / NITHIN THOMAS PRASAD / MARKETS & POLICY, SOLAR
Local Lifeline
Communities rely on DRE to get through the Covid-19 crisis
Nearly 300,000 Households Electrified Through Off-Grid Solar Solutions: RK Singh
18,734 homes in left-wing extremism affected areas of Chhattisgarh are yet to be electrified
SEP 22, 2020 / RAHUL NAIR / OFF-GRID, SOLAR
Explained: How Punjab plans to spin paddy stubble into gold
Other than biomass projects, eight projects of BIO-CNG are under execution in the state. Most of these projects will be commissioned in 2021 and 2022. These will need around 3-lakh metric tonnes of paddy stubble annually.
[Startup Bharat] From solar stoves to 3D printing, four stories of innovation from Gujarat
Solar-powered sugarcane juicer to help become self-reliant
Naina J A, DHNS, Mangaluru, JUN 03 2020, 19:45 IST | UPDATED: JUN 30 2020, 20:49 IST



MNRE grants five-month extension for renewable energy projects hit by COVID-19

The solar body, NSEFI, had asked the ministry to further extend the period by six months

Aarushi Koundal • ETEnergyWorld • Updated: August 13, 2020, 20:19 IST

Yunus Social Business lends ₹1 cr to S4S Tech

Our Bureau | Chennai | Updated on May 14, 2020 | Published on May 14, 2020

Solar energy firms can be enablers of healthcare: Apollo Hospital Joint MD

Solar energy providers can play a crucial role as enablers of healthcare in areas where there is inadequate access to a grid-connected power, Apollo Hospital Enterprise's Sangita Reddy said

Topics
solar energy

Press Trust of India | New Delhi
Last Updated at September 8, 2020 22:39 IST

NTPC invites bids for supply of biomass pellets for its 17 thermal plants

The pellets made out of stubble and husk would be utilised at its 17 thermal coal-fired power plants

Renewable energy can get India's returned rural migrants back to work

Covid-19 gain: India sees narrowing gap between clean energy, coal power

G Balachandar | Chennai | Updated on September 02, 2020 | Published on September 02, 2020

Sistema.Bio Secures $12 Million in Financing with Participation from Endeavor Catalyst

JSW Solar bags 810 MW blended wind energy projects from SECI

he Solar Energy Corporation of India (SECI) had conduced an auction for setting up 2,500 MW ISTS (inter state transmission system) projects under tariff based competitive bidding. The tender was floated in June

PTI • September 26, 2020, 07:54 IST

Karnataka Mini-Hydro Projects Can Carry Forward Banked Energy for 2 Months

No such facility provided to other renewable energy projects

Women-focused last mile distribution platform Frontier Markets raises $2.25 mn

Business News › RISE › Startups › NewsBuzz › Atomberg Technologies lands $10 million in Series-A round

Atomberg Technologies lands $10 million in Series-A round

Startup Street: WeWork Wants To Double Locations As It Completes One Year In India

PRESPL raises Rs 360 million equity from Shell

8 energy startups led by women entrepreneurs bag $10,000 seed fund each from POWERED Accelerator

Annexure 3: Benchmark Costs

			General States		
			2018	2019	2020
Solar Pumps (Rs/HP)	3 hp	AC Surface	80000	67000	54400
		DC Surface	85000	74000	54400
		AC Submersible	80000	67000	56100
		DC Submersible	85000	74000	56100
	5 hp	AC Surface	65000	56000	47300
		DC Surface	77000	66000	47300
		AC Submersible	65000	56000	47300
		DC Submersible	77000	66000	47300

			General States	
			2019	2020
Solar Pumps (Rs/HP)	0.5 hp	AC/DC Surface	53000	53000
		AC/DC Submersible	68000	68000
	1 hp	AC Surface	102000	92400
		DC Surface	108000	92400
		AC Submersible	113000	103700
		DC Submersible	119000	103700
	2 hp	AC Surface	65000	61100
		DC Surface	73000	61100
		AC Submersible	76000	65700
		DC Submersible	86000	65700
	7.5 hp	AC/DC Surface/Submersible	56000	47000
	10 hp	AC/DC Surface/Submersible	51000	44500

		General States		
		2018	2019	2020
Standalone Solar Power Plants/Packs (upto 10 kW)	6 hrs	100	94	94
	3 hrs	80	74	74
	1 hr	68	62	62
Standalone Solar Power Plants/Packs (>10 kW-upto 25 kW)	6 hrs	90	84	84
	3 hrs	72	66	66
	1 hr	61	55	55

	General States		
	2018	2019	2020
Street Light- Lithium Battery	435	299	258.67
Solar Lamps	250	160	158

		North East States			
			2018	2019	2020
Solar Pumps (Rs/HP)	3 hp	AC Surface	88000	73700	59900
		DC Surface	93500	81400	59900
		AC Submersible	88000	73700	61800
		DC Submersible	93500	81400	61800
	5 hp	AC Surface	88000	61600	52100
		DC Surface	93500	72600	52100
		AC Submersible	88000	61600	52100
		DC Submersible	93500	72600	52100

		North East States		
			2019	2020
Solar Pumps (Rs/HP)	0.5 hp	AC/DC Surface	58300	58300
		AC/DC Submersible	74800	74800
	1 hp	AC Surface	112200	101700
		DC Surface	118800	101700
		AC Submersible	124300	114100
		DC Submersible	130900	114100
	2 hp	AC Surface	71500	67300
		DC Surface	80300	67300
		AC Submersible	83600	72300
		DC Submersible	94600	72300
	7.5 hp	AC/DC Surface/Submersible	61600	51700
	10 hp	AC/DC Surface/Submersible	56100	44500

		North East States		
		2018	2019	2020
Standalone Solar Power Plants/Packs (upto 10 kW)	6 hrs	110	103	103
	3 hrs	88	81	81
	1 hr	75	68	68
Standalone Solar Power Plants/Packs (>10 kW-upto 25 kW)	6 hrs	99	92	92
	3 hrs	79	72	72
	1 hr	67	60	60

	North East States		
	2018	2019	2020
Street Light- Lithium Battery	475	328	284.533
Solar Lamps	275	176	174.5

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