

# LEVERAGING TECH ENABLED ENERGY TRANSITION PATHWAYS FOR WOMEN ECOPRENEURS- 2022



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# Chapter 1



## Background

*A look at India's transition to clean energy and what it means for women in the underserved communities.*

Ministry of Power, as on January 2020, announced that the total installed electricity generation capacity of India has reached 366 Gigawatts of which 23% (about 84 GW) is from Renewable Energy Sources. Hence, India seems confident of reaching its RE (Renewable Energy) targets and the trends overall show a promising future for RE in India. For women this should translate to greater job and business opportunities. According to the Council on Energy, Environment and Water (CEEW) and the Natural Resources Defense Council (NRDC) more than 1 million Full Time Equivalent (FTE) jobs could be created if India achieves its target of 100 GW of installed solar energy (CEEW and NRDC, 2016). The numbers include scope of work and business in the grid connected space as well as decentralized renewable based options such as off grid RE based power plants and household RE technologies for electricity and heating. Electricity access has globally been recognised as the first footstep and a precondition for socio-

economic progress. Since, the Government of India declared the nation to have moved from a power deficit to a power surplus nation, the focus in the Indian policy context has moved from simply the access issue to the reliability of electricity supply which has major implications for both the issues of energy transition, climate action and socio-economic progress. Though, in most urban areas the planned outages, low quality of output or interruptions that consumers have to face, have decreased, the access and reliability of the electric grid is still a problem in the peri-urban and rural areas. So, while supply of electricity linked to demand has improved as a result of new capacity installations, the requisite investments in adequate distribution infrastructure is still short. And it should be addressed, not only for the benefits that a highly reliable grid can have on economic growth, but also for the opportunity this presents in making way for the energy transition to a cleaner and more equitable system inclusive of gender and socio-economic equity. However, if we move away from the grid connected supply system and explore the arena of decentralised clean energy systems and how this technology is positioned to play a key role in delivering secure, locally sourced and environmentally benign energy solutions to urban and rural consumers we find many areas of work and prospective engagement for women entrepreneurs. This is the sector that the study explores to understand the ground reality, eco system enablers and detractors and opportunities and challenges that women from marginalised and underserved communities might have for a sustainable livelihood generation that interlinks the clean, reliable energy access issue to leveraging tech enabled energy transition pathways for women entrepreneurs while addressing climate change and socio-economic and gender inequity at the same time. From a literature survey it is however, clearly evident that gendered analysis of green growth and development strategies reveals at least two critical

shortcomings. First, women are known to have weaker access to new technologies almost everywhere in the world (Rosser 2005; Hafkin and Huyer 2006) so there are likely to be unequal access issues inherent in the transition to low-carbon economies. Second, it is well established not only that 70 percent of the world's poorest 1.3 billion people are women and children (UN Women 2014) but also that women are already very poorly represented globally in sectors like construction, renewable energy, manufacturing and public transportation that are critical to the green economy.

This study looked at pathways to Just Transition away from fossil fuels, the socio-economic impacts of this transition on the marginalised women and the need for strategising policies for an inclusive and sustainable transition. Climate action warrants a shift from fossil fuels, but the need for larger conversations around the economic, social and political implications of phasing out fossil fuels and transitioning away from a coal-fuelled economy towards sustainable forms of energy through a gendered lens can't be ignored. The factors such as location, value chain, skill level, and gender inclusiveness affect the variation in these impacts and hence developing focused policies and strategies would be crucial. The study focussed on women in the decentralised energy sector keeping in mind the importance of advancing the narrative of the need for successful inclusion of women in the tech enabled clean energy sector in as many ways as possible in order to define the future of India's energy movement. The decentralised energy sector seems to be poised at a very crucial position in aiding this transition involving the marginalised communities because of the low capital and technical know how involved which is easy to achieve for this socio-economic segment.

# Chapter 2



## Rationale for the Study

Even as renewable energy takes centre stage in the energy transition, women are still underrepresented in the sector. Research findings reveal that women represent on average 11% of the workforce in the solar rooftop sector. While this is lower than the global average of 32% for women in the renewable sector overall, it is higher than the percentage of women employed in other energy sectors in India – which is less than 10% in coal, oil and gas companies, and electricity utilities. The clean energy sector, as an emergent field still has room to address gendered needs. Moving away from fossil fuels and toward renewable energy will require not only the reskilling and upskilling of large workforces but also building the resilience of the communities that support them. If this shift focuses exclusively on the current, predominantly male fossil fuel workforce, it will reinforce existing gender gaps in terms of workforce demographics, gender pay gaps, and discriminatory practices. It is vital to understand how the private and public sectors and development partners can bring women into green jobs, including renewable energy and close existing

gender gaps. To enable the transition to a gender-sensitive green economy, the opportunities and constraints that women face in green technology based livelihoods must be explored. These initiatives must be documented and analysed based on concrete examples from the ground where green technologies, education, training, financing and emergent business models for low-income women have proved successful. Assembling such a body of knowledge will result in formulation of appropriate programs leading to advocacy for policies to ensure that green technologies and livelihoods do not remain unaffordable and inaccessible for low-income groups in general, and women in particular (Baruah, 2017).

## The context in India: Technologies, Mechanisms and Application Areas

Stemming from the oil crisis in the 1970s India has had a long history of off-grid solar application deployment. The mechanisms used ranged from early demonstration projects, philanthropic initiatives, subsidy based systems from NABARD, public grants based programs and market-based mechanisms including retail and Pay-As-You-Go (PAYG) model for viable and widespread deployment of solar home systems in rural India. It was from 2009 that greater engagement in this sector was noticed with the announcement of the national solar program followed by increasing private sector investment and innovations. Though the central government through national or

state nodal agencies, commercial banks, and private suppliers have implemented many programs, the effectiveness of these initiatives have not fully addressed the multifaceted challenges including distribution and procedural energy justice issues that range from how to successfully negotiate and deliver partnerships between public and private actors, how to provide the required capital, operational efficiencies and new business practices to drive solar PV based energy transition (Prabhakar et al, 2019) and most importantly it lacks an inclusive gender dimension.

### Developmental Sector Initiatives

In India, the importance of women (i.e., the primary users of household energy for cooking and heating as well as the possibility of livelihood opportunities as energy entrepreneurs) in the context of energy have been widely recognised by successful organisations and networks like SEWA (Self Employed Women's Association), TIDE (Technology Informatics Design Endeavour), AWC (All India Women's Association) & SELCO (Solar Electric light company of India). The aim of these organisations has been to involve more women and transform them into energy entrepreneurs. All India Women's Conference (AIWC) in India started providing rural women with solar lanterns and charging stations. Under this initiative women charged their lanterns during daytime and then in the evening they rented the solar lanterns to street vendors and to those houses that did not have electricity or faced long hours of power cut. AIWC also had initiatives on solar powered water purifier (women sold purified potable water to the locality at very nominal rates) (AIWC 2009). Two other household level income generating activities started by women by solar RETs (Renewable Energy

Technologies) were bare foot engineers from Tillonia Women's group who not only installed, maintained and repaired but also manufactured parabolic solar cookers with confidence. Also, at BAHAI's women's group from Madhya Pradesh women manufactured, sold and also marketed solar cookers. From a country perspective these are some notable examples of women involvement in this space. The study focusses on initiatives and models in the context of West Bengal.

### Application Areas:

Solar energy can be used through the thermal route or the photovoltaic route. A few applications of the thermal route are water heating, cooking, drying, water purification and power generation. Through the photovoltaic route it can be used for applications such as lighting, pumping, communications and electrification of villages. Agriculture involves various time-consuming stages in processing, and drying is one of them. Drying in the open sun is not only time consuming but also unhygienic. Solar dryers are now used to dry crops and other products. They come in a variety of shapes and sizes, and therefore they can be utilised for various domestic purposes as well as in agricultural processes (UNDP 2005). Domestic food preservation and processing such as milk chilling, ice making, grinding is also carried out, but at a relatively smaller scale. For these activities decentralised systems are, perhaps, currently the most suited option for meeting their electrical and mechanical energy demands, which when designed appropriately could serve well for many years to come, even when their demand increases, until connected permanently to grid. In all of these multiple uses, women stand a chance to make a sustainable livelihood.

What is the present picture of vulnerable women involved in or

benefitting from this technology in West Bengal?

In West Bengal, though we were unable to trace any significant number of women focussed public DRE (Decentralised Renewable Energy) programs operational during the study period, we have identified mostly rural based women led solar clusters as well as urban individual solar entrepreneurs building a sustainable future in their role as energy pioneers in the solar power industry but the narrative needs to be strengthened manifold to have a greater impact on women's empowerment and involvement in this space. For the model to be successfully replicable in similar rural clusters and urban entities or clusters significant gaps have been identified.

The following section expands on the study objective and methodology for the study thereby arriving at the implications, recommendations and way forward.

# *Chapter 3*



## *Objectives & Methodology*

After secondary research, the study carried out 7 field-visits to explore the opportunity of identification, selection and subsequently mentoring clusters of economically needy and underserved women who were a part of or prospect in a solar entrepreneurship discourse. The objective of this study was twofold. Primarily to explore how women can turn emerging technology from a threat to an opportunity for greener growth. The focus was also to capture how women solar entrepreneurs are currently equipped to deal with the new and emerging models of work, disruptive technology, levels of engagement that is driving the impetus towards a greener economy.

The secondary aim was to identify micro and home-based enterprise clusters, develop a focussed Interest Group and influence evidence-based policymaking for scale up of existing women focussed solar clusters.

In order to answer the first question women led small solar businesses, formal or informal clusters, social entrepreneurs, social sector businesses, developmental practitioners and experts in clean energy

and climate action were studied and/ or interviewed in order to diagnose their operational mores to identify the challenges, technology and structural enablers and disablers faced by the ventures and the pathways adopted by them in moving into their present state.

To achieve the second objective, the study carried out a situation analysis through literature review and stakeholder consultations. The primary instrument for data collection for both objectives was focussed group discussions and expert interviews. Based on the literature review and consultations, five districts and the areas in and around Kolkata were selected for the scoping study. The descriptive statistics and findings was based on data collected from 55 women entrepreneurs who were part of this study and face to face interviews with experts and relevant stakeholders. The geographic area covered was urban, peri urban and rural areas in Kolkata, 24 Parganas (N), 24 Parganas (S), Birbhum, Purba Medinipur and Jhargram.

This research followed a non-probability purposive sampling method. The snowball technique was used to connect with a heterogeneous group of women small business owners, women focussed clusters and solar entrepreneurs through the existing network of people connected to this ecology. Secondary data was garnered from documented project related information and internal records of the businesses. The analysis was carried out based on the information gathered through focus group discussions and expert interviews such as existing picture of income generation potential for underserved communities of vulnerable women in the urban and rural self-employed segment in West Bengal, areas of employment like assembly, sales, repair and maintenance of solar lanterns, street lamps, heating and lighting equipment in the domestic sectors or maintenance of solar energy-based applications like solar dryers, solar cold storage, solar aerators

meant for rural productive uses/livelihoods in the local communities, the socio-economic, cultural challenges and ecosystemic enablers. The project of which the study is a part builds the narrative through showcasing and storycrafting of the journey of identified case studies as well as prospective clusters.



Figure 1: The Project Journey



Interaction at IISWBM, IBRAD, Seva Kendra Kolkata- connecting to social society organisations and academic institutions

# Chapter 4



## Stakeholder & Cluster Selection

Based on our research and exploratory field visits we connected with a heterogeneous group of social sector activists in the energy, entrepreneurship and climate action domain, academicians, women led informal clusters, small business owners and entrepreneurs through the existing network of people connected to this ecology. The study excluded women involved in wage or salaried income scopes.

Four criteria informed our selection of locations & clusters (performed and in-process) as the main areas for research. The following functional aspects were taken into account in identification –

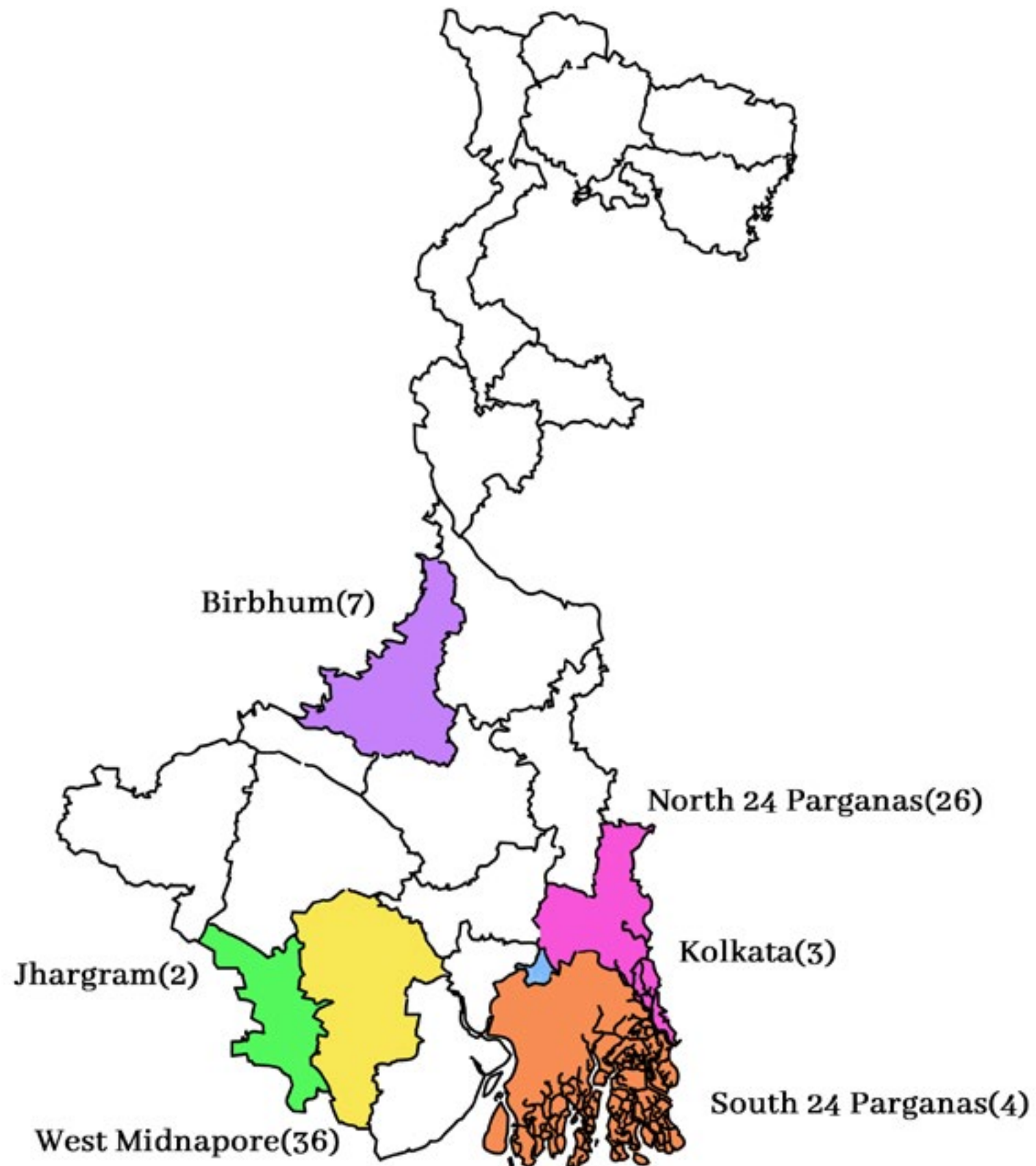
1. Developed (partially) but in need of mentoring
2. Abandoned projects in need of revival
3. Energy entrepreneurs-in-training/development
4. Green & Sustainable Livelihoods Clusters which had been groomed previously by SDRC and were now willing to take positive, definitive steps towards becoming Energy Entrepreneurship Clusters in renewables (no prior knowledge but well-connected to social

entrepreneurial networks and willing to learn or expand).

The five locations corresponding to the selection criteria were as follows:

1. Sagar Island Solar Projects {Abandoned Projects in need of revival - (South 24 Parganas)}
2. Natural resource management addressing climate change by gender mainstreaming through Solar Energy Program {renewable energy (solar)entrepreneurs in training (West Midnapur and Jhargram)}
3. Maslandapur Cluster {New prospective in transition (North 24 Parganas)}
4. Tribal marginalised women ecopreneurs {New prospective (Birbhum)}
5. Individual solar entrepreneurs from Kolkata and adjoining areas {renewable energy (solar)entrepreneurs in training and various stages of development}





Districts of West Bengal where the study was conducted

# Chapter 5



## Study Findings

This section has been elaborated from the findings based on extensive discussions with the beneficiaries- in this case the women solar entrepreneurs, key stakeholders in the clusters, their roles, business models, socio economic impact along with the challenges, eco systemic enablers and policy implications. This has been covered through identifying the products; business models; profiles; challenges and opportunities of the respondents for a Just Transition to be possible, Products and Services

At present, production, assembling, sales, marketing and maintenance service of solar products and small household items like solar lanterns replacing kerosene lamp, solar improved cookstove, solar home system instead of a diesel generator for household needs as well as small business and utilities like street lightening and catering to the agri sector energy needs like solar pumps etc is the primary focus of the rural clusters we have studied. The urban based entrepreneurs cater to industrial, commercial as well as the domestic sectors as systems

integrators, sales, maintenance and research and training functions. Before we move on to the descriptive statistics, an important finding from the study is that most of the women involved in the clean energy sector have achieved empowerment and a higher status within their social circles post their successful engagement in this sector. Most women reported their families having initial objections to their involvement in a sector traditionally considered a man's domain dealing with electricity and circuits. Within the community as advocates of climate action and environmental advocates they are seen as ambassadors of change. This extends the narrative to include the climate action aspects along with women's economic empowerment as clean energy pioneers through their small businesses and self-employment in the solar sector.

### Business Models

In both the rural and urban areas, the initial funding came from philanthropic, private sector funds and loans. After the training period was over, loans from Self Help Groups, district level Industrial Development Office have contributed to further capital investment. Most of the cluster based entrepreneurs and micro units provide a range of additional services as part of a service contract, including installation mostly in urban belts and continuous product support, maintenance and repair activities. Moreover, training seemed an important part of all the business operations in both geographic locales. This is done for local capacity building for ensuring local maintenance which acts as a key differentiator from Chinese solar products which are cheaper with wider distribution networks. Particularly noteworthy was the product innovations with modular design to facilitate repair and replacement of parts, without the need to replace entire systems. Particularly in the urban areas, custom-designs of solar solutions with proprietary

method, modifying home appliances to use Direct Current, which consumes considerably less energy than conventional alternatives were noticed. The cluster based entrepreneurs were very marginalised and a healthy partnering with a range of stakeholders, including civil society players, supply chain partners, academic institutions, and local block level government actors were visible. Increased awareness of the need for partnership with research institutes for additional funding and technical support to roll out more advanced technical model were noticed. However, though local level governmental actors were involved after the initiatives started, most of the initial support came from the developmental actors and non-governmental organisations. Most of the cluster based entrepreneurs are yet to incorporate their business units as the sales and marketing is as yet limited to local or bulk orders sourced through developmental partners. This points to a huge gap that needs to be addressed in connecting the entrepreneurs to existing e-commerce platforms or established networks as well as individual capacity building for scaling up their units even though they may continue to benefit from the cluster approach which for this segment is especially relevant and useful considering the lack of risk appetite and access to finance which is a present reality.

Table 1: Demographic and Business Profile of the Respondent Solar Entrepreneurs

Table 1: Demographic and Business Profile of the Respondent Solar Entrepreneurs				
Nature of activity	Assembly of solar products like lanterns, Solar Home Systems, solar mobile chargers, solar DC system, solar EV, solar Bio floc, Solar heater, solar sensor light, solar cap, solar inverter			
	Assembling and roof top installation of solar home light systems			
	Installation & maintenance of solar street light and solar water pump			
	Training, Research & Innovative product development			
	Sales & Marketing of solar products and services			
Form of business	Unincorporated		40%	
	Incorporated Proprietorship		37%	
	Incorporated Co-operative		13%	
	Pvt Limited		10%	
Education Level	VIII Passed		39%	
	Completed 10th Board Exam		10%	
	Completed 12th Board Exam		39%	
	Completed College		7%	
	Post-Graduation Professional	/	5%	
Marital Status	Single		10%	
	Married		90%	
Average Income in INR (Monthly)	2000- 5000		65%	
	5000- 10,000		25%	
	10,000 and above		10%	
Main earning member of family	Entrepreneur herself	20%	Parents/ In laws/ Children	33%
	Husband	45%	Others	2%

Age (in years)	Below 25	10%	36 – 45	34%
	26 – 35	49%	Above 45	7%
Initial Capital Generation Source	Philanthropic Funds		60%	
	Loan (*SHG, IDO, Govt. Scheme, Private financial institution)		33%	
	Own capital		7%	
Primary Customer Base	Domestic		70%	
	Commercial and Public Procurement		25%	
	Industrial		5%	

Source: Field Survey

41 solar entrepreneurs from 40 villages of West Midnapur , Jhargram districts and Kolkata and adjoining areas were selected for the focus group discussion and 14 eco entrepreneurs and prospective solar entrepreneurs from Maslandapur, Birbhum and Sagar island apart from 10 expert interviews with academics involved with entrepreneurship development, clean energy and climate action, social sector activists involved with cluster development and climate action and women empowerment were conducted to arrive at the findings.

The producer group comprising women from the 40 villages of West Midnapur and Jhargram Districts from Dantan, Gopiballavpur and Kesiary blocks who were part of the Natural Resource Management Addressing Climate Change By Gender Mainstreaming Through Solar Energy Program, the study team from SDRC encountered is one of the strongest examples of live cases of green energy driven entrepreneurship among underserved women hailing from the so-

called lesser developed regions of West Bengal where perhaps even the spread of formal education(both institutionally and otherwise) cannot be considered widespread. The West Midnapur cluster comprises women from villages in the districts where governmental and para statal infrastructural support is not forth coming. That is not to say that there is no intention- it is just a matter of access in the sense of even the knowledge infrastructure not being present as enablers in the ecosystem. Once the connect has been established and in the duration of our study we made the observation that the organisation which first initiated the capacity building and training for these women are active players in what can be called the Just Transition Scenario since in their essential discourse area they did intent to train professionals in solar technology instead of handicrafts or any other (as generally perceived by capacity building CSOs to be “cash cows”). They made a conscious choice to train these women as solar energy technicians because we feel that they were in a state of maturity where they could be considered s a part of the Just Transition Discourse alliance.



FGD in progress in Dantan



Storycrafting with solar entrepreneurs in  
Daton Cluster, Kharagpur

Sagar Island, the next cluster we studied in 24 Parganas South is a unique case in point in the sense that ostensibly their story seems like a story of failure however as we went deeper into the narrative and began to craft their story what emerged can be easily called a vision of hope. The island situated on the continental shelf of Bay of Bengal, about 150 km south from Kolkata is isolated from main land of West Bengal State by Hugli River and travel is still very problematic dependent on the high tides and ebbing of the river. West Bengal Renewable Energy Development Agency started their work installing Photovoltaic Power plants since 1994, one of the earliest instances in the country, considering the existing challenges to the electrification of such remote area. In Sundarbans average 250 sunny days and 55 overcast days are observed and an average of 1600 kw/m<sup>2</sup> solar

irradiation is projected to be expected on horizontal surface. Hence the technology seemed the perfect choice for both the climatic conditions as well as structural challenges present. The first photovoltaic power plant with capacity of 26 kw peak was installed in the year of 1996 at Kamalpur under Rudranagar Gram Panchayet. From 1996 to 2006, a total of upto 10 PV plants were installed in this Island. In the year of 2012, the state ICZM (Integrated Coastal Zone Management) project, started the most difficult work of construction of electrical power transmission tower through the river, for feeding conventional grid power to this island. On getting the conventional power, the existing PV plants were disconnected from the distribution lines mentioning the technical constraints of Solar Photovoltaic storage cells. (Mandal, 2019). Sagar was a government project where humongous financial investments were made in setting up solar modules which were grids in themselves. It was a fairy tale scenario where the problem of last mile connectivity would be solved solely by solar! However, once the initial investment (including the requisite transfer of technology) the administration seemed perhaps, apropos a political shift, that might have occurred to completely lose interest in persisting with the project. Since the international big wigs were involved in the funding process like World Bank, ADB etc as well as high capacity developmental sector giants like GTZ who were steering the program the installations and initial "run" did happen what did not was any serviceable follow through thus rendering the project as an abandoned operation. There were considerable unmaintained rooftop solar installations in the whole area which the study team observed and the respondents mentioned. The study team interviewed civil society organisations and women prospective solar trainees operating locally in Sagar, Rudranagar and Mathurapur -II blocks. Post deliberations, discussions and intervention by SDRC something wonderful is coming to pass- the oldies from the radically "JUST" Left vis a vis a completely new

generation of marginalised women are taking on the mantle of the vanguard who will help the shutdown Sagar to cluster re emerge as a success story in the Just Transition narrative. However, this is work in progress which SDRC is actively engaging in. The maintenance and repair of the abandoned solar installations in the local areas would prove to be a considerable income generation potential for marginalised women. The intention is to ensure that these individuals who were highly demotivated do not once again lose demotivation and are ready to take the next step. However, the policy implementation, advocacy, access and awareness are huge areas of gap that needs to be addressed.



Women in front of unused PV solar panels in need of repair and maintenance in Sagar

Exploring the scope and opportunity existing on the ground the study looked some prospective clusters of women ecopreneurs and their situations for exploring a clear energy enabled livelihood option.

# Chapter 6



## The Prospective Clusters

The Bolpur cluster comprised entirely indigenous women mostly Santhals but also from the Munda community. Their livelihood is almost solely dependent on handicrafts and other traditional crafts which they have not very successfully tried to market for long periods of time. In our previous years' interventions, we had the privilege of meeting some of these community leaders whom we had trained in connecting circularity to their indigenous livelihood processes by simple recognising the kind of environmental stewardship their ancestors have engaged in for almost over a millennia. The identification of the opportunity possible through involving local government and actors in driving the Start-up Village Entrepreneurship Programme (SVEP) a sub-scheme under National Rural Livelihood Mission (NRLM), Ministry of Rural Development, (MoRD) to promote start-up enterprises in rural areas also seemed a timely interlinkage that can be explored to drive the solar entrepreneurship narrative and action forward. The trust building exercise that is inherent to the work that we do and the stories that we craft was fortunately not required as these women knew

us. However, the moment the narrative went into the solar or energy domain one could perceive a marked lack of trust as the one thing that these ladies knew needed protection was their livelihood however once we had reiterated the Just Transition narrative which included at the very least the safety and dignity for the actors involved and once we had helped connect them to the other players in the Inception workshop who came from similar tribes and domains we saw that they were willing to listen. This is also a journey in progress but at the very least we have established our bonafides which we feel will help them take up solar as a livelihood option on an extended scale- this year has only seen the plant taking root. However, since the education level while perfunctory is not non-existent it has not been as difficult. This is definitely a strong cluster in development.



Storycrafting session in Bolpur and Dantan with a high tribal representation

The Maslandapur (24 Parganas, North) cluster experience was also very close to our hearts- a captive cluster with which we had worked from before the pandemic trying to help securitise livelihoods without discarding post carbon philosophies. The ecopreneurs involved are a mature cluster and while we have only done but a few knowledge dissemination workshops and not yet involved our cohort of energy practitioners and experts they are ready for the next phase. They are

enthused to think they are a part of the “future of work” and the energyscape even though they belong to what might otherwise be construed as the back waters. The suitability of this peri urban cluster is their partially more developed market linkage as compared to the rural set ups.



Storycrafting Session in Maslandapur Prospective Solar Cluster



Solar Technology Awareness Workshop in Maslandapur Cluster

### Opportunities and constraints in the ecosystem:

The ground reality remains that supplementing the energy needs of rural and urban areas from polluting or flammable sources such as kerosene, firewood, animal dung and agricultural residue continue from lack of reliable access to electricity or lack of affordability of electricity costs (Clancy, Skutsch and Batchelor 2003). By increasing access to reliable and affordable sources of decentralized clean energy, initiatives like that in West Midnapur or Sagar or the urban solar entrepreneurs benefit households that maybe underserved by the grid as well as those that need to diversify their energy sources to save money. Many of the rural and peri urban areas in West Bengal still suffer from frequent voltage fluctuations and in the areas surveyed there are presently no other renewable energy projects hence the solar entrepreneurs currently have a wide local market to cater to which is unsaturated. However, a public procurement boost for such products will open up the market to a greater extent. The need for diversification of home energy products in India is borne out by national-level data. The annual market for solar lanterns and cook stoves was estimated at \$500 million and \$400 million respectively (Business Line 2012). Using solar lighting and other decentralized renewable energy technologies based products both for commercial and domestic use currently is a more cost effective solution compared to alternative energy sources like kerosene and diesel used by poorer households which are the primary market for the rural entrepreneurs in our study area. The situation in West Bengal regarding driving this technology did not seem very adequate. This is coupled with lack of adequate and appropriate financing to be the biggest impediment for advocacy, training, capacity building and dissemination of information regarding the environmental, health

and economic benefits of using this technology. The study did not find significant private sector or commercial investment in solar lighting and other decentralised technologies. The scope of women belonging to marginalised households to benefit from solar entrepreneurship is huge if the present forms of social oppression and isolation that make their socio-economic and political empowerment are augmented.



Urban and peri urban solar entrepreneurs at their work





Women assembling solar products in Daton



Products assembled and innovated by solar entrepreneurs

# Chapter 7



## Conclusion

A fair amount of research focus happens to explore the role and impact of clean energy on women as end users of technology whereas this research explored pathways to leveraging women's potential as entrepreneurs, facilitators, designers and innovators in the energy sector. Although women's access to green technologies is currently severely limited by inadequate financial and information access and low social status, there is tremendous potential to create livelihoods for women in the energy sector. However, women can gain optimal traction from green initiatives only within the context of wider socially progressive pro-women policies. Prior research on gender distribution of global employment patterns have pointed out that historically and currently, the technology workforce represents a vertically and horizontally gender-stratified labour market, with women concentrated in the lowest-paid positions, closest to the most menial and tedious components and furthest from the creative design of technology and the authority of management or policymaking. Even in the renewable energy sector issues of gender equity need to be addressed at all



Inception Workshop: The stories and the crafters

levels to avoid a similar destiny.

Recommendations for Gender Inclusive Green Growth:

Need for greater advocacy and access to information regarding existing policies focussed on women entrepreneurship and green post-carbon economic development among vulnerable and marginalised communities; Solar PV subsidies to be integrated to maintenance services which will increase the scope of greater involvement of women not just in the sales or production roles but also in the services and expanding the life cycle of the product and expanded income generation potential. Success of business innovations is nested in enabling policies and skill development. Greater focus needed on research and innovation enablers and financial access for R&D in the eco system. Income, education and user satisfaction are key drivers for sustained solar use to counteract lack of political will in transformational journeys.

Policy support enhancement to various circular business models advocacy and education focussed on modular product design, product service system model, skilling in repair and maintenance of existing installations and products can boost clean energy transition among rural and urban poor.

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# Annexures

## Annexure 1

List of micro-solar and eco entrepreneurs who were part of the study

SI No	Name	
1	Manasi Pari	West Midnapore
2	Shiuli Digar	West Midnapore
3	Archana Das	West Midnapore
4	Falgunn Pradhan Das	West Midnapore
5	Tagari Pradhan Das	West Midnapore
6	Rina Hembram	West Midnapore
7	Mitali Das Dutta	West Midnapore
8	Basanti Hansda	West Midnapore
9	Jharna Hansda	West Midnapore
10	Supriya Maikap	West Midnapore
11	Pratima Patra	West Midnapore
12	Soma Adhikari	West Midnapore
13	Sulata Roy	West Midnapore
14	Shampa Chanda	West Midnapore
15	Debashree Dev	West Midnapore
16	Sangita Dey	West Midnapore
17	Mamata Mahapatra	West Midnapore
18	Susama Mahapatra	West Midnapore
19	Priyanka Mahapatra	West Midnapore
20	Chandana Das	West Midnapore
21	Arati Das	West Midnapore
22	Archana Jana	West Midnapore
23	Putul Dey	West Midnapore
24	Pinki Pradhan	West Midnapore
25	Sulata Bhunia	West Midnapore
26	Nisha Das	West Midnapore
27	Soma Jana	West Midnapore
28	Moumita Dey	West Midnapore
29	Rinku Dey	West Midnapore
30	Rinku Jana	West Midnapore
31	Bindu Jana	West Midnapore
32	Sunita Samanta	West Midnapore
33	Nupur Jana	West Midnapore
34	Renuka Das	West Midnapore
35	Rekha Rani Barik	West Midnapore
36	Puspa Tudu	West Midnapore
37	Chandmoni Hembram	Jhargarm
38	Basanti Baskey	Jhargarm
39	Rakhi Misra	South 24 Parganas
40	Sudipti Halder	South 24 Parganas
41	Kanchan Paira	South 24 Parganas
42	Kamala Mandal	South 24 Parganas

43	Panu Mahali	Birbhum
44	Barnali Menali	Birbhum
45	Jayashri Tudu	Birbhum
46	Padmabati Tudu	Birbhum
47	Koushlaya Kisku	Birbhum
48	Alladi Besra	Birbhum
49	Madhabi Kisku	Birbhum
50	Sangita Sen	North 24 Parganas
51	Tanushree Chakraborty	Kolkata
52	Mohana Chatterjee	Kolkata
53	Banabithi Bhattacharyya	North 24 Parganas
54	Itika Ghosh	North 24 Parganas
55	Uma Banerjee	North 24 Parganas

## Annexure 2

### List of Stakeholders and Institutions Interviewed

Sl No	Institution	Name	Designation
1	The Indian Institute of Social Welfare and Business Management (IISWBM), Kolkata	Prof. Dr K M Agrawal	Head, MBA-Public Systems
2	The Indian Institute of Social Welfare and Business Management (IISWBM), Kolkata	Dr. Binoy K Choudhury	Associate Professor MBA- Energy Management
3	The Indian Institute of Bio - Social Research and Development- IBRAD	Prof. S. B. Roy	Chairman
4	The Indian Institute of Bio - Social Research and Development- IBRAD	Dr. Raktima Mukherjee	Senior Researcher.
5	Rollins College, Florida University	Dr. Mary Conway Dato'On	Professor of International Business and Social Entrepreneurship
6	Seva Kendra, Hijli, Kharagpur	Mr. Moven Ms. Ruth Roy	Program leads - NRM
7	Freelancer	Mominul Islam	Solar Technician Trainer
8	University of Calcutta	Prof. Sharmistha Banerjee	Dept. of Business Administration
9	Awareness Foundation	Mr. PP Mitra IES	Founder
10	Cathedral of Most Holy Rosary	Father Menezes	Pro-vicar
11	Paribesh Unnoyon Parishad, Sagar	Dr. Amalesh Mishra	Secretary