ADOPTION OF SOLAR TECHNOLOGY BY ENTREPRENEURS IN INDIA: OPPORTUNITIES & CHALLENGES

Thesis Submitted for the Award of the Degree of

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in

Commerce

By

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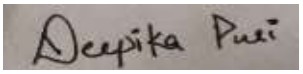
DECLARATION

I hereby declare that the thesis entitled **ADOPTION OF SOLAR TECHNOLOGY BY ENTREPRENEURS IN INDIA: OPPORTUNITIES & CHALLENGES** submitted to Lovely professional university, Jalandhar in fulfilment of the requirements for the degree of Doctor of Philosophy (Ph.D.) is the original and independent work carried out by me under the supervision of Dr Nitin Gupta working as Professor, Head of the Department, Mittal School of Business. This thesis has not been previously formed the basis for the award of any Degree, Diploma, Fellowship or other similar titles.



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CERTIFICATE

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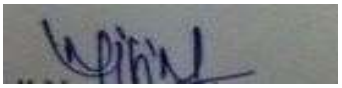

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ABSTRACT

Sustainable growth compels us to consistently preserve and enhance our resources by progressively altering our approach to technology creation and utilization. In an ideal scenario, any nation would possess a enough supply of employment opportunities, sustenance, energy, water, and sanitary facilities to satisfy the essential needs of all individuals. The fundamental principle of sustainable development revolves around the preservation of equilibrium between human endeavours and the environment, with the aim of guaranteeing that forthcoming generations would be afforded equal or enhanced possibilities as our present ones. This study further examines the performance of entrepreneurial firms that have opted to utilize solar energy in the agricultural sector. Furthermore, it investigates the characteristics that lead to entrepreneurial success within the framework of solar technology adoption. The study additionally examines the institutional frameworks that facilitate the establishment of a conducive atmosphere for promoting solar-powered entrepreneurial endeavour's that contribute to the advancement of rural areas. Furthermore, it identifies and assesses the overarching obstacles and prospects associated with the adoption of solar technology by entrepreneurs operating within the agricultural sector. The integrated study design, which combines quantitative and qualitative approaches, was chosen to achieve these aims and objectives. Embedded research design refers to a study that employs a randomized, controlled approach, incorporating qualitative data collection and analysis. The researcher collected and analyzed both quantitative and qualitative data for this study in the National Capital Region of Delhi. The quantitative research involved using a structured questionnaire survey, while the qualitative research involved conducting semi-structured interviews.

The primary objective of Research Objective-1 was to investigate the factors that influence entrepreneurship in the agricultural sector, specifically in relation to the adoption of solar technology. To achieve this objective, a total of 10 determinants were

carefully chosen and analyzed. These determinants were hypothesized to have an impact on entrepreneurs' decision-making process when considering the adoption of solar technology as a business activity. (1) Awareness; (2) Governmental mandates; (3) Solar Market Provisions; (4) Involvement of local citizens; (5) Prior expertise; (6) Stakeholder Confidence; (7) User-friendliness; (8) Simple upkeep. (9) Quality of life and (10) Additional enterprises. The factors that were found were compared among the respondents in order to assess the entrepreneur's inclination to embrace solar technology as a commercial endeavours. The findings of this study indicate that several factors had a significant influence on the adoption of solar technology among entrepreneurs. These factors include Consciousness, Governmental directives, Suppliers for the Solar Market, Participation of residents of the local area, Experience, Stakeholders Trust, and The Use of Solar Technology in Life. The influence of elements such as comfortable maintenance, living standards, and the impact of other business activities on entrepreneurs' decision to embrace solar technology was determined to be minor and lacking considerable impact. The researcher's primary aim, as outlined in Research Objective-2, was to investigate the performance of entrepreneurial firms. The aforementioned literature was used to analyse the following 9 Key Performance Indicators (KPIs) in this context. There are several key factors that contribute to the overall performance of a business. These factors include sales, overall profitability, business growth, service quality, level of customer satisfaction, level of employee satisfaction, product innovation status, process innovation status, and product quality. The study's findings indicate that Sales, Profits, Service Quality, Customer Satisfaction, Product Innovation, and Product Quality are major elements that influence the performance of entrepreneurial firms in the solar technology sector. The study revealed that characteristics such as Business Growth, Employee Satisfaction, and Process Innovation were determined to be statistically irrelevant and did not have a meaningful influence on the success of entrepreneurial firms in the context of solar technology.

Under Research Objective-3, the researcher sought to identify and assess the comprehensive potential and obstacles associated with the use of solar technology by entrepreneurs in the agriculture industry. The difficulties that were identified are as follows:The factors contributing to the issue are as follows: (a) Insufficient advertising;

(b) The necessity for a feasible national or state-level mini grid policy; (c) Insufficient skilled labour at the local level; (d) The significant disparity in awareness; (e) Marketing products to the intended customers; and (f) The substantial capital investment required. The recognition of these issues also resulted in the identification of the possibilities that have emerged as a result, which are stated below:The proposed benefits include: (1) the creation of employment opportunities; (2) the development of business expertise; (3) the sharing and transfer of knowledge and technology; (4) the facilitation of value-added product production and marketing within communities at competitive prices; (5) the utilization of solar equipment as a means of livelihood and savings in various settings such as homes, hotels, restaurants, and dhabas; (6) the stimulation of individual interest and subsequent growth in sales; and (7) the enhancement of living standards. The primary objective of Research Objective-4 was to conduct a comprehensive examination and analysis of the institutional frameworks that facilitate an environment favourable to solar-powered entrepreneurial endeavours, with the ultimate goal of enhancing rural communities.Three unique institutional frameworks were implemented by three institutions, namely SELCO, AIWC, and TERI, in order to promote RE-based entrepreneurship in India. The author delineated many parameters that serve as incentives for solar entrepreneurs and demonstrates that the results generated by different institutional arrangements are similar. SELCO exemplifies a private model wherein all partners are private enterprises, whereas AIWC and TERI employ partnership arrangements that are public-private and public-private-people, respectively. To summarize, the three examined institutions provide valuable understanding of three different institutional structures that influence RE-based entrepreneurship and provide a conducive entrepreneurial atmosphere. The researcher encountered several challenges over the course of her investigation. As a result of the study's restricted focus (and time limitations), she was unable to investigate variations in institutional structures across various areas of India, where solar entrepreneurs may encounter distinct obstacles. An in- depth investigation has been conducted on three groups to acquire a deeper understanding of the development and endorsement of current regulations for solar renewable energy- based entrepreneurship.

In the present study, the research primarily examined the role of different institutional structures in facilitating the growth of solar enterprises. It would be of great interest to conduct a comparative analysis of these structures in order to ascertain their relative effectiveness in future studies within this domain. Not only would this have potential scientific contributions, but it would also have policy implications. Moreover, utilizing observation techniques on a substantial quantity of solar-powered micro-businesses, along with conducting interviews with entrepreneurs, might enhance academics' comprehension of the impact of such entrepreneurship on communities. This will also enhance comprehension of the determinants that impact entrepreneurship and facilitate the identification of their relative significance and contextual relevance. The researcher further suggests that additional research is necessary to explore the identified gaps in this study, taking into account the quantitative and thematic analysis, as well as the improved conceptual framework. As mentioned earlier, the theoretical framework may be broadened to encompass the components identified and elaborated upon in this thesis for the purpose of investigating micro enterprises operating in the solar energy sector. In the future, it is imperative to conduct more methodical investigations on partnership arrangements in order to gain a deeper understanding of the dynamics involved when several players collaborate to accomplish a shared objective. This study aims to examine the characteristics of entrepreneurial initiatives and activities, as well as the outcomes generated by various institutional frameworks and the beneficiaries involved, including users, suppliers, and indirect stakeholders.

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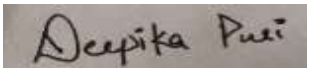

(**Deepika Puri)**

PREFACE

The primary objective of this study is to enhance our understanding of the institutional frameworks that facilitate a conducive environment for the promotion of solar-based entrepreneurial endeavours that contribute to rural development. Additionally, it aims to gain insights into the challenges and opportunities that agricultural entrepreneurs encounter when contemplating the adoption of solar technology. Chapter 1 provides an overview of the study's history, focusing on the context of entrepreneurship within the solar technology industry, specifically in relation to agriculture. Chapter 2 delves into the development of entrepreneurship in India, present employment system, overview of entrepreneurship development scenario in India. The chapter explores how entrepreneurship has grown over the years, shaped by Entrepreneurship Development Scenario**,** steps taken by government of India and recent initiatives to boost entrepreneurship. It also highlights the various challenges faced by Indian entrepreneurs before starting up. Chapter3 provides a comprehensive literature review on the fundamental concepts employed in this thesis, specifically rural development, entrepreneurship, institutions, and institutional arrangements. Additionally, it presents a conceptual framework derived from multiple constructs, which has been utilized to construct the conceptual framework employed in this study. The focus of Chapter 4 has been on the study's methodology. The document delineates the study design and offers a comprehensive account of the methodology employed in the creation of the research instrument. This chapter presents the sample characteristics, data processing procedures, and limitations of the present investigation. Chapter 5 of this study provides a comprehensive examination, in-depth analysis, and significant observations.In this chapter, the influence of independent factors on dependent variables is assessedand the formulated hypotheses are examined. It provides detailed explanations of the outcomes obtained through the utilization of statistical techniques and instruments. The analysis and examination of the relationship between independent and dependent variables were also conducted. The findings, consequences, and conclusions are presented in Chapter6.Additionally, it delineates the recommendations and their implications offering clear guidance for future actions.

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AIWC	:	All India Women's Conference
CIAE	:	Central Institute for Agricultural Engineering
CSE	:	Center for Science and Environment
DST	:	Department of Science and Technology
ESI	:	Entrepreneurial Social Infrastructure
GBIs	:	Generation-Based Incentives
GOI	:	Government of India
IIT	:	Indian Institute of Technology
IREDA	:	Indian Replenishable energy development agency
KPI	:	Key Performance Indicators
LaBL	:	Lighting a Billion Lives
MHP	:	Micro-HydropowerProgram
MMR	:	Mixed Method Research
MNRE	:	Ministry of new and Replenishable energy
MoU	:	Memorandum of Understanding
NGO	:	Non-Governmental Organization
NIMBY	:	Not In My Backyard
PLF	:	Plant Load Factor
PPPPP	:	Pro-Poor Public Private Partnerships
PV	:	Photovoltaic
PV	:	Photovoltaic Cells
RE	:	Replenishable energy
RETs	:	Replenishable energy technologies
SELCO	:	Solar Electric Light Company of India
SET	:	Solar Energy Technology
SHS	:	Solar Home Systems
SSS-NIRE	:	Sardar Swaran Singh National Institute of Replenishable energy
TERI	:	The Energy Research Institute of India
TFP	:	Total Factor Productivity

CHAPTER-1
INTRODUCTION

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1.1 ENTREPRENEURS – MEANING AND DEFINITION

The material, monetary, and human resources of a country determine its economic potential. It is possible for an economy to achieve higher levels of development via the acquisition of additional production items generally or through the improvement of technology. Planning a development with the purpose of making the most of its human resource base is a sound strategy. In light of this, industrialization is one path to socioeconomic advancement for every country. A nation's entrepreneurial spirit is the primary driver of economic progress. Being entrepreneurial is a trait that emerges from the interplay of the actions and behaviours of a distinct group of individuals called entrepreneurs. The conditions are right for entrepreneurship to flourish in India's economy right now. The importance of a supportive corporate environment in fostering the next generation of entrepreneurs is also generally agreed upon. Since rapid and sustained economic development is often the result of individuals displaying high-quality entrepreneurial abilities, it follows that these talents must emerge from within the environment.

It is possible for a country to have an abundance of both financial and natural resources. Inadequate entrepreneurship, however, would lead to resource usage that is less than expected. Entrepreneurs are valuable members of industrial society and should be treated as such. It is the responsibility of the entrepreneur to increase the gross domestic product, create jobs for others, and ensure his or her own financial stability.
The entrepreneur is a guy of economics who, via innovation, hopes to improve his earnings. Innovation entails problem-solving, and entrepreneurs get fulfilment from utilizing their expertise to overcome challenges. Women entrepreneurs are defined as those who initiate, plan, and oversee the operation of a company. The number of businesses started by women is growing at a fast pace. Entrepreneurs boost economic development by creating new employment for their communities via founding new firms. Rather of focusing on attracting long-standing enterprises like branch plants, many rural authorities are increasingly prioritizing the cultivation of young entrepreneurs due to the

fact that entrepreneurs are a key engine of economic development. Most lawmakers are aware that entrepreneurs often start out with little capital and run enterprises of varying sizes and in a wide range of industries. For this reason, many different types of business owners are usually helped by policies. Policies often fail to take into account the reality that the benefits an entrepreneur experiences could differ substantially depending on their goal for the company's future development. Furthermore, rural regions are often devoid of these high-growth enterprises.

The French term ―entrepreneur‖ originally meant someone who planned certain kinds of entertainment, such as musical performances. The English word ―entrepreneurship‖ is derived from this meaning. According to the 1897 edition of the Oxford English Dictionary, an entrepreneur is someone who organizes entertainment, especially musical concerts, much like a director or manager of a public musical institution. Its earliest use was in the early sixteenth century, and by the 17th century it had come to mean those connected with military missions. Civil engineering activities, such as construction and fortification, were thereafter included.

1.1.1 DEFINITIONS OF AN ENTREPRENEUR

Originating with the French word entrependre, meaning to take on or play the role of a mediator.

In 1725, Richard Cantillon said that an entrepreneur is someone who buys something at a certain price with the plan to sell it for a different, unspecified price. In doing so, they take into account the inherent risks in conducting business while deciding how to employ and acquire resources.

A.B. Say (1803): An entrepreneur is a kind of economic actor who uses land, labour, and capital, among other production resources, to make a product. The profit is what remains after he pays the rent on the land, the wage of the labour force, and the interest on the capital via selling the items to the market. He shifts economic resources from a less productive area to one that is more productive and yields more. Schumpeter asserts in 1934 that entrepreneurs are creative thinkers who use a strategy to disrupt existing commodities and services in order to introduce new ones. Someone with an intense desire

to succeed is an entrepreneur [N-Ach]. He goes out of his way and takes calculated risks. An entrepreneur awaits change, responds to it, and grabs opportunities (Peter Drucker, 1964). Entrepreneurs are masters at transforming ideas into tangible assets since innovation is a unique weapon at their disposal. It is critical to highlight the function of the imitator entrepreneur in emerging economies, who copies rather than invents new technology (Kilby, 1971). Self-motivated, risk-taking individuals with an internal control locus are the hallmarks of entrepreneurs, according to Albert Shapero's 1975 definition. In 1983, G. Pinchot defined an intrapreneur as an entrepreneur with experience working for a preexisting business.

1.1.2 TYPES OF ENTREPRENEURS

Enterprising individuals are unique. This group consists of owner-managers who are willing to take risks, handle the day-to-day operations of the business, reap the rewards of success, and face the consequences of failure. Managers make judgments on whether to innovate, which innovations to adopt, and how to collect and combine resources in order to generate change and provide their firm a competitive edge. Even But there are big differences in how company owners do things. Many different types of entrepreneurs contribute to the well-being of their local communities. At its core, the Kauffman Centre for Entrepreneurial Leadership distinguishes between ―high growth‖ and ―lifestyle‖ entrepreneurs.

Way of lifePeople who wanted to live the way they wanted to live or help support their families started new enterprises. The freedom and ability to choose their own schedules are common goals for many company entrepreneurs. When it comes to their chosen lifestyles, some entrepreneurs put their personal development last. In most cases, these company heads don't have a large staff. Local hardware shops, consultants who work out of their homes, and family-owned grocery stores are all examples of companies operated by parents. Because of their emphasis on lifestyles, the benefits of these firms are mostly linked to the enhancement of community quality of life. A common motivation for entrepreneurs experiencing rapid expansion is the desire to build brands that are instantly recognizable and amass substantial wealth. Acquiring the resources needed to enable growth is often the primary focus of these businesses. Many entrepreneurs want to take their company public once they've achieved a certain degree of success. Inventions that

have a big impact on the market's competitive landscape are common among high- growth entrepreneurial firms. There is a widespread belief among community leaders that fast-growing companies are the most beneficial to local economies. Due to the nature of the proposed study, to examine and analyze the opportunities and challenges related to the use of solar technology by agri-business entrepreneurs, a solid grounding in the agri- business is essential.

1.1.3 VALUE OF ENTREPRENEURS TO THE COMMUNITY

Local economies are greatly boosted by entrepreneurs. It is evident that this conclusion is borne out by the many entrepreneurial development programs launched by municipalities during the last 20 years. Almost no new businesses make it through their first few years, and even fewer manage to expand rapidly (Malecki 1988). The new entrepreneurship effort, on the other hand, is a response to the growing consensus that entrepreneurs are vital to regional economies. Entrepreneurs are obviously important on a national and local level. Gross domestic product (GDP) grows more quickly in countries where entrepreneurs are more active. Entrepreneurship accounts for a third of the variance in economic growth rates among countries (Reynolds, Hay and Camp, 2020).

1.1.4 ENTREPRENEURIAL FIRM PERFORMANCE

An excellent vantage point from which to discuss a company's success is its performance. To be more specific, there is a wide gap between the actions of organizations—that is, the production and sale of goods and services—and our own observations as academics. Researchers interested in quantitative company-level studies often wonder what variables, all else being equal, cause differences in firm performance. Nevertheless, business owners are more likely to be concerned with the company's financial line than with the expansion of jobs, which is why our success criteria may differ. Similar to the elephant in the blind men's tale, companies seem quite different when seen via multiple criteria.

1.2 AGRI-BUSINESS

Farming includes tending to fields, planting seeds, harvesting crops, caring for livestock, and feeding animals. Up until recently, this image accurately depicted the situation. Modern farming, however, is much different. Everyone involved in the production, distribution, and consumption of food and fibre4 is a part of agribusiness, the contemporary agricultural sector. Everyone from farmers to those who provide farming inputs (such as seed, chemicals, and financing), process the raw materials (such as milk, grain, and meat), and then sell the final goods (such as ice cream, bread, and cereal) to consumers (through channels like food-joints and supermarkets) are all part of the agribusiness industry.

The agriculture industry has been through a rapid transformation due to the emergence of new sectors and the expansion and specialization of traditional agricultural activities. The shift happened over time as a result of several factors rather than all at once. Having a basic understanding of the evolution of agribusiness across time helps in comprehending its current operations and its probable future changes. At first, working as a farmer was easy since farming was the primary business; nevertheless, efficiency was poor. It is common practice for farmers to simply produce enough food to sustain a family of four. Consequently, most farmers could fend for themselves. The bulk of their production inputs, including as seed, draught animals, feed, and basic farming equipment, were manufactured by them. Traditional farm families processed their own food and clothes from the crops they grew. They ended up eating or using almost all of their production. Auctioned off for profit was the little portion of harvest that went unused on the farm. Using these goods, the small fraction of the people living in cities and villages was provided with food and clothing. Only a few of agricultural products made it to the export market, where they were purchased by consumers in other countries.

It was more lucrative for farmers to concentrate on production, so they started buying inputs they had previously made. Others capitalized on this trend by starting companies to meet the need for production agricultural inputs including seed, machinery, and tools. The agricultural inputs industry is one in which these farms are active. Around 75% of all inputs used in production agriculture come from input farms, which are a large part of the

agribusiness sector. These farms produce a diverse array of items depending on technology. As the agricultural supply sector underwent transformation, a comparable evaluation was carried out to account for the off-farm relocation of commodities and food manufacturing. Changing the shape of most commodities (such wheat, rice, milk, livestock, etc.) would make them more useful and convenient for buyers. For example, instead of grinding their own wheat before making a cake, customers would rather buy flour. The convenience of buying flour, rather than wheat, an unprocessed agricultural product, makes them willing to pay a premium for it.

1.3 SOLAR TECHNOLOGY

The energy consumption in India has increased twofold since the year 2000 and is expected to increase even more by 2040, making up a quarter of the global increase during that period (MNRE, 2014). With a production capacity of 1,174 TWh (FY14), India is the fourth largest consumer and fourth-largest producer of electricity globally (IBEF 2016). India ranks third in global energy production, yet over 250 million people still do not have access to it (Galan, 2015). There will be far-reaching consequences for the world economy and the power sector as a result of India's predicted rapid energy consumption, given the country's 1.3 billion inhabitants and rapidly expanding middle class. According to Hubacek (2007). The key areas of focus are the promotion of hydro, replenishable energy, gas-based products, and the use of clean coal technology. By 2021, replenishable energy (RE) is expected to have increased by 41 GW, in order to meet the increasing energy demand. ―Cornot-Gandolphe (2016)‖

There are advantages and disadvantages to India's present energy scenario. The power industry continues to rely heavily on coal production. Most of India's 557 million metric tons (mt) of coal production in 2012–2013 went toward fuelling the country's rapidly growing power industry. A target of 795 million tons of production was set for 2016–17. Concurrently, with local production falling short of demand, India is more reliant on imports to cover its natural gas demands, making this a top priority for the country (Mondial, 2013).

Massive energy poverty and access inequities afflict the subcontinent. One census estimates that 77 million Indian households still use kerosene as a source of illumination (Lam et al, 2012). In order to be considered to be living in energy poverty, one must be deprived of both the most basic services (such as water supply, information exchange, improved health care, and education services) and a means to supplement local production (such as 120 kWh of electricity per capita per year for lighting or 35 kg of liquid and/or gas fuels per capita per year). The study was conducted by Palaniappan et al. in 2010. As many as 44% of families in rural India do not have access to power, making the situation much more serious (Athreya et al., 2010). Because of geographical constraints and problems with access, finding a solution is more expensive and time- consuming in rural areas. Because raising living standards in rural India is an important objective, this stands in the way of rural development. Having access to economical electricity for home and agricultural usage impacts rural regions' potential to create employment and income.

Research indicates that expanding solar and nuclear power capacity is critical in light of the aforementioned issues associated with India's heavy use of coal in its power sector and the lack of electricity in rural regions. In order for India to meet its goal of using 40% renewable energy by 2040, the country would have to spend $120–130 billion on 175 GW of renewable energy, also known as replenishable energy, by 2022. (TATA Power Solar, 2014). A shift toward renewable energy has emerged in response to these issues. When it comes to renewable energy (RE), the Government of India (GOI) goes to the MNRE as well as the Ministry of Power for most of its information needs. This ministry's stated goal is to assist the nation in meeting its increasing energy needs via the creation and execution of innovative and renewable energy solutions. The need of switching to alternative energy sources should not be stressed enough without first highlighting the causes and contexts of energy use.

Solar power capacity objectives for agriculture and other sectors are challenging to achieve due to the many issues associated with solar energy use in this sector. Priority one is the need for land. Solar power installations are instantly linked to land. The more sunshine a piece of land gets, the better it is for solar panels. A significant obstacle is the

lack of large tracts of land dedicated only to solar energy generation. To keep arable land safe, the MNRE has mandated and given preference for solar systems to be constructed on abandoned or unused properties.More efficient technology can reduce the amount of land required, although the amount of land needed could vary depending on the technology. Essential difficulties that need innovative solutions are high land costs and obstacles to acquiring land.

Up from 20 GW by 2021–2022, the MNRE has increased the target for grid-connected solar projects under the NSM to 100 GW by 2024–2025. During 2008 and 2009, its highest output was just 6 MW. A substantial portion of the quick increase in solar installation capacity in India may be attributed to the Made in India program, which promotes local manufacture. Based on the amount of solar power that has been deployed, India ranks sixth globally. The goal for 2022 was surpassed by a total of 25,212.26 MW of installed solar power by the end of 2018.

The remaining solar power production for 2018–2019 and 2019–2020 will be put up for yearly bid by the MNRE. Their goal is to build 100 GW of additional solar power output by March 2023. According to this plan, we can complete the project in another two years. Prices will be drastically reduced by the use of competitive bidding to establish tariffs (reverse e-auction). Solar power cost around INR 18 per kilowatt-hour in 2010. Roughly 75,000 acres have been acquired out of the almost 10 million acres set aside for the different parks with solar electricity.

An analysis of the capacity enhancement in respect to the objective is shown in the table below. The data demonstrates a sharp increase in the pace of capacity acquisition.

Year	Solar power additions in MW	
	Target	Achievements
2013-2014	1100	932.1
2014-2015	1100	1112
2015-2016	1400	3019
2016-2017	9100	5526
2017-2018	10000	9363
2018-2019	10000	3270
2019-2020	12000	8000
2020-2021	12000	9500
2021-2022	18000	15000
2022-2023	20000	19000
2023-2024	22000	Ongoing

Table-1.1: Increase in solar capacity relative to the goal between 2013–2014 and 2023– 2024.

1.4 APPLICATION OF SOLAR ENERGY IN THE AGRICULTURE SECTOR

Solar power might revolutionize the agriculture industry. Irrigating crops, building cold storage facilities in rural areas, and sending extra electricity into the grid may all boost farmers' revenues. Solar energy collecting is like planting a new crop for farmers: it provides a steady income stream regardless of weather conditions. Power in rural India is spotty and unreliable, even when grid lines are there. Several sites in the far north and northeast pose difficulties for grid and distribution line installations because to the high and uneven terrains. The use of solar electricity to bridge this power deficit may completely alter the playing field.

Irrigation Run by Solar Energy: A major advancement in solar power technology, solar irrigation pumps have great potential for the growth and development of the agricultural sector. They may be set up in any remote farmland that doesn't have access to the grid or

any other kind of electrical power. In rural regions, where agriculture is already flourishing, sunlight is plentiful, which is the only thing it needs. Solar pumps would replace electrical and diesel pumps. The country's electric pump set count was 14.33 million in 2018 and 6.26 million in diesel pump set count.

The second way solar energy is used in agriculture is by planting solar panels, which are essentially crops, in fields. It is possible to harvest crops and produce electricity by covering a whole farmland with solar cells. This situation is analogous to growing a single crop of solar panels at a height of fifteen to twenty feet above the field's food crop. When placed so that plants still get an adequate amount of sunshine and wind, studies done all over the globe have shown that shade from solar panels does not hinder crop growth. It has also been seen in trials in Gujarat, where solar panels are arranged with chessboard-like gaps at a height of around 15 feet from the ground (GERMI) to ensure that crops get adequate sunlight. Solar energy exchange, an experimental method, was first implemented in Japan. Akira Nagashima came up with the idea of putting solar panels over farmland in the form of a shaderoof, with holes cut into it to allow air to flow through and sunlight to reach the crops below. The fact that photosynthesis cannot be sustained in sunlight beyond a certain optimum intensity lends credence to the notion. Consequently, surplus sunlight may be converted into energy.

Agribusiness value chains including cold storage:Potential applications of solar energy in the agri-value chain include: solar-irrigated farms; solar-powered cold storages/chillers in remote areas for foods with a short shelf life, such as milk, fruits, and vegetables; solar-powered transportation, such as reefer vans; and solar-powered retail outlets, such as the push carts used by street vendors. India, the world's second-largest producer of horticulture, has substantial post-harvest losses.Cold storage is an essential link in the supply chain for farmers and suppliers who face the danger of crop loss due to the delicate nature of the food. Because electricity is so erratic and sometimes unavailable in remote rural regions, cold storage solutions are more important than ever. Powering our homes and businesses with diesel is a shortsighted and unsustainable energy strategy. One possible substitute would be to install solar panels on top of warehouses or storage facilities; these types of buildings often have limited or no adjacent grid connections. For

a sum of Rs 20,000, spread out over 15 years, the Central Institute of Atomic Energy (CIAE) in Bhopal constructed a 20 kwp plant with power storage that measured 5 by 4.4 by 3 meters. It was found that mangoes had an enhanced quality, longer shelf life, and less weight. It is possible that farmers may save money if they reduced waste in agricultural output. This is a tremendous technical advance for the agri-value chains, especially when you think about the United States' storage capacity, which is less than 10% of NCCD (31 million metric tonnes) and the country's overall storage infrastructure problems.

Missouri, USA: Along Route 66, solar-panelled roads are being constructed to generate electricity. Solar Roadways is developing it; they're a crowdsourcing company that specializes in solar road and parking lot construction. The roadways would be covered with tempered glass so that automobiles could drive on them. The hexagonal panels' inclusion of LED lights for signage also makes paint markers redundant. The common issue of snow on roadways in the US would also be mitigated by the heating devices installed in these vehicles. In a joint effort with the US, France aspires to build 600 miles of solar-powered highways.

Solar photovoltaic (PV) cells were developed in 1954 at the United States' Bell Labs; they have been used to power space missions since the late 1950s, according to photovoltaic technology. Small semiconductor photovoltaic panels collect sunlight and convert it into usable power for many uses in this method. Outdoor Dehydrator: Freezing food is one of the most common and time-honoured methods of food preservation, and it also increases the nutritional content of dried food. Dehydration allows food to be dried, which not only keeps it fresh for longer but also prevents it from spoiling. Due to a decrease in microbial enzymatic activity and a slowing of chemical processes, drying increases the product's shelf life. Materials and packaging that are lighter and smaller in volume are not only cheaper to produce, but also simpler to transport and store. A large number of consumers, including food service establishments like restaurants and barracks, may be supplied with potatoes in their dried form. Drying aids in loss reduction and marketing management at critical periods. Sunlight was first used to dry wheat and other crops. Solar dryers are superior to open-air methods in many respects, including

protection of grains and fruits and vegetables, decrease of loss, drying time, drying uniformity, and overall product quality.

Energy is used for a multitude of purposes beyond only home and agricultural demands in rural areas. In rural India, grid-supplied electricity makes up the gap, but kerosene and local biomass provide around three quarters of the energy required for lighting and cooking. In 2015, the World Bank In rural regions, agriculture uses the second-highest amount of energy, with diesel and electricity being the primary sources. People and animals provide the bulk of the energy required for domestic and agricultural purposes. According to Khamati-Njenga and Clancy (2005), there is a negative correlation between health and the use of kerosene, inefficient biomass usage, and insufficient ventilation.

Table 1.2: A source of where rural Indians get their power from and how it's used for homes and businesses.

Need	Use and Sources
"Domestic	Cooking - Biomass, kerosene, LPG, Kerosene, LPG, grid electricity Lighting (including street lighting) - Kerosene, Grid electricity, solar Other uses - Grid electricity, renewables (solar, biomass, etc.)
Agricultural	Grid electricity, renewables, animal/human energy
Industrial or commercial (including institutions and Government)	Grid electricity, captive generation (diesel/kerosene/petrol), Renewable
Transport	Diesel/Petrol, Grid electricity, Coal (very limited in railways)"

1.4.1 CAUSES OF RISING ENERGY DEMAND TREND

In 2024, India is expected to become the world's second-largest coal user, overtaking the US (2014). from China forward. According to BP (2015), the majority of the rise in global coal consumption up to 2030 will be accounted for by China, at 29%, and 63% by India. Table 1.3 shows that there are a variety of potential sources of the present rising trend in energy consumption, according to the Centre for Rural Information and Insights (Kearney, 2010).

Table 1.3: Nature and cause of energy need (Ranjit, 2011)

Causes	Nature
Everyday necessities in rural India	Energy is needed not only for the kitchen, but also for other everyday tasks such as lighting, heating, and powering appliances.
Agricultural subsidies and initiatives encourage increased energy consumption	Agriculture is the third-largest consumer of electricity in India, using 22 percent of the country's total supply. There has been an uptick in consumption due to subsidies.
Government regulations can lead to inefficient providers	Rural Electric Cooperatives and other independent providers now must comply with tight government restrictions or face the prospect of raising rates or lowering quality.
Inadequate infrastructure cannot support increased demand	In rural areas of India, electricity is sometimes available but has trouble reaching homes and businesses. Power equipment, such as transmission lines, that isn't up to par causes a significant amount of energy loss during transmission, according to energy audits. This prompted initiatives in Meghalaya and Tripura to instal hydroelectric dams and wind farms.

1.4.2 ISSUES WITH EXPANDING THE COAL BASED POWER INFRASTRUCTURE IN INDIA

Productivity has dropped throughout the last five years due to problems with coal supplies (NTPC, 2012). There are a number of problems with keeping things as they are, and they fall into four broad categories:

To begin, there is the inherent difficulty in dealing with coal due to its nature and availability: First, there is growing environmental concern about problems including water pollution, fly ash disposal, waste management, and land degradation; second, Indian coal has 30% less calories than imported coal (Sloss, 2015). Finally, there are a number of problems stemming from the infrastructure, which is a growing concern. Thirdly, energy imports made up 7% of GDP in 2013, which is about twice the amount as Japan (4% of GDP) and Germany (3.3%), according to a study by the New York Academy of Science. As a result, the import of coal increased by 21% in 2012 and 2013 (TATA power solar, 2014).

Investments and installed capacity in the industry indicate a future transition to alternative energy. In 2016, IRENA According to the Rajasthan Solar Policy, which was launched in 2011, solar power parks that are authorized for manufacturing solar panels are to be constructed. To further guarantee that the projects inside the Gujarat Solar Park have access to the required tools, sufficient repair and maintenance services, and a steady supply of skilled labourers, the park also provides incentives for the construction of on- site manufacturing facilities.The Electricity Act of 2003 places limitations on foreign direct investment (FDI) up to a maximum of 100% for projects that generate and distribute renewable energy (NTPC, 2014).

India is required under the UNFCCC (2007) to add 545 GW to its electricity capacity during the next quarter of a century. Research by Mahindra's Centre for Rural Information and Insights (2013) examined the energy problems faced by India and the areas where renewable energy technologies (RETs) are opening up new possibilities for sustainable energy development.They found that at times of peak demand, India's energy shortages range from 10.3 to 15.4 percent. As the Indian economy and population continue to grow, the country's energy demands are expected to increase. Nevertheless, it is heartening to see RET production and installed capacity on the rise. For instance, compared to 20 MW in 2011, India's installed solar capacity increased to 3.74 GW as of March 31, 2015 (Martin, 2015).

1.5 REPLENISHABLE ENERGY POTENTIAL IN INDIA: ACTORS AND INSTITUTIONAL STRUCTURE

Renewable energy sources account for over 12.3 percent of India's total installed capacity (Krithika, 2014). According to MNRE (2013), the vast majority of the generating capacity is linked to the grid, while only a small percentage is derived from sources outside of the grid. When it comes to renewable power generation, India ranks sixth globally (REN21, 2013). From 2002 to 2012, the use of renewable energy sources increased at a CAGR of 22%, continuing a trend of fast expansion. From 2005–2006 to 2009–2011, installations increased from less than 10 MW to more than 0.7 GW MW, and by 2013, they had reached almost 30 GW, demonstrating the very remarkable development rate of solar energy during the previous three years (2009–2012). [2013, MNRE]

The area of renewable energy is one in which many Indian organizations are actively involved. In India, the main government agency in charge of replenishable energy programs on a national level is the Ministry of New and Replenishable Energy (MNRE). The Ministry of Energy's principal objective is to address the increasing energy needs of the country via the research, development, and implementation of alternative energy technologies. Resource evaluations for renewable energy sources are another service that MNRE provides, in addition to assisting with R&D. Solar Energy Centre, C-WET (Center for Wind Energy Technology), and SSS-NIRE (Sardar Swaran Singh National Institute of Replenishable Energy) are a few of the technical institutions housed within the Ministry of New and Replenishable Energy (MNRE) that act as nodes for particular forms of replenishable energy. Coordinating the statewide execution of replenishable energy and cogeneration projects is the responsibility of a complex web of state government institutions. In addition to helping distribute government subsidies for replenishable energy projects, these groups also operate pilot programs to demonstrate the technology's advantages and provide assistance to anybody else interested in becoming involved. On top of that, there are a number of private sector organizations, both nonprofit and for-profit, that provide rural residents and farmers with replenishable energy (RE) technology and assist would-be entrepreneurs in small towns in establishing RE-based microbusinesses.

Table 1.4: Key players in the renewable sector (MNRE, 2015)

	Centre	State	Private
Policy	MNRE/ IREDA	State energy departments (e.g., GEDA, KREDL)	
Regulation	CERC	SERC	
Solar manufacturing	BHEL, BEL		TATA Power, Others
Wind manufacturing	BHEL		Suzlon, others
R & D	MNRE R&D institute (SEC, C-WET, etc.) R&D centers under central Universities, Department of Science and Technology (DST)	Research institute under the state PSUs and state Universities.	University research institute, private company R&D centers, etc. The Energy Research Institute (TERI)

In Table 1.4, you can see a list of all the companies involved in renewable energy in India. Programs targeting the development of alternative fuels and applications, the utilization of replenishable energy in residential, commercial, and industrial settings, and its application in rural areas for household needs such as lighting, cooking, and transportation have all been spearheaded by the Ministry of New and Replenishable Energy (MNRE). It also promotes the research, manufacturing, and distribution of renewable power goods and services to rural areas, where locals may utilize them to launch energy-based enterprises.

To encourage the use of renewable energy sources, the government offers several incentives. A few examples of these incentives include generation-based incentives (GBIs), fiscal incentives, viability gap funding, concessional financing, and interest and capital incentives. The National Solar Mission aimed to lower the cost of solar power

production in the nation via a long-term strategy, ambitious deployment objectives, intensive research and development, and local manufacture of critical raw materials, components, and products. Studying and using solar power to generate electricity and other forms of renewable energy is something the Mission strongly supports. There has been a steady decline in the price of renewable energy, particularly when contrasted with more conventional energy sources like fossil fuels.The establishment of the IREDA, a dedicated financial agency, has provided a significant boost to the advocacy, planning, and provision of funding for efficiency and conservation initiatives related to renewable electricity.

Renewable energy sources accounted for 2% of the nation's total installed capacity in April 2002, with 3475 MW of capacity. It contributed around 4.13% to the total power mix in 2010 and had reached 18,655 MW by year's end, making up more over 11% of the total installed capacity of 1,68,945 MW (MNRE, 2011). Renewable energy sources (RETs) such as solar, wind, hydro, and bio-mass have been the focus of significant research and development efforts in India's governmental and corporate sectors for the last few decades. Actually, by aggressively encouraging renewable energy production, several Indian states are leading the way for the remainder of the nation. In 2010, solar power was most prevalent in Gujarat, wind power in Tamil Nadu, small hydro development in Himachal Pradesh, and biomass usage in Punjab and Haryana. Finally, renewable energy sources are a vital component of India's energy mix since they provide universal access to power and stimulate development in rural areas. Renewable energy, especially wind and solar, will see a meteoric surge in use as a result of stringent government policies.An impending meteoric spike in energy consumption is likely due to the fact that 44% of India's rural population lacks access to reliable, contemporary power. In addition to being a viable alternative to traditional energy sources, replenishable energy has the ability to play a pivotal role in achieving key policy objectives (MNRE, 2011a). It strengthens India's energy security by reducing the country's dependence on imported fossil fuels and diversifying its energy mix. Solar power, especially in rural regions, is seen as a way for India to become energy independent in the long run (PC, 2006). The basic energy needs of the Indian people, particularly those living in rural and remote areas, may be adequately met by using

replenishable energy sources in addition to traditional energy production (PC, 2007). The growth of renewable energy sources in India has been greatly influenced by private investment.

1.6 ACTORS OF INSTITUTIONAL ARRANGEMENTS USED IN THIS STUDY

1.6.1 SOLAR ELECTRIC LIGHT COMPANY OF INDIA (SELCO)

Many different people and organizations will need to pitch in for SELCO's business strategy to be successful in its management and operational aspects. First, you must take notice of what they are and how they communicate before you can understand their relationships. To begin, SELCO has been collaborating with credit-cooperatives, micro-finance institutions, and RRBs to provide its solar system buyers with the essential financing options. Traditional banks are hesitant to provide loans in rural regions because borrowers often lack the typical collateral, guarantees, and margin funds that are required to secure a loan. A solar-powered microbusiness may be funded with the assistance of SELCO, which functions more as a facilitator than a guarantor. One of the key reasons banks are unwilling to provide loans in rural regions might be the remembering mechanism, which makes it difficult to accommodate return schedules and preferences that are every day or week instead of monthly.The administrative and transactional burden on the bank is increased as a result. Nevertheless, SELCO often arranges micro- business finance via a bank in cases when an owner has bought solar-equipment from the organization. On rare occasions, SELCO may also provide a bridging loan to customers who are deemed financially unable to obtain the necessary margin funds.Additionally, SELCO only partners with regional vendors. Reliable electrical components are essential for rural India, and SELCO is willing to sacrifice some technical expertise to get them. Meeting with local businesses is a common SELCO practice for brainstorming new and improved ways of doing things.Thirdly, SELCO collaborates with a wide range of community-based groups and NGOs since they know that supplier contacts can't foster innovation in every way. One example is the partnership between SELCO, SEWA, and other rural community- and volunteer-based groups. This matters because, without the help of civic organizations, SELCO would find it far more difficult to win over the

community.Given that SELCO develops products with each customer's needs and feedback in mind, the ability to interact with consumers and company owners is even more important for the team. Consequently, local organizations play a crucial role as stakeholders for SELCO in this situation. Fourth, SELCO's marketing and R&D divisions are also essential stakeholders, along with the business owners. It is critical for SELCO to maintain an open channel of communication with business owners and come up with innovative solutions to help their operations, like developing solar-based technologies that are more appropriate for a specific issue or purpose, because the success of new products and designs depends on feedback from these owners. In addition, the technical team of SELCO places a premium on meeting with locals to understand their specific desires and requirements, rather than spending any of the company's income on advertising or marketing. This ensures that SELCO and its clients are constantly exchanging knowledge and information.

1.6.2 ALL INDIA WOMEN'S CONFERENCE

With its main office in India and branches in many other South Asian countries, the AIWC is an international organization. It serves as the hub of the MNRE in terms of spreading information about renewable energy and how women may benefit from it. Additional funding for AIWC-managed training and pilot projects comes from the MNRE's finance arm, IREDA. The organization has strong linkages to the Ministry's green business incubators and RET development centers, and it has a long history of collaboration with MNRE (formerly MNE). The majority of the AIWC's training courses, however, are developed and delivered by educational institutions, scientific think tanks, volunteer groups, and NGOs. Several phases are included in each experimental program and orientation, which begins with the dissemination of Consciousness and continues with open meetings and workshops given to women company owners by a range of moderators from different AIWC partner colleges. In many ways, these types of partners are essential to the smooth operation of any educational or incubator program. Companies such as TATA Power Solar and Urja Unlimited, as well as NGOs and VOs, provide the AIWC with RETs. And they provide classes so low-income women may learn to produce RETs at home and start their own businesses. As an example, AIWC has

successfully held training courses on lights, air dryers, and solar water heaters for local communities. It also seems that in the slums of Delhi and Gujarat, women are making, repairing, and maintaining solar RETs. Anyone can get the training they need to run their own real estate-based business, whether it's out of their home or a street stand.

1.6.3 THE ENERGY RESEARCH INSTITUTE OF INDIA (TERI)

To rally support for the initiative among rural residents, TERI collaborates with local NGOs. Established in 2007, Lights a Billion Lives aims to provide affordable solar illumination to areas in India that are either completely or partially electrified. A quarter of solar firms are owned by women from low-income families. illumination a Billion Lives (LaBL) has ensured that 3,50,000 homes in India that are not yet linked to the electricity grid had dependable illumination. Any of India's 22 states would welcome you to join the course. Many other nations are connected to it by international routes, including Afghanistan, Pakistan, Nepal, Bangladesh, Myanmar, Uganda, Ethiopia, and Kenya. Here you may find the thoughts and feelings of a handful of solar company owners from all across India. Some of these perspectives have been culled from TERI's materials, while others have been derived from my own interactions with these business owners while doing fieldwork. The dual goals of this market value chain are to expand availability of reliable backup power sources and to improve the quality of replenishable energy sources already in use. The delivery of goods and services to their ultimate consumers is the main focus here. To construct a dependable and sustainable energy business chain, more financing, mentorship, and capacity building support is required. At the cluster and village levels, the initiative aims to expand energy entrepreneurs' service possibilities, such as connecting them to the delivery of clean drinking water. Lighting a Billion Lives (LaBL) is TERI's massive global campaign to provide 1 billion rural residents with solar lights. These lights not only provide high-quality light and a smoke- free indoor environment, but they also reduce the demand for fossil fuels like kerosene, which power plants use for lighting. TERI has made a special opportunity for young professionals and students to take part in this initiative.

1.7 RESEARCH CONTEXT

Entrepreneurs provide significant value to local economies. They promote short-term synergies in areas where entrepreneurial endeavors are forming and flourishing, and in the long run, they produce value on a local, national, and global scale (Wang, 2012). Instead than focusing on importing resources like money and people, an entrepreneurial approach to rural development aims to foster an entrepreneurial spirit among locals and help existing businesses grow (FAO, 2011).

A town's or region's economy benefits, people find work, and the community's scarce resources are protected. Supporting rural development, institutional diversity, and policy procedures, the entrepreneur's set values work in tandem to encourage dynamic and autonomous business. Academics and practitioners alike are coming to the consensus that proper institution-building is essential for understanding the impact of institutions on development (Barrett, Lee & Mcpeak, 2005).

India is in the top five worldwide places for renewable energy investment, according to Ernst & Young's 2011 Replenishable Energy Country Attractiveness Indices. According to Ernst & Young (2013), this nation actively encourages energy-based entrepreneurship and has seen a large number of public and private organizations transition to a green economy. In light of the current uptick in interest in RETs and related green initiatives in rural regions, studies investigating the future of rural development through the enhanced collaboration of various institutions to foster the expansion of entrepreneurship based on RE are necessary.

1.8 RESEARCH AIMS, OBJECTIVES, QUESTIONS & HYPOTHESIS

1.8.1 RESEARCH AIM

The primary objective of the research is to get a better understanding of the opportunities and challenges that solar energy might provide to agricultural entrepreneurs in the context of broad usage. We will also look at the good (new job creation, for example) and negative (social exclusion risk, for example) effects of entrepreneurship on rural development in this research. An in-depth analysis of rural entrepreneurs' roles in the

renewable energy sector is necessary as they are behind the pro-poor development efforts in many Latin American, African, and South Asian nations.[1]

1.8.2 RESEARCH OBJECTIVES

The precise goals of this study are as follows:

RO-1: To examine the Determinants of entrepreneurship in the context of solar technology adoption in agriculture sector.

RO-2: To investigate the Entrepreneurial Firm Performance in relation to entrepreneurs engaged in solar technology in the agriculture sector..

RO-3: To identify and analyze the overall opportunities and challenges for solar technology adoption by the entrepreneurs in agriculture sector

RO-4: To examine the institutional arrangements that help in the creation of an enabling environment for supporting solar based entrepreneurial initiatives.

1.8.3 RESEARCH QUESTION

Answering the first research question, what factors influence the use of solar technology in the agricultural sector?

The second research question concerns the level of performance of entrepreneurial firms in comparison to those entrepreneurs who are involved in solar technology for agricultural purposes.

Third Research Question: What are the main opportunities and challenges of solar technology that businesses in the agricultural industry face when trying to use it? Research Question 4: How can existing institutional frameworks support the growth of a favourable climate for solar-powered businesses that serve underserved communities?

[1] Davis, J. (2006). M P RA learning from local economic development experiences: Observations on integrated development programmes of the free state, republic of South Africa. (available online: https://core.ac.uk/download/pdf/6617334.pdf , accessed 10th August 2020)

1.8.4 RESEARCH HYPOTHESIS

Hypothesis 1: The adoption of solar technology in the agricultural sector is greatly affected by a number of important entrepreneurial factors.

The null hypothesis states that the adoption of solar technology in the agricultural sector is unaffected by entrepreneurial factors.

Regarding this, the following are the alternative hypotheses:

Hypothesis 1a: People are more likely to use solar power when they are aware of the many advantages that solar-powered goods and services provide.

Hypothesis 1a0: People's awareness of the advantages of solar-powered goods and services has no impact on their decision to use such technology.

Hypothesis 1b: Solar technology adoption is greatly affected by government regulations and standards for the manufacturing of solar energy equipment and consumer protection.

Hypothesis 1b0: Solar technology uptake is unaffected by government regulations and standards for solar energy equipment manufacture and customer protection.

Hypothesis 1c: The vendors in the solar energy industry have a substantial influence on the adoption of solar technology when it comes to the necessary accessories.

Hypothesis 1c0: The vendors in the solar energy industry have no influence on the adoption of solar technology when it comes to the necessary accessories.

Hypothesis1d: The adoption of solar technology is greatly affected by the level of participation of local inhabitants in its design and execution.

Hypothesis 1d0: The adoption of solar technology is unaffected by the level of participation of local inhabitants in its development and execution.

Hypothesis1e: Solar technology adoption is affected by prior experience with replenishable energy sources.

Hypothesis1e0: Solar technology adoption is unaffected by prior experience with replenishable energy sources.

Hypothesis1f: The trust of stakeholders has a substantial effect on the uptake of solar technology

Hypothesis1f0: The trust of Stakeholder has unaffected on the uptake of solar technology.

Hypothesis1g: The adoption of solar technology is greatly affected by the contribution of solar generated energy.

Hypothesis1g0: The adoption of solar technology is unaffected by the contribution of solar-powered energy.

Hypothesis 1h: The acceptance of solar technology is greatly affected by how easy it is to use solar energy equipment.

Hypothesis 1h0: Solar technology adoption is unaffected by the usability of solar energy equipment.

Hypothesis1i: Solar power's ability to raise living standards has a major bearing on how widely used solar panels are.

Hypothesis1i0: The influence of solar energy on raise living standards has little bearing on the uptake of solar technology.

Hypothesis1j: Entrepreneurs are greatly encouraged to embrace solar technology by the impact of other business activities in the region .

Hypothesis1j0: Entrepreneurs are not greatly encouraged to embrace solar technology by the impact of other businesses activities in the region..

Hypothesis 2: Key Performance Indicators (KPIs) in the agricultural sector reveal that the adoption of solar technology based goods has a substantial effect on firms performance.

Hypothesis 0: Key Performance Indicators (KPIs) in the agricultural sector reveal that the adoption of solar technology based goods has no effect on firms performance.

In this respect, the following constitute the alternative hypothesis.

Hypothesis 2a: Sales growth is significantly affected by the adoption of items based on solar technology.

Hypothesis 2a0: Sales growth is unaffected by the adoption of items based on solar technology.

Hypothesis 2b: The increase of profits is significantly affected by the adoption of items based on solar technology .

Hypothesis 2b0: The increase of profits is not significantly affected by the adoption of items based on solar technology .

Hypothesis 2c: The adoption of solar technology based products has significant impact on the expansion of the company

Hypothesis2c0: The adoption of solar technology based products has no impact on the Expansion.

Hypothesis 2d: A substantial effect on service quality is caused by the use of goods based on solar technology.

Hypothesis 2d0: The service quality is unaffected by the introduction of goods based on solar technology.

Hypothesis 2e: The adoption of items based on solar technology significantly affects consumer satisfaction.

Hypothesis 2e0: Customer satisfaction is unaffected by the adoption of items based on solar technology

Hypothesis 2f: The adoption of goods based on solar technology significantly affects employee satisfaction.

Hypothesis 2f0 :The adoption of goods based on solar technology does not affect employee satisfaction.

Hypothesis 2g: The adoption of solar technology based products has significant impact on the product innovation .

Hypothesis 2g0 :The adoption of solar technology based products has no significant impact on the product innovation.

Hypothesis 2h: The adoption of solar technology based products has significant impact on the process innovation .

Hypothesis 2h0: The adoption of solar technology based products has no significant impact on the process innovation.

Hypothesis 2i: The adoption of solar technology based products has significant impact on the product quality .

Hypothesis 2i0: The adoption of solar technology based products has no significant impact on the product quality.

H-3: There are ample opportunities for solar technology adoption by the entrepreneurs in agriculture sector in India.

H-4: The institutional arrangements significantly help in the creation of an enabling environment for supporting solar based entrepreneurial initiatives leading towards rural development.

CHAPTER-2

ENTREPRENEURSHIP DEVELOPMENT IN INDIA – GROWTH AND CHALLENGES

CHAPTER-2

ENTREPRENEURSHIP DEVELOPMENT IN INDIA – GROWTH AND CHALLENGES

The British government had showed little interest in India's burgeoning industrial sector before to the country's 1947 declaration of independence. As its main commercial activity in India, it had concentrated on exporting raw materials and importing finished items. India didn't begin implementing its Five-Year Plan until 1951 because the nation couldn't identify its goals until after it achieved independence. The bulk of India's GDP still came from agriculture, even after the nation achieved independence. But there were just a few of very noteworthy sectors. The administration decided to give industrial expansion and agricultural development the proportional priority they deserved throughout the first five-year plan. Heavy fundamental industries need substantial investment resources, hence the government decided to put them in the public sector. Certain strategically important industries, like defence and railway transport, have been reserved for the public sector in India, which is still a developing nation with a relatively low rate of capital formation. Private entrepreneurs, on the other hand, have been given free reign over the remaining industries. Little tweaks here and there allowed the administration to strengthen their plan over time. It shifted its focus from supporting large corporations to supporting small and medium-sized firms, as well as auxiliary businesses, after initially supporting village and small-scale enterprises that used locally available raw materials and skills.

With gradual expansion, the variety of small-scale firms that can afford to invest in plant and equipment has grown, giving birth to the concept of MSMEs.The government had prior knowledge of the correlation between the ease of obtaining bank loans and the expansion of businesses. Priority sector advances, which aim to prioritize the distribution of bank credit on moderate terms (i.e., relatively low interest rates and extended payback periods) and were made possible by the expansion of the banking network, which was accelerated following the partial nationalization of banks in 1969 and led to an increase in the number of branches. Priority sectors are given preference in the deployment of bank credit according to this notion. Several government-controlled industrial organizations

were losing money because competent managers weren't overseeing them. This led to the government realizing it couldn't do everything and eventually loosening limitations on the reserved list that affected private companies. Particularly after the Bank Nationalization, the SSI sector grew at an unprecedented rate. At the moment, the government is putting its energy into building the infrastructure that will allow the industrial sector to grow. At this time, the country's leadership is of the opinion that the micro, small, and medium enterprise (MSME) sector can make a substantial contribution to the expansion of the labour force. Consequently, the demands of the MSME sector are receiving special attention from all parties involved.

Another turning point in India's history occurred in 1991 in regard to the country's economic policy. Globalization, liberalization, and the privatization of several sectors were all parts of the administration's strategy. There was a rise in both the monetary value and the number of multinational enterprises that set up shop there once the country opened its economy to international trade. The domestic industries received a boost from this, which accelerated their adoption of cutting-edge technology. This allowed them to better compete in the competitive market.

For the first time in modern history, the industrial sector's contribution to GDP is higher than the agricultural sector's. Companies in the software, insurance, banking, and pharmaceutical industries, as well as those in the automotive and pharmaceutical manufacturing sectors, are well-known on a global scale. The pharmaceutical and automotive sectors are two examples of these types of businesses.

2.1Employment Scenario

There are too many qualified people in the country's labour force for the government to hire them all. The private sector must be heavily involved if we are to effectively create jobs that matter. When individuals in an economy are actively seeking job but are unable to locate any, this is known as unemployment. The unemployment rate, which is a common way to measure this, is determined by dividing the total number of unemployed persons by the total number of employed individuals.

Individuals are considered to be unemployed according to the International Labor Organization (ILO) if they do not currently have a job, are actively seeking employment, have wanted a job in the last four weeks, are able to begin working in the next two weeks, have found work and are waiting to start the job in the next two weeks, or have landed a job and are planning to start in the next two weeks.The Office of National Statistics uses the International Labor Organization's criteria to get an official estimate of the unemployment rate.

While the problem of unemployment is not exclusive to India's economy, it is a major worry for many countries throughout the globe. Several things may have combined to cause this mess. Unemployment is a result, in part, of the current state of technical progress, especially the widespread use of computers. Because capital development is minimal, there are limits on the generation of job opportunities. Work opportunities have shrunk due to the introduction of newly built equipment, even if there has been advancement in industrial and infrastructural development.

Because of the differences between the two, it is important to include both rural and urban occupations in any discussion of work. Some of the most up-to-date and historical statistics on India's unemployment rate are as follows:

Due to the widespread spread of the Corona Virus pandemic in India, the unemployment figures may have been grossly inaccurate. Around these regions, people may say things like that. But some have gone back, and most would like to remain in their hometowns, where state and federal governments are collaborating to create new employment opportunities. Migrant labourers who were sent to various states' industrial centers have gone back home as a result of the continuing lockdown. While a few have returned, the most majority have decided to remain in their home towns. The continuing lockdown situation has resulted in the closure of several enterprises that offered chances for self-employment. Almost every industry has felt the effects of the closure to some degree. Every year, millions of individuals found work in these businesses. Those who have contributed to the Employee's State Insurance (ESI) system will remain eligible for unemployment insurance under the government's

Atal Beema Vyakti Kalyan Yojana program. Employees will be safeguarded by this program all during the outbreak. Workers in India's formal sector have the option to enroll in the self-funding Employees State Insurance (ESI) program, which is administered by the Employees' State Insurance Corporation (ESIC).

2.1.1 Rural Employment

There are two main causes for the disproportionately high rural unemployment rate. First, the dissolution of family farms caused farmers to engage in less lucrative practises and prolonged an invisible kind of unemployment in rural regions. The second factor is that the changing circumstances necessitated agricultural automation, which has led to a shift in the rural working population. As a consequence, people are seeking job prospects in the nearby urban and metropolitan districts. A large portion of the workforce that has left rural regions lacks the necessary skills.

Let us bring to your attention a sobering truth in this section: the educational system has, for far too long, failed to recognize the value of students' abilities and the work they put into their studies. Unskilled work accounts for the vast majority of the employment opportunities for students who were unable to further their education due to failing the tenth or twelfth grade exams. Economic activity can only take it up to a certain point. The Skill Development Corporation of India has just lately started providing short-term training courses for a range of occupations, including wireman, plumber, carpenter, bar bender, and more, with a duration of up to three months. This has only just recently come to the notice of the government. Certificates will be awarded to students who demonstrate mastery of course material and who pass the exams administered by the aforementioned organization. Their marketability to potential employers will likely rise because of this. The specific case at hand is to a Killari-based department that was set up by the non- governmental organization PRATHAM. Despite the fact that this unit provides a number of services, such as residential accommodation and skill teaching, the reaction has been quite disappointing. Similarly, the L&T Training Centre in Khopoli is a cutting-edge facility, but it is not seeing the kind of occupancy rates that were expected. Job

possibilities for newly graduated students are made available via this centre through the various vendors with whom Larsen & Toubro collaborates.

Additionally, this state has first-hand knowledge of the lengthy period of time when the state-run Industrial Training Institutions were empty of students. Many businesses have chosen to implement industry-specific, short-term training programs as part of their CSR activities in response to the current focus on skill development by the federal government. These programs have shown to be beneficial for these companies.

2.1.2 Urban Employment

Lack of fundamental facilities like roads, transportation, energy generation, trained labor, etc., slowed the establishment of new enterprises in the early phases of industrialization. This contributes to the decline of the agriculture sector. Over time, the government's focus shifted to investing in the socioeconomic development of the nation, which led to improvements in roads, communication, educational opportunities, and medical care. The liberalization of the economy allowed for foreign direct investment (FDI) on a more temporary basis, which boosted its development, and it has only become faster since then. More and more individuals are able to afford higher education as time goes on. The public sector has stepped aside from the provision of higher education, with the private sector now taking the lead. There has been a proliferation of schools providing various forms of higher education during the last 30 years. These include schools of management, medical, and engineering, among many others. Rural communities may now access higher education just as metropolitan ones. The importance of education is widely recognized by the general public. Annually, the employment market welcomes thousands of fresh graduates and postgraduates from a diverse range of academic disciplines.

2.2 Present Education System

Current educational practices are based on students' chronological ages, and despite repeated calls for reform, the system has failed to evolve to meet the demands of modern society. The graduates that schools produce do not align with the sorts of workers sought for by businesses in the service and industrial sectors. This mismatch has created a

situation where many recent graduates are seeking employment in other industries, while the industry is facing a shortage of qualified workers.

2.2.1 Recent Changes

In response to this revelation, the University Grants Commission and the All India Council for Technical Education decided to make apprenticeships a prerequisite for degree conferral for all graduates. The purpose of these legislative measures was to establish a minimum apprenticeship term that students attending research institutions would be forced to complete before they could get their degrees.Using this approach was all the rage in the medical industry. Academics and businesspeople will work together more closely when this policy was changed. In response to industry needs, educational institutions and businesses alike will have to revise their respective curriculum. Both the tasks at hand and the development of relevant skills will need to take centre stage. Things will get better from here on out, as time goes on. Students and recent grads should be cognizant of the fact that there are limitations and that they must exert maximum effort to establish their own businesses, engage in economic activities, and, in due time, move from being job-seekers to job-providers. Successful entrepreneurs are not born but made; they undergo a process of nurturing and education to reach their full potential.

2.3 Entrepreneurship Development Scenario

Any country would be unable to provide employment opportunities to all of its young people who are of working age. Furthermore, service providers are necessary since society has a great need for various services. This is the other choice you may choose if you are seeking employment. The business owners get the land, labour, and money they need to launch their services once they envisage them. Many more young individuals who are qualified for jobs may find work with these companies. As a result, every community needs both employees and those who are self-employed to function. It has long been recognized that encouraging an entrepreneurial mindset is necessary. Training prospective entrepreneurs who are deserving of it has become more commonplace due to the realization that entrepreneurialism is not an innate trait but rather an acquired one. In response to this requirement, which has been correctly recognized by both the federal

government of India and each of the states in India, Entrepreneurship Development Institutions have been established in each area. Individuals recognized as beneficiaries by the District Industries Centre, located at the District Headquarters, are provided with shorter training programs by these organizations.

Businesses are actively seeking out senior students at professional schools and institutes in the hopes that they may become company owners in the future. The different companies provide guidance to those who are really considering going into business for themselves. To help kids who have real potential as future company owners, some companies have set up Incubation Centers at schools. Through these incubation facilities, qualified professionals guide the participants. Local firms provide additional guidance and resources to students who demonstrate an entrepreneurial spirit, allowing them to start and expand their own enterprises. To help the unit get off the ground and run on its own, even if they are convinced, they nevertheless offer to be partners in such enterprises. There is room for negotiation over the share of profit that each side will retain. Assuming all goes according to plan, companies will leave the unit once it starts making money on its own.

Numerous entrepreneurship programs pair successful businesspeople with talented students who have fresh ideas for businesses, which are then refined by experts in the field. Lenders that see potential in this industry are willing to provide lower rates, extended gestation periods, and long-term repayment plans to businesses who show promise.
There has been increasing concern about India's job situation due to the country's high unemployment rate. In response, the central government and individual state governments have taken various measures.

2.4 Steps taken by Government of India

In response to the issue of high unemployment rates, the central government of India and the governments of the different states have taken several measures. Notably, in consideration of these changes and enhancements brought about by these new advances, a number of the aforementioned programs have been revised and rebranded. Financial

assistance for first-generation business owners has been a governmental priority in response to the many changes brought about by globalization. Training and bank-based financial assistance were primary goals of the aforementioned government programs; some of these schemes also included subsidies. The core objective of the programs is to provide individuals with opportunity to work for themselves.

The Indian government formed NSDC in 2008 as a public limited corporation. NSDC is a nonprofit organization with 49% ownership held by the Indian government via the MSDE. Its end objective is to narrow the gap between the demand for and supply of skilled labour across all economic subsectors. In an effort to boost the employability of program graduates, it has made plans to offer formal certificates to candidates who successfully complete the programs, established an evaluation system, and created short- term skill development programs with curriculums that incorporate substantial industry. Side note: several companies have started their own short-term training programs to attract the right kind of employees—the kind that can help them meet their corporate social responsibility (CSR) goals. In sum, the ever-changing scene at the Industry Training Institute is proof that talent development is the top priority for the Indian government. While many ITIs have never before seen full occupancy, admissions are pouring in at an unprecedented rate.

2.4.1 Self-Help Group Movement

India has seen a rise in the number of self-help groups since 1972. SHGs, or self-help groups, are informal gatherings of people who have a common goal of improving their quality of life. Typically, they manage themselves and are overseen by their contemporaries. In India, the government encouraged and even encouraged women to create self-help groups (SHGs). So much help has been received. Priority and reduced- rate credit input has been provided to these modest home generators. There is a significant market for the products made by these locally owned and operated companies. Because of this, the women in the household have started to chip in more financially. As a consequence of this program, the women have developed self-confidence. Now, they are given the importance they deserve and are considered when significant decisions for

the family are made. The women now have more freedom thanks to the SHG project. A great deal of the new spirit of entrepreneurship has emerged because of this initiative. These SHGs have received training in various subjects from the government. Entrepreneurial spirit is essential for solving current problems, creating new employment, and sustaining economic growth. In addition, it reveals how daring, imaginative, and risk-taking a culture is as a whole. More specifically, studies done by the GEDI have shown a strong beneficial association between innovation, economic development, and entrepreneurial endeavours.

When considering the slow Indian labor market and the relevance of Start-Up India initiatives, as well as the role of entrepreneurship in creating jobs, India's performance is noteworthy. The GEDI (2021) ranks 137 countries, with India coming in at number 68, indicating a decent performance. According to 2020, India was ranked 69th on this list in 2017. In a study that comprised 137 countries, the USA came out on top. According to the Global Entrepreneurship Index (GEI), every country is ranked based on how much it fosters and supports entrepreneurial endeavours. Responsible for creating the Global Entrepreneurship Index is the GEDI, a policy-focused organization with a mission to expand economic opportunities for individuals, groups, and nations.

India is ranked fourteenth among the twenty-eight countries that comprise the Asia- Pacific region. India is now in the middle of the pack, according to this. The three most powerful countries in the region are currently Taiwan, second only to Hong Kong, and first, after Australia. Strangely, India ranks lower than China (at number nine) and other well-known national powers like Korea (at number four) and Japan (at number six) in this region. Evaluating the performance based on certain criteria also makes the viewing more engaging. When it comes to innovation, internationalization, opportunity start-up, risk retention, opportunity perception, and intense market competition, India is unrivaled. To a greater extent than its total score, India excels in these subscores. As a whole, it performs as well as its human capital performance.

On the measure of product innovation, India stands out among the world's top nations. This metric measures the capability to create new items, alter current ones, or make exact

copies of them. The ability to identify opportunities and take measured risks is one of India's strongest suits. This is related to the country's familiarity with innovative goods, its optimistic outlook on globalization, and its desire to tap into stronger markets outside. India is strong because it is not afraid to try new things. India rates worse than the overall score in many areas, including culture support, technological absorption (by far the lowest), quick growth, and access to risk financing. It also ranks lower in startup skills and networks. The largest barrier that India still faces is its capacity to adopt new technology. How well one nation incorporates the technological know-how of another into its own systems and institutions is a measure of its absorption of technology. It is worth noting that India is also facing significant challenges when it comes to connectivity and ethnic support. When it comes to the level of familiarity and engagement amongst Indian businesses in terms of exchanging ideas, pertinent data, and connections in the market, as well as taking part in joint ventures and other forms of cooperation, India falls behind a lot of other nations. A further big problem with the Indian system is that it has no cultural support. The impact of corruption on public opinion of entrepreneurship as a career path is the focus of this investigation. A nation's respect for entrepreneurship as a career path and a tool to raise national prestige is measured.

The fact that corruption is still influencing people's views of entrepreneurship in India is evidence that the issue persists there despite the government's best efforts and the advancements achieved in this area. Furthermore, the customary underlying priority in India for safe and stable paid job remains higher than entrepreneurial growth, as shown by the understanding of Indians. The fact that most Indians think starting a business is riskier than working for someone else for a salary is evidence of this. Surprisingly, India still ranks low in access to risk finance, despite the many initiatives launched under the Start-Up India programs. Therefore, there is still a big problem in the entrepreneurial sector when it comes to making sure that whenever an entrepreneur needs it, they can get the right amount and kind of funding.

If India wants to climb the ranks of the GEDI index, it needs to focus on nurturing entrepreneurs' skill sets, which includes investing in staff training, making sure the labor market can adapt to hire the right people at the right time, and ensuring entrepreneurs

have a high level of education. Among these qualities is the timing and ability to hire the appropriate people with the correct capabilities. Classes that teach entrepreneurship skills should be more heavily emphasized in order to improve the educational system's capacity to provide high-quality help.

The entrepreneurial landscape in India has grown substantially throughout the last several decades. When India finally opened up to foreign direct investment (FDI) in the early 1990s, thanks to much-needed liberalization legislation, the country's market was flooded with eager international firms. When people in a country are willing to take risks and try new things, it shows in the economy. An entrepreneurial spirit is essential to a country's economic health for many reasons, including but not limited to: the creation of jobs, increased national income, industrialization of underdeveloped regions, technological advancement, export promotion, and development of rural areas.

The current climate in India is ideal for the development of fresh company concepts. Recent economic advances have made today's markets much more stable, active, and liquid than those in other countries. Everyone knows that getting a degree is a huge deal when it comes to fostering an entrepreneurial spirit. New opportunities arise daily as a consequence of deregulation policies, such as more foreign direct investment, simpler access to technology, and others. Obtaining funding is within reach. Angel investors and organizations like the NEN and NSEF are helping new firms get the funding they need. So, it's safe to say that India is an open market for new businesses. Social entrepreneurship has becoming more significant in India's startup ecosystem. Many Indians, encouraged by the government or acting independently, have chosen to take action in response to the persistent problems of poverty and unemployment.Programs like Tata Jagriti Yatra and Teach for India not only provide participants the chance to get actual experience in entrepreneurship, but they also inspire young people to pursue it. More and more people are starting to realize that social enterprises might help discover answers to societal issues. In order to get things rolling, we need to create an environment where entrepreneurs feel safe enough to build methods that will help the less fortunate without fear of retaliation.

Launching a firm in India is no picnic, hence one has to be prepared for it. Indeed, contemporary Indian entrepreneurs need not go outside the borders of India to follow their passions. Empire building, on the other hand, needs more than just possibilities; it also necessitates a viewpoint and personal driving elements, both of which are abundant in Indian culture. A sense that India will soon become a global economic superpower is hard to shake.

2.5 Recent Initiatives to Boost Entrepreneurship

Innovation and entrepreneurship are highly encouraged in India, thanks to the government's many initiatives in this regard. One of India's major challenges is the need to provide new employment opportunities. On the other hand, India's vast and varied population gives the country great potential for innovation, entrepreneurship, and economic progress. Numerous new programs and initiatives have been launched by the Indian government to encourage innovation in various sectors. Collaborating with many groups of people, including students, researchers, entrepreneurs, non-governmental organizations (NGOs), and underprivileged communities.

The Indian government has prioritized gender equality in all policy initiatives because it knows that women's business ownership and economic engagement are key to the country's development and success. More funding, business connections, and educational opportunities are being made available to women by the Indian government in an effort to level the playing field for women in the country's corporate sector. Over the years, the Indian government has implemented several policies meant to foster the development of new companies and entrepreneurs. The idea of entrepreneurship is gaining the attention of Indian government authorities. Numerous prominent initiatives exist with the goal of encouraging private sector development; Startup India is only one of them. The significance of entrepreneurs to advancement is often misunderstood by those who research public policy. India has taken many steps to encourage innovation and entrepreneurship, including:

2.5.1 Startup India

The Startup India program is an initiative by the Indian government that aims to foster entrepreneurship by offering comprehensive assistance to startups throughout their journey. With the launch of the project in January 2016, several would-be entrepreneurs have received the assistance they needed to launch their businesses. Businesses are supported in every way possible by this initiative, which includes a free online learning program that lasts four weeks, research parks, incubators, and startup centers spread out over the nation, and a strong network of academic and commercial organizations. In addition, funds have been set up to help fledgling companies raise money. The goal of the initiative is to create a setting where startups can thrive and innovate without any obstacles. This will be achieved through initiatives such as the Startup India Learning Programme, online recognition of startups, easier patent filing, relaxed procurement norms, support from incubators, funding from sources other than investors, tax benefits, and the resolution of regulatory issues.

2.5.2 Make in India

In September 2014, the Make in India initiative was launched with the objective of establishing India as a hub for design and manufacturing. It was an impassioned call to action for India's corporate leaders and citizens, as well as an open invitation to global partners and investors, to bring India's manufacturing sector into the modern era by doing away with outdated policies and practises and gathering information on the market's potential. Everyone from prospective international partners to the Indian business community and the general public has come to appreciate India's capabilities again. An very lofty goal inspired the creation of Make in India. More open and helpful frameworks have been put in place, among other things, thanks to the program. A world-class industrial infrastructure has been built, investments have been drawn in, innovation has been promoted, new skills have been created, and intellectual property has been secured.

2.5.3 Atal Innovation Mission (AIM)

As part of its broader mission, the Indian government is launching this programme to promote innovation and entrepreneurship in the country's tech-centric industries by

showcasing the best new businesses, grand challenges, and innovation hubs in the country. Recently, AIM opened Atal Tinkering Labs (ATL) in schools all throughout India to foster curiosity, experimentation, and discovery. As a resource for students to use in their STEM (Science, Technology, Engineering, and Math) education, ATLs are a boon to STEM programs. Atal Incubation Centres (AICs) are another program of AIM that provides mentorship, office space, and other resources to emerging businesses with the hope that they would grow into successful, long-term enterprises. As befits their standing as premier incubation centers, AICs provide the physical infrastructure, including operational buildings and capital equipment, that is necessary for their work. Throughout India, you may find incubation facilities that link startups with mentors, investors, and other resources to help them grow.

2.5.4 Support to Training and Employment Programme for Women (STEP)

The STEP initiative was initiated by the Indian government's Ministry of Women and Child Development (WCD) to remedy the dearth of formal skill training opportunities for rural women. Aayog and the Ministry of Skill Development & Entrepreneurship recently updated the 30-year-old effort's guidelines to reflect modern demands. Any Indian woman who is at least 16 years old is eligible to join this program. Agriculture, gardening, food processing, traditional crafts (like embroidery), computer and information technology services, tourism, traditional crafts, handlooms, and many more topics are covered in the course.

2.5.5 Jan Dhan- Aadhaar- Mobile (JAM)

As a technological intervention, JAM has the potential to change the lives of millions of Indians by cutting out middlemen and allowing subsidies to go directly to those who qualify. Not only does JAM provide a vital check on corruption, but it also opens bank accounts in all underserved areas, allowing those who wouldn't have access to them before.

2.5.6 Digital India

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accounts in all underserved areas, allowing those who wouldn't have access to them before.

2.5.7 Biotechnology Industry Research Assistance Council (BIRAC)

With the intention of encouraging and assisting new ventures in the biotechnology industry, the Department of Biotechnology formed BIRAC as a public-sector organization. It aspires to institutionalize innovation and strategic research in all biotech companies in an effort to bridge the gap between academics and industry. Ultimately, our goal is to use cutting-edge technology to make products that are cutting-edge but affordable. In order to support India's budding biotech industry, particularly among SMEs, BIRAC has collaborated with a diverse array of national and international partners, enabling several rapid developments in medical technology. Division of Scientific and Technological Affairs (DST): All major projects requiring scientific and technological contribution are coordinated by the several departments that make up the DST. For instance, one initiative in India that aims to improve the quality of life for the elderly and disabled is the Technology Interventions for Disabled and Elderly program. On the flip side, the ASEAN-India Science, Technology, and Innovation Cooperation is working to bridge the development gap and enhance connection between ASEAN member states. Science, technology, and innovation are all boosted by cross-industry cooperation in research. In addition, it provides scholarships to researchers and scientists from ASEAN member states so they may hone their skills in R&D and academic institutions in India.

2.5.8 Stand-Up India

The 2015-founded Stand-Up India is working to help India's poorest citizens get access to institutional finance. Businesswomen from Scheduled Castes and Scheduled Tribes, as well as members of these communities, are the target of this initiative, which aims to level the playing field so that they may share in India's economic growth. This is achieved by providing Greenfield business loans ranging from one million to ten million rupees to at least one woman and one person from the SC or ST group. These loans may be used to start firms in the service, manufacturing, or commerce sectors. Small company

entrepreneurs in India may get information on credit assurance and financing on the Stand-Up India platform, which also functions as an online marketplace.

2.5.9 Trade related Entrepreneurship Assistance and Development (TREAD)

In response to an urgent need, the TREAD project facilitates access to financing for low-income women in India via non-governmental organizations. Women may benefit greatly from the counseling, training, and access to finance facilities that registered NGOs can provide, which can lead them to explore occupations outside of agriculture.

2.5.10 Pradhan Mantri Kaushal Vikas Yojana (PMKVY)

The Ministry of Social and Economic Development (SDE) established the Skill Certification program to increase young people's employability by giving them access to training tailored to various industries. You may also get a certificate that recognizes your prior learning by taking an exam to see how much you know and have mastered. The government will cover all costs associated with training and testing under this program.

2.5.11 National Skill Development Mission

Launched in July 2015, the initiative is an endeavor to facilitate cooperation across sectors and jurisdictions. Built with the objective of establishing an Expert India in mind, it expedites and improves quality while cutting down on the time it takes to make decisions across industries, allowing for the vast supply of abilities. In order to guide skilling initiatives all throughout India, the first stage of the mission suggests seven sub- missions. Education at the institutional level, infrastructure, convergence, teachers, international work, livelihood security, and the exploitation of public sector resources all play significant roles.

2.5.12 Science for Equity Empowerment and Development (SEED)

In an effort to help underserved rural areas, SEED is working to provide doors for enthusiastic researchers and field workers to participate in community-based, action-oriented initiatives that will have a positive impact on local economies. The goal of connecting national laboratories and other specialized science, technology, and innovation institutions with grassroots entrepreneurs has been to increase access to professional counsel and high-quality infrastructure. The goal of SEED's equality in development initiative is to guarantee that disadvantaged communities, in particular, can benefit from technology advancements.

The entrepreneurial sector in India is booming, and small enterprises are the foundation. India ranks 68th out of 137 nations on GEDI, which is a respectable showing. Once again, India is in the middle of the pack when considering the Asia-Pacific region; out of 28 nations, it ranks fourteenth. India is among the world's best when it comes to product innovation. If we look at start-up capabilities, networks, and cultural support; technology absorption; great growth potential; and risk capital availability, we see that India is well behind the competition.

Social connection and cultural support are also major issues in India. To improve its score on the GEDI index, India should invest more in the education and training of entrepreneurs and work to make its labor market more flexible so that it can recruit and retain individuals with the right combination of skills. Innovation and entrepreneurship are highly encouraged in India, thanks to the government's many initiatives in this regard. As part of its mission to foster an entrepreneurial spirit, the Indian government launched Startup India to assist startups throughout their life cycles. There has been a meteoric rise in the number of new businesses in India during the last few decades. The rapid expansion of the Indian economy has made the country an attractive location for new ventures. A large portion of India's corporate scene is characterized by social entrepreneurship. Despite official backing or lack thereof, many Indians have resorted to non-governmental organizations (NGOs) in an attempt to better their current and future generations' living conditions, since unemployment and poverty remain throughout the country. Programs like Tata Jagriti Yatra and Teach for India inspire young people to be

entrepreneurs by providing them with practical experience. More and more, people are starting to see the value in social enterprises and their ability to help solve social issues. What we really need is to create a setting where entrepreneurs feel safe enough to try to help the underprivileged financially.

Over the years, the Indian government has implemented several policies meant to foster the development of new companies and entrepreneurs. The idea of entrepreneurship is gaining the attention of Indian government authorities. Numerous prominent initiatives exist with the goal of encouraging private sector development; Startup India is only one of them. Many policy observers, however, still fail to grasp the role that entrepreneurs play in driving economic expansion.

2.6 Challenges faced by Indian Entrepreneurs before Starting Up

Taking the plunge and starting a company is an act of courage. Leaving a stable job to start a new business takes a lot of courage. A strong sense of self-confidence and determination are necessary for success. You need to convince yourself that this product is an absolute must-have and that you are the perfect fit to make it.

Is the scope of your proposal sufficient?There are various sorts of difficulty that entrepreneurs face, but the struggle for ideas is the most significant. So, what's your plan for the future? Tell me about the business you intend to start. Tell me the demographics you're aiming for. Would you be open to trying out your suggestion? If you have any of these or any other questions, you should definitely do some research to get the answers. Obtaining Funds: Aside from time constraints, businesses also face the formidable challenge of securing funding. Now is the time to plan your capital-raising initiatives, including when to launch them, how to execute them, and who could contribute. For a startup to be successful, the founders often need to put their own money on the line for a long period.

Making the appropriate hires: Any entrepreneur worth their salt knows that getting off the ground requires a network of supporters. It is critical for any business to find the right co-founder or early startup team. One of the toughest things you'll have to do if you want

your project to succeed is to find someone who shares your passion. Marketing that makes the most of a little budget: It is critical to expose your startup to prospective clients. To reach one's target audience, it is crucial to use effective advertising methods.

Peace of Mind Regarding Money: When starting a firm, the two most important things to consider are financial difficulties and You will be able to focus more on building your company once you know your family's financial needs are met. Also, you may afford to take more measured risks if your firm has enough operational resources. The classic saying, ―there is no gain without suffering,‖ is relevant when dealing with stress. There are emotional and professional difficulties that every entrepreneur must overcome. To run a successful business, one has to be both strong and quiet. If you want to go it alone and start your own company, you need be emotionally and psychologically ready to face the problems that will crop up every day. Coping with Setbacks: There is a certain amount of risk involved in introducing new products and expanding current markets; the more you try, the less likely it is that every single idea will be a success. This is known as the ―quick fall‖ notion.

CHAPTER-3
CONCEPTUAL FRAMEWORK AND REVIEW OF LITERATURE

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CONCEPTUAL FRAMEWORK AND REVIEW OF LITERATURE

Rural development, entrepreneurship, institutions, and institutional arrangements are some of the key terms used in this thesis. This chapter introduced the conceptual framework that this thesis has gained from various constructs in order to establish a framework that is used in this work, and it also provided a thorough Review of Literature for these terms.

3.1 CONCEPTUAL FRAMEWORK

A conceptual framework, at its most fundamental level, is a model or set of ideas that describes the world and provides an explanation for the relationships between various things or variables. Before delving into a discussion of the frameworks used for analysis in the research, it is important to provide a brief overview of some of the most popular approaches to entrepreneurship in relation to this study and its specific setting. Some examples of such research agendas are those that center on educational attainment and training levels, those that take a cultural and contextual perspective, those that are integral in nature, and those that base their work on individual and societal factors.

3.1.1 OECD/EUROSTAT ENTREPRENEURIAL FRAMEWORK

These are the metrics that decision-makers think to be most important, according to the OECD/EUROSTAT framework Impact, Factors, and Entrepreneurial Performance (Ahmad & Hoffmann, 2008). This sheds light on why this paradigm works well with the study's overarching goal—to investigate the institutional contexts that encourage solar energy-based entrepreneurship in the agriculture sector and the wider effects on rural areas.[2]

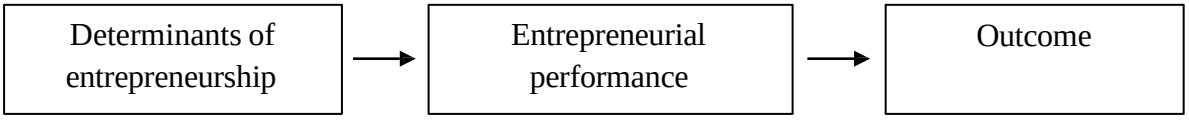

Figure: summary of the elements from OECD/EUROSTAT framework

[2] Hoffmann, A. (2007). A Rough Guide to Entrepreneurship Policy. In: Thurik, R., Audretsch, D. and Grilo, Isabel Handbook of Research on Entrepreneurship Policy. New York: Edward Elgar Press.

3.1.2 THE INFLUENCE OF OTHER FRAMEWORKS IN MAKING THE OECD/EUROSTAT FRAMEWORK

These are the metrics that decision-makers think to be most important, according to the OECD/EUROSTAT framework Impact, Factors, and Entrepreneurial Performance (Ahmad & Hoffmann, 2008). This sheds light on why this paradigm works well with the study's overarching goal—to investigate the institutional contexts that encourage solar energy-based entrepreneurship in the agriculture sector and the wider effects on rural areas.

[3](Lundström & Stevenson, 2005)

After considering these factors along with a realistic view of policymaking, OCED/EUROSTAT developed their own framework, as indicated in the table below:.

Table 3.1: OECD Framework

Determinants	Entrepreneurial performance	Impact
• Regulatory framework • Market conditions • Access to finance • Knowledge creation • Entrepreneurial abilities • Culture	• Firm based • Employment based • Wealth based	• Job creation • Economic growth • Poverty reduction

Figure: The OECD/EUROSTAT framework (OECD, 2009)[4]

3.2 REVIEW OF LITERATURE

3.2.1 ENTREPRENEURSHIP

A large number of social entrepreneurs also work for nonprofits, with the goal of putting their ideas into action to solve community problems. Also, keep your entrepreneurial spirit alive by looking for and capitalizing on business opportunities to disrupt established

[3] Audretsch, David B. Thurik, Roy, Verheulm Ingrid and Wennekers, Sander . (2002),Entrepreneurship: Determinants and Policy in a European – U.S. Comparison, London: Kluwer Academic Publishers.
[4] OECD. (2009), Working Out Change: Systemic Innovation in Vocational Education and Training, Paris: OECD.

markets and so bring about positive social and environmental change (Hockerts&Wustenhagen, 2010). The committee on sustainable development's 1987 Brundtland Report brought this concept into the spotlight. When individuals engage in entrepreneurial activities, they seek out chances despite their present financial situation. Anyone who plans, executes, and oversees the daily activities of a business venture is considered an entrepreneur. While Schumpeter calls him an inventor, Marshall (2011) says he was more of a commercial enterprise organizer and speculator. Characteristics of entrepreneurs, as described by Cantillon (2015), were examined, including the ability to rent out space and to run businesses from the hub. It is fairly uncommon to use the example of entrepreneurship to clarify various aspects of company structure. There are many different kinds of entrepreneurs in the contemporary world, and you can find people with an entrepreneurial spirit in each line of life. Management of tiny firms is often linked with entrepreneurship. It is often believed that the perfect entrepreneur is one who begins with a little company with the vision of expanding it into a huge enterprise.[5]

3.2.2 SOCIAL ENTREPRENEURSHIP

―Dees‖ (2018) An entrepreneur that prioritizes building social value above just financial gain may be considered a social entrepreneur if they are a force for positive change in the nonprofit sector. According to him, using cutting-edge techniques and technology to improve society is the ultimate goal of social entrepreneurs. This approach is consistent with the Schumpeter theories of entrepreneurial activity that are often used to describe social innovators.Written by Miller and Certo in 2018. Although this study acknowledges the importance of all of these different entrepreneurial concepts, it employs Dees' (2018) definition of entrepreneurship.[6]

3.2.3 THE CONCEPT OF REPLENISHABLE ENERGY ENTREPRENEURSHIP

Even though there isn't yet a formal academic definition of ―renewable energy entrepreneurship,‖ this research focuses on the launch of micro-businesses in rural

[5] Hockerts, K., & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids - Theorizing about the role of incumbents and new entrants in Sustainable Entrepreneurship. Journal of Business Venturing. 25, 481-492.
[6] Dees, J. G. (2018). Enterprising non-profits. Harvard Business Review . 76 (1), 54-67.

regions that make use of renewable energy sources. Thus, before implementing the concept in line with the previously chosen Dees' definition of social entrepreneurship, it is essential to rationally prove it. Despite their similarities, these concepts are really very distinct. Timeliness suggests that the concept of ―green entrepreneurship‖ is still in its infancy, having just begun to acquire traction in the last few decades. Green entrepreneurship is becoming more and more of a popular concept, and there is a growing amount of literature on the issue to back this up.

Most commonly used definitions of ―green entrepreneurship‖center on the products or services offered by companies. Common terms used to characterize eco-friendly business practices include: Being able to make something worthwhile out of nothing, seeing opportunities when they arise, and making do with few resources are the three hallmarks of rural entrepreneurship. The source is Jones and Sakong (1980).[7]To illustrate this point, let's look at what Dr. Mohammad Yunus and the Grameen Bank of Bangladesh were able to do.

An excellent discussion of the concept of ―green‖ may be found in the OECD's (2010) proposal of a basic measuring framework that embodies the widely held dualistic perspective on the topic. It looks at the economic activity related to environmental services and goods on the one hand, and production efficiency (a company's green process technique from some of the material we previously covered) on the other. The former is sometimes referred to as a process approach when discussing green business, while the latter is frequently referred to as an output strategy. In this latter case, the company is embracing environmental practices. This concept could become trickier as ―green‖ corporate practices are often defined in a way that takes ethical, social, or environmental factors into account. Where replenishable energy entrepreneurship fits into the bigger picture of this field's scholarly work is most clearly shown in the output technique.

In contrast, Rural development via entrepreneurship places an emphasis on fostering the expansion of already indigenous businesses rather than seeking outside knowledge and

[7] Jones, L., & Sakong, I. (1980), Government Business and Entrepreneurship in Economic Development: Korean Case, Cambridge, MA: Harvard University Press.

funding. The community's limited resources would be safeguarded while new economic opportunities and employment were generated. To overcome the obstacles and embrace the unknown of new company creation, to create value by combining a rare combination of resources to take advantage of an opportunity, and to generate something out of nothing, there needs to be a larger pool of rural entrepreneurs. Economic development and progress will continue to affect rural communities under their leadership.

In order to bring about a more sustainable economic sector, an eco-preneur is someone who creates a firm in that area with an eye on sustainability, employs green practices, and commits themselves to sustainability in all aspects of their lives (Isaak, 2012). The maintenance of an environmentally friendly supply chain could also be affected by this. These businesses are on the lookout for green projects that might also pay off financially.[8] New employment, higher incomes and wealth, and connections to the global economy are just a few of the ways in which entrepreneurs boost local economies. This is especially true in rural areas. Recognizing the importance of innovators, several state and local governments are shifting their focus from luring enterprises from other places to cultivating their own. To be clear, there is no difference between rural and urban entrepreneurship with respect to the substance. The objective of rural entrepreneurs is to find a special blend of resources, both agricultural and otherwise. The social aims of rural development and the commercial objectives of entrepreneurs may be more closely aligned in rural settings than in urban ones (Sherief, 2015).[9]

Environmentally sensitive attitudes contribute to potential for value creation in business, according to Anderson (2018), who argues that the idea of value is the bedrock of both entrepreneurship and environmentalism.[10]

[8] Isaak, R. (2012). The Making of the Ecopreneur. Greener Management International. 38, 81-91.
[9] Sherief, Sultan R. (2015), Entrepreneurship as an economic force in rural development, Africa Economic Analysis: Chennai.(Available online:http://www.africaeconomicanalysis.org/articles/gen/rural_entrepreneurship.html)
[10] Anderson, A.R. . (2018). Cultivating the garden of Eden: Environmental Entrepreneuring. Journal of Organizational Change Management. 11 (2), 135-44.

3.3 DETERMINANTS OF ENTREPRENEURSHIP

3.3.1 Awareness

In their analysis, Snape and Rynikiewicz (2012) found that adoption was greater in places where agents were used in photovoltaic systems and dropped in areas farther away, forming a circular pattern.[11]Fischer and Sauter (2021) found that recommendations from people one knows seem to be quite important when determining whether to buy solar panels, which might mean that social references influence people's opinions on renewable energy. Also, the views of those closest to a person had a substantial impact on their own views on local replenishable energy projects.[12]

Through in-depth interviews, Hotel Energy Solutions (2021) studied the factors and initiatives impacting the uptake of renewable energy solutions by small and medium- sized enterprises (SMEs) in the hotel industry across the EU. According to the research, small and medium-sized enterprises (SMEs) in the hotel sector are hesitant to use replenishable energy systems due to a number of issues, including high installation costs, a lack of awareness of the advantages of RES among regional and local authorities, and ambiguous legal requirements.[13]

3.3.2 Governmental directives

Public policy influences the likelihood that individuals will use renewable energy sources, according to certain studies. Potential barriers to the widespread use of renewable energy sources include public opinion, poorly thought-out policies, the NIMBY effect, and a lack of data about the potential environmental and landscape

[11]Snape R, Rynikiewicz C, Peer effect and social learning in micro-generation adoption and urban smarter grids development? *Network Industries Quarterly,* 14 (2-3) (2012) pages 24-27. https://core.ac.uk/download/pdf/17207292.pdf

[12] Fischer C, Sauter R, Users as pioneers: transformation in the electricity system, micro-CHP and the role of users. In: K. Jacob, M. Binder and A. Wieckorek (eds.). Governance for industrial transformation. Proceedings of the 2003 Berlin Conference on the Human Dimensions of Global Environmental Change. Environmental Policy Research Centre: Berlin. (2021) p. 319-337. http://userpage.fu-berlin. de/ffu/akumwelt/bc2003/proceedings/319%20-%20337%20 fischer.pdf

[13]Hotel Energy Solutions, Factors and Initiatives affecting Replenishable energy Technologies use in the Hotel Industry, *Hotel Energy Solutions project publications,* 2021. http://hote-lenergysolutions.net/sites/all/files/docpdf/factorsandinitia-tivesaffectingrenewableenergytechnologiesuseinthehotelin-dustrypublicationfinalfinal.pdf (Accessed 23 May 2021)

impacts. The policy climate has the power to promote or retard the proliferation of RETs.[14]

3.3.3 Solar Market Supplies

The authors of the study are Mattes 2020. The 2012 European Manufacturing Survey in Germany provided the data used to determine the following factors that have a significant impact on the adoption of replenishable energy technology by German manufacturing enterprises: solar market supply, availability to renewable energy resources, company size, geography, financial resources, and policy mix in terms of legal and political frameworks.[15]

3.3.4 Participation of residents of local area

Heaslip et al. (2017) In a similar vein, researchers in Ireland and Denmark discovered that citizens' involvement in sustainable energy community project development and implementation significantly influenced their decision to support the programs. According to Reinsberger and Posch's research, there are a number of factors that contribute to the widespread use of solar systems in Austria. These include financial incentives and regular community meetings with local residents.[16]

3.3.5 Previous experience

The main factors that influence Taiwanese consumers' plans to use renewable energy sources were studied by Feng (2021). We surveyed 273 individuals to find out their thoughts and experiences with renewable energy sources. Rogers' Diffusion of Innovations, the Technology Acceptance Model, and the Theory of Reasoned Action formed the basis of the study. Subjective norms (e.g., peer pressure), compatibility (e.g., past experiences and current demand), perceived usefulness (e.g., whether the system is

[14]Klick H, Smith E, Public understanding of and support for wind power in the United States, *Replenishable energy*, 35 (7) pages 1585–1591. DOI: 10.1016/j.renene.2009.11.028

[15]Mattes K, Müller S, Jäger A, Weidner N, Weißfloch U, Adoption and diffusion of replenishable energy technologies: Influence of the policy mix in the manufacturing industry, Working Paper Sustainability and Innovation, No. S6/2014, Fraunhofer ISI, Karlsruhe, (2020). http://nbn-resolving.de/ urn:nbn:de:0011-n-2942282 (Accessed 15 September 2021)

[16]Devine-Wright P, editor. Reconsidering public attitudes and public acceptance of replenishable energy technologies: a critical review. School of Environment and Development, University of Manchester, Oxford Road, Manchester M13 9PL, UK, 2017. http://geography.exeter.ac.uk/beyond_nimbyism/ deliverables/bn_wp1_4.pdf (Accessed 15 June 2021)

better than before, economic benefit to gain, ease of use, satisfaction with the system), and perceived ease of use (e.g., knowing how easy the system is to use) are the main factors influencing the adoption of rene systems, according to the study's results. Consistent with previous research, this study found that participants' income had no impact on their valuation of RET. The risks and advantages of carbon capture and storage are good predictors of how people will feel about the technology, according to the study's authors. Decisions are impacted by the technology's price, hazards, and rewards, according to the research.[17]

3.3.6 Stakeholders Trust

Researchers Huijts et al. (2019) looked at the ways in which stakeholders' attitudes, societal norms, perceived behavioural control, and personal norms affect their intentions to support or oppose new sustainable energy technologies. The concept states that people's views are influenced by elements such as trust, procedural justice, distributive fairness, and how they perceive the technology's costs, dangers, and advantages.[18]

3.3.7 Easiness to use

Clean cooking fuel and stove adoption in China was investigated by Shen et al. (2015). The study discovered that in China, there are several factors that impact the adoption of clean fuels and cooking stoves. These include household characteristics such as age, gender, location, family size, income, and ease of use and maintenance. Additionally, factors like public awareness and education about the technology play a role, as do government policies and regulations, government funding, and the expansion of the renewable energy market.[19]

[17]Feng H, Key factors influencing users' intentions of adopting replenishable energy technologies, *Academic ResearchInternational,* 2 (2) (2021) pages 156-168. http://www.savap.org.pk/journals/ARInt./Vol.2(2)/2021(2.2-16).pdf

[18]Ajzen I, Fishein M, The prediction of behavioral intentions in a choice situation, *Journal of Experimental Social Psychology,* 5 (2019) pages 400-416. https://doi.org/10.1016/0022-1031(69)90033-X

[19]Shen G, Lin W, Yue D, Liu Z, Chen Y, Yang Z, Factors influencing the adoption and sustainable use of clean fuels and cookstoves in China - a Chinese literature review, *Renewable and Sustainable Energy Reviews,* 51 (2015) pages741-750. https://doi.org/10.1016/j.rser.2015.06.049

3.3.8 Easy to maintain

Clean cooking fuel and stove adoption in China was investigated by Shen et al. (2015). A number of factors were discovered to have a substantial impact on clean fuels and cooking stoves. These factors include household characteristics (such as family size, age, gender, location, income, and ease of use and maintenance), public awareness and understanding of the technology (through means like higher education, publicity, and demonstrations), government policies and regulations, economic support, and the expansion of the renewable energy market.[20]

2.3.9 Living standards

Policies have an immediate impact on living standards, pricing, and technological innovation, according to Verbruggen et al. (2020).[21]

2.3.10 Other businesses

In order to determine the barriers that homeowners face while trying to use solar energy, Ng'eno (2014) conducted a poll. Household income, knowledge with solar technology, and availability to other power sources are some of the characteristics that influence the use of solar energy for residential purposes, according to the research. The public's understanding and sentiments about renewable energy sources in India, however, have received very little attention from researchers. Micro and small companies (SMEs) account for a significant chunk of India's GDP, yet surprisingly little is known about their use of renewable energy sources (RES). The bulk of these businesses run on privately held fossil fuel energy generators since the national grid doesn't provide enough power to their rural or semi-urban settings (though this varies by area). In light of the importance of these qualities and the lack of studies that investigate the dynamics of their

[20]Shen G, Lin W, Yue D, Liu Z, Chen Y, Yang Z, Factors influencing the adoption and sustainable use of clean fuels and cookstoves in China - a Chinese literature review, *Renewable and Sustainable Energy Reviews*, 51 (2015) pages741-750. https://doi.org/10.1016/j.rser.2015.06.049

[21]Verbruggen A, Fischendick M, Moomaw W, Wier T, Nadai A, Nilsson LJ, Nyboer J, Sathaye J, Replenishable energy costs, potentials, barriers: conceptual issues, Energy Policy, 38 (2) (2020) pages 850-861. https://ideas.repec.org/a/eee/enepol/ v38y2010i2p850-861.html

adoption, this section investigates the elements that help entrepreneurs create replenishable energy. The study focuses on entrepreneurs in India. [22]

3.4 FIRM PERFORMANCE

In what ways may the success of a business be measured? When someone says ―company,‖ what does that imply exactly? This is a good starting point for our investigation into the factors that propel prosperous companies, but we're content to leave it to the theory of the business literature (Nightingale 2018). In particular, although companies create and sell goods and services, there is a vast difference between what we academics perceive and what they truly do. Finding the variables that, all else being equal, cause discernible variations in business performance is the main goal of quantitative research performed at the firm level. On the other hand, business owners may place a higher value on other measures of success than we do. A company owner's primary goal may be maximization of profit, in contrast to an academic's emphasis on employment creation. Similar to the elephant in the blind men's tale, the criteria used to assess organizations may give them quite distinct appearances.[23](Huergo, E., & Moreno, L. 2021) examine how public and private R&D investments influence firm performance in different sectors, highlighting that firms with higher R&D intensity experience sustained improvements in profitability and market share.

(Demirel, P., &Kesidou, E. 2020) show that firms adopting green innovation technologies not only improve environmental performance but also benefit from enhanced firm performance, especially in markets where consumers value sustainability.

3.4.1 Employment

Because it is fundamental to defining the character and scope of an organization, the total number of workers is sometimes used as a surrogate for its size. Job growth metrics are also frequent, either as a stand-alone indication or as a complement to broader measures like the frequency of rapidly expanding companies. It is often believed that politicians and economists use the increase in employment as a key measure of their success in

[22]Ng'eno N, Factors affecting the adoption of solar power for domestic usage in Kajiado County, Kenya. Being an MA Research Thesis in Project Planning and Management submitted to University of Nairobi, Kenya, 2014. http:// erepository.uonbi.ac.ke/handle/11295/74308 (Accessed 15 May 2021)

[23] Nightingale, P. (2018). Meta-paradigm change and the theory of the firm. Industrial and Corporate Change, 17(3), 533–583.

creating a robust labor market and tackling the problem of unemployment. In contrast, entrepreneurs are less inclined to view the growth of their workforce as a measure of success due to the fact that it raises payroll expenses. This proves the idea about the interconnectedness of measurements and the various assessments performed by the organization, as discussed before. The importance of job growth has been the subject of conflicting findings in the research on growth sequencing. Evidence suggests that higher employment levels lead to higher sales and profitability. According to many sources (Coad and Rao 2009; Coad 2010; Coad et al. 2020) The employment of new staff, however, is not always given the priority it deserves in rapidly growing companies.

3.4.2 Turnover

Since turnover indicates a rise in revenues, it is a more accurate indication of that entity's success than business size, according to the previous simplification. Consequently, management literature tends to concentrate more on turnover and related indicators than on company size. As we saw in the section on firm size, most organizations see a rise in turnover rates after an increase in staffing levels. Turnover, however, may happen early for fast-growing businesses.

3.4.3 Profits/Profitability

Because they reveal how well the company's management has been able to spot and seize lucrative business possibilities, profits are an important measure of a company's performance.The importance of finding profits in pushing future development is emphasized by both Chandler et al. (2009) and Coad et al. (2017), with the latter finding particular relevance to high-growth enterprises. From basic accounting computations to the more advanced financial ratios (such as return on assets, etc.) often found in academic papers and textbooks on finance, there is a wide range of ways to assess profits. Although they do show up every so often, the latter are used less often since there isn't enough data.

3.4.4 Productivity

At the corporate level, productivity is a critical performance indicator that shows how well or poorly a corporation uses its production components. Value-added per unit of

fixed capital stock is an indication of capital productivity, whereas value-added per worker or per hour is one measure of labour productivity. Both metrics are strongly correlated with the nature of the technology used, with more labour-and capital-intensive methods achieving greater productivity. As Gal 2020 points out, total factor productivity (TFP) is an additional important productivity measure for businesses.[24]Keep in mind that deflated firm sales could stand in for production if it isn't available; however, the deflator's qualityand, by extension, the product's homogeneitywill heavily influence how well this stand-in performs. The source is Melitz (2000).[25]Organizational and process innovation, as well as company size, which captures growing return to scale, are important antecedents of productivity.

3.4.5 R&D/Innovation

Businesses' creative endeavours have been the focus of several studies in the entrepreneurship literature, thanks to the strong ties between the two sectors. Studies of innovation often use R&D, human resources, and financial resources as inputs, and new product sales and patents as intermediate and ultimate outputs. (Espel and Hopkins, 2020).[26]So, most innovation-focused entrepreneurship studies will employ either publicly accessible measures, such as research and development spending or patents, or metrics derived from survey instruments, such as the Community Innovation Surveys in Europe.

3.4.6 Firm survival

One way to evaluate a company's competitiveness is to look at how long it has been operating in a certain market. Therefore, the company's ability to stay in business is a measure of performance. The survival strategy to measuring business success, however, has a number of drawbacks. To determine if a business will survive, one must be able to determine how long it will take, in months or years, for the firm to enter and leave the

[24] Gal, P. (2020). Measuring Total Factor Productivity at the Firm Level using OECD-ORBIS, OECD Economics Department Working Papers, No. 1049, OECD Publishing, Paris.
[25] Melitz, M.J. (2020). Estimating Firm-level Productivity in Differentiated Product: Industries, Harvard, mimeo.
[26] Hopkins, M.M. and Siepel, J. (2020). Just how difficult can it be counting up R&D funding for emerging technologies (and is tech mining with proxy measures going to be any better)? Technology Analysis & Strategic Management, 25(6), 655–685.

market. Defining ―entry‖ and ―exit‖ is where most of the problems begin. A new company's entrance into a product market is markedly different from an established firm's introduction into the same market. When thinking about getting out of here, don't automatically assume failure and/or bankruptcy. Indeed, there are a great deal of other, more dramatic, and positively unrelated causes for the activity to end (such as the owner's retirement or death), which has nothing to do with business. Leaving a company does not always mean shutting down operations. It is possible for another company to quickly and easily take over the activities (Parker 2019).[27]

3.5 RURAL DEVELOPMENT

According to the World Bank's debate, more private initiative is needed to solve problems that government bureaucracy can't manage. Development calls for a flexible institutional structure that places a premium on different points of view, argues Sachs (1984). The research questions make it obvious that naturally multi-nested institutions are the focus of this thesis. Reason being, many people participating in institutional settings are part of partnerships, and this research examines such interactions. Second, the principle of subsidiarity should be upheld in order to direct this development process in such a way that the time it takes to make a decision and put that decision into action is as short as possible. This will bring the choice into the everyday lives of the people who are closely involved.[28] By extending this process into a social mobilization effort including a federated network of cellular, layered communities, Friedman anticipates a future where social learning is the dominant form of knowledge production and validation, building on Sach's (1984) work.[29] Lang (1988) argues that development plans often ask for changes in behaviour, and that these changes may be more easily implemented if the individuals whose actions are intended to bring about the changes are included in the planning process. This lays the groundwork for the idea's multi-approach functionality and helps to uncover some of the more fundamental issues with stakeholder decision-making in a sustainable growth

[27] Parker, S. (2019). The Economics of Entrepreneurship. Cambridge: Cambridge University Press.
[28] Sachs, J.. (1984). Princeton Studies in international finance: theoretical issues in international borrowing. (Available online: https://www.princeton.edu/~ies/IES_Studies/S54.pdf) (Accessed: 4th March 2021).
[29] Sachs, J.. (1984). Princeton Studies in international finance: theoretical issues in international borrowing. (Available online: https://www.princeton.edu/~ies/IES_Studies/S54.pdf) (Accessed: 4th March 2021).

agricultural context, where all stakeholders' input is required and where their distinct responsibilities overlap or disagree.[30]

One study by Flora et al. (1997) noted Equipped social capital (ESI) is an alternate method to a qualitative kind of social capital. One interpretation of ESI is that it may transform social capital into institutional frameworks that promote collective effort; another is that it can explain a collection of principles, ideas, and measurements for measuring a community's capacity to solve problems and handle difficulties constructively.[31]

Connecting and bridging social capital, survival support networks, and career progression networks are all defined differently by Putnam (2000). The discussion of social capital in this section does not imply that the paper primarily examines the topic in relation to rural power entrepreneurship. Rather, it implies that the types of institutions examined and the relationships between stakeholders help to clarify some parts of Putnam and Flora's work.[32]

According to Kostov and Lingard (2001), the use of abstract concepts such as environmental sustainability, multifunctionality, and integrated development has been prevalent in describing rural areas. Our knowledge of rural development processes has grown thanks to studies conducted all across the globe. This is especially true in the realm of culture, which encompasses not just language but also norms, identities, sex, psychological segregation, and power.**[33]**

According to Lowe et al. (2005), rural development entails improving the living conditions of rural residents and transforming rural places into modern, self-sufficient small towns. Rural development is defined in the empirical research according to a number of different theoretical and practical frameworks, including cultural standards,

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[30] Lang, R. (1988). Planning for integrated development. In Integrated Rural Planning and Development. In: F.W. Dykema Rural and Small Town Research and Studies Programme. Sackville, New Brunswick: Mount Allison University. 81–104.

[31] Flora, Jan L., Jeff Sharp, Cornelia Flora, and Bonnie Newlon, Entrepreneurial Social Infrastructure and Locally-Initiated Economic Development' Sociological Quarterly 38, (4), 1997: 623-645.

[32] Putnam, Robert D. (1995). Bowling Alone: America's Declining Social Capital. Journal of Democracy . 6(1), 65-78.

[33] Kostov, P. and Lingard, J. (2001), Rural Development as risk management (Available online: https://core.ac.uk/download/pdf/9309677.pdf)

personal beliefs, political and religious ideas, and the difficulties of implementing local policies.[34]

Researchers Van der Ploeg et al., 2007 New goods and services, together with the subsequent formation of new markets, are seen to be at the heart of regional growth, according to the author. It entails developing and replicating specific, linked knowledge bases in addition to establishing new methods to cut costs via the formation of new technical trajectories.[35]

In order to improve the social, cultural, and economic conditions of the people and enable them to fully participate in national programs, Omofonmwan and Odia (2009) state that rural development growth is a process of change in which government efforts are combined with those of the people. Modernizing the traditional ways of life of rural communities is what rural development is all about. Another way to put it is as a movement towards progress.[36]

- There are four broad categories that have been used to classify this idea in the literature, with the most recent three being used to this investigation:
  • The conventional understanding of the term, which places an emphasis on individual differences, societal norms, and psychological distance (FAO, 2011) [37]
- Synergy, integration, and involvement are at the heart of this contemporary idea (Kostov and Lingard, 2011).[38]
- The importance of public participation in rural development is emphasized by this term.
- Development in rural areas is complex and multi-levelled. Economic players should only be considered within the context of their own social and economic

[34] Lowe, P., Ray, C., Ward, N., Wood, D. and Woodward, R. (2005). CRE school of agriculture, food and rural development. Participation in rural development: a review of European experience
[35] Van Der Ploeg, Jan D. (2013) Food sovereignty: A critical dialogue peasant-driven agricultural growth and food sovereignty.
[36] Omofonmwan, S.I. and Odia, L.O. (2009). The role of non-governmental Organisations in community development: Focus on Edo State–Nigeria. Anthropologist. 11(4), 247–254.
[37] FAO (2011), The state of food and agriculture: Women in agriculture closing the gender gap for development, Food and agriculture organisation of the United Nations, Rome (available online: http://www.fao.org/docrep/013/i2050e/i2050e.pdf)
[38] Kostov, P. and Lingard, J. (2001), Integrated rural development -do we need a new approach? (Available online: http://econwpa.repec.org/eps/othr/papers/0409/0409006.pdf (Accessed: 24 March 2021).

> systems, claims Callon (2013). The difficulties of complete rural development may be met with a systems-based strategy that prioritizes these systems. Markets are not static, objective parts of networks, according to Callon (2013); rather, they are dynamic, socially constructed entities. In a cyclical causal way, a market is generated via the processes of separation, organization, integration, and externalization. [39]

Rural development encompasses a wide range of topics and circumstances related to the preservation of cultural heritage, the biophysical environment, and other forms of cultural and historical legacy (Bezanson, 2015). The economic and social climate, the infrastructure, the availability of social services, and many other factors, including the methods and structures of government[40]

Central to Friedman's work is the concept of a system of layered societies, which is also a finding shared by Ostrom (2017). From the point of view of community management, he defines rural development as community oversight. In this approach, rather than focusing on the bureaucratic system and its centrally mandated development programs and projects, the focus is on the community itself—its needs, its abilities, and, ultimately, its control over its resources and destiny. Power over one's own life and the ability to direct one's own productive resources toward the betterment of one's family and community are other significant themes. It taps into the core principle of responsibility and control, which states that those whose lives are most directly impacted by an action should have a say in shaping it. It is recognized that there should be a balance between lawful (and sometimes government-directed) top-down programs and bottom-up development procedures that include local participation. The research is very relevant to this thesis since it examines the same concepts used by the institutions and actors under scrutiny. Additionally, the instances and circumstances provided further highlight the control and accountability issues mentioned by Korten later in the thesis. [41]

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[39] Callon, M., & Muniesa, F. (2013). Economic markets as calculative collective devices.Organization Studies. 26(8), 1229-1250.

[40] Bezanson, K., Sagasti, F. and Seaford. S. (2015). Prospects for development thinking and practice (Available online: http://www.development.wne.uw.edu.pl/uploads/Courses/dev_benzason_sagasti , accessed 18th March, 2021)

[41] Ostrom, E. (2017). A diagnostic approach for going beyond panaceas. Proceedings of the National Academy of Sciences. 104, 15181-15187.

Dykeman (2018) follows a similar line of thinking when discussing community and rural development, highlighting its process orientation and its role as an intermediary between many parties such as community members, local authorities, businesses, special interest organizations, educational institutions, and government agencies at the highest levels.[42] The concept of interconnectivity, complexity, ambiguity, conflict, plurality, and social limits must be acknowledged and addressed in development planning, according to (2018). An ongoing, integrated, and cooperative strategy founded on shared interests and ideals is required to overcome these seven constraints of rural regions. In response to these needs, the European Union's LEADER initiative has, since 1991, advocated a bottom-up, community-centered, collaborative approach to rural development. Growth in rural areas is more likely to be carried out when choices are taken at the local level, based on consensus, rather than when they are made at the state level. Despite the claims of several national and international organizations to be dedicated to participatory tactics in helping the rural poor, Kibreab asserts that there has been less progress in translating lofty objectives into tangible initiatives (2019). Ultimately, this can be backed up by looking at the track record of past economic development and cooperatives initiatives. These initiatives have generally had limited success and often end up benefiting traditional elites at the expense of poorer communities. [43]

Reducing the scope of top-down interventions is a drastic measure with the intention of achieving new objectives related to the rural development phase via the promotion of concepts such as multi-dimensionality, integration, coordination, subsidiarity, and sustainability (Moseley, 2019).[44]As we go through the many portions of this thesis, we will see why the concepts of player coordination and integration are fundamental to understanding rural development, making the connection to sustainability, and acknowledging the multidimensionality of the idea.

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[42] Dykeman, F.W. , (2018) Developing an understanding of entrepreneurial and sustainable rural communities' in Entrepreneurial and sustainable communities. In: Dykeman, F.W. , ed. Proceeding of a Conference Held in St. Andrews-by-the-sea, St. Andrews-by-the-sea June 1988: Rural and Small Town Research and Studies Programme

[43] Kibreab, G. (2019). The Consequences of Non-participatory Planning: Lessons from a Livestock Provision Project to Returnees in Eritrea. Journal of Refugee Studies. 12 (2), 135-160.

[44] Moseley, M. (2019). The New Localism as a Response to Rural Decline'. In: Westholm, E., Moseley, M., and Stenlas, N Local Partnerships and Rural Development in Europe: A literature review of practice and theory. Cheltenham: Countryside and Community Research Unit. 25-44.

Scoones (2019) argues that rural development may be seen from an angle that incorporates integration both explicitly and implicitly. This is relevant to the study of rural development principles alongside sustainability, poverty reduction, climate change adaptation, and other major international development concerns. [45]

Kay (2019) outlines the synergy strategy. One way to look at rural development is as an internal reorganization of social capital. This capital consists of the norms and networks that enable people to act collectively. The understanding of the market that this research has is crucial, particularly when considering its origins and evolution. The discussion of social capital in Woolcock and Narayan's (2000) study may seem limited, but there are actually many dimensions to the synergy approach. The study also looks at how stakeholders and project beneficiaries in rural areas could work together to create a multi-layered effect. As this thesis will show in the next sections, there has been very little literary development on bonding and bridging, which limits the potential impact of social capital research. Interactions between structured institutions and local actors and beneficiaries may be seen as win-win situations when the collective approach is maintained and the roles of functional players are clearly defined.

Methodological hurdles and two conceptually separate symbolic interpretations of attachment and joining coexist, according to Geys and Murdoch (2022). Because of this, the focus shifts from the amount to the quality of social capital. Anyone can form a group if enough people join together, whether that's on purpose or by accident. They provide a summary Bridge social capital is based on fewer linkages than bond social capital, which is based on strong relationships within the network; both types of social capital are important to the theories of synergy. Bonding social capital helps traditional communities preserve their cohesiveness by fostering trust and collaboration. While social capital bonds lessen potential harm, they also dampen enthusiasm for improvement. Due to the

[45] Scoones, I. (2019). Livelihoods perspectives and rural development. The Journal of Peasant Studies. 36(1), 171–196.

ever-changing nature of the development process, the two categories of social assets are always transforming into one another. [46]

3.6 ENTREPRENEURSHIP CONTRIBUTING TO RURAL DEVELOPMENT

The development of local entrepreneurial capabilities and a cohesive regional/local plan are essential components of an ambitious but complex strategy for rural economic growth if we are to produce entrepreneurs. According to Chambers (2006a), development programs that are customized to the local environment and include community people in the process make the top-down model more successful. When RDOs fulfill both criteria, they pave the way for entrepreneurial growth in rural areas. Since the ownership part of the dialog changes how development and, even more importantly, growth tools are seen, this argument holds water within the framework of this discourse. Instead of just knowing the solution, this makes the people who spend money, use technology, or get an education become its managers and owners.

Tecnosol, an initiative in Nicaragua that provides decentralized power generation using solar photovoltaic (PV), wind, and hydropower to mostly rural Nicaraguans who lack access to electricity, is another good example that fits the bill (Technosol, 2008). It is common for women from low-income homes to create small micro companies. There is a striking resemblance to the Grameen Shakti initiative in Bangladesh, which uses a market-driven approach to provide electricity to marginalized communities. It accepts payments in a variety of forms, including loans for livestock, and is based on the microcredit plan of Grameen Bank.

Organizations and people who advocate for rural development understand the significance of starting and running rural businesses, since entrepreneurship is seen as a tool for strategic development that might hasten rural development. According to this point of view, entrepreneurship is an essential instrument for the improvement of rural areas. Development organizations, farmers, rural women, and young people are among the rural development stakeholder groups that see entrepreneurship as a way to improve

[46] Kay, C. (2019). Development strategies and rural development: Exploring synergies, eradicating poverty. Journal of Peasant Studies. 36(1), 103–137.

people's lives, families' lives, and communities' quality of life while also preserving a healthy economy and environment. One way to do this is by empowering individuals to make their own decisions and reduce their need on social support. Despite entrepreneurship's relative neglect in rural economic growth theory, it has recently received increased attention from development experts and scholars in response to threats posed by global competition and organizational restructuring (Khan et al., 2017).[47]Entrepreneurs as agents of rural development are the primary subjects of this study because of the aforementioned gap in the literature.

Manufacturing water pumps, streetlights, residential lighting, and industrial and home solar water heating equipment, TATA BP Solar finally controls 30% of India's solar energy industry (Wilson & Zarsky, 2019). Offering customers a long-term service backed by contractual connections to the local government and taking use of the government's subsidies and tax breaks for solar PV systems (PVs hereafter) is possible since it is a joint effort with the government. Users are responsible for installation and maintenance, but locals are trained in these areas. A direct outcome of this is the increased degree of local entrepreneurialism among the youth and women in these regions.

"Sustainable Entrepreneurship and Rural Development: Pathways for Green Growth in Latin America‖ which focuses on how sustainable entrepreneurship, particularly in eco-tourism and organic farming, contributes to rural economic growth in Latin America. The authors argue that rural entrepreneurs who focus on sustainability help preserve natural resources while also generating income and employment. The study highlights the critical role of entrepreneurship in fostering both economic and environmental sustainability in rural areas. (Rodríguez, L. & García, E. 2023)

3.7 INSTITUTIONS AND INSTITUTIONAL ARRANGEMENTS

[47] Khan, F., Munir, K., and Willmott, H. (2017). A Dark Side of Institutional Entrepreneurship: Soccer Balls, Child Labour and Postcolonial Impoverishment.Organization Studies . 27(7), 1055-77.

The social, economic, and political aspects of everyday life may be substantially predicted by looking at these. Although institutions do alter over time due to people's actions, they also create patterns of behavior that individuals tend to stick with (Giddens, 1984). They lead to development outcomes that are positive or negative. What institutions encourage in terms of relationships and conduct has far-reaching effects on societal rights and dignity as well as resource distribution.

Institutional structures have a substantial impact on how well a certain set of policies or technological solutions work. Similarly, institutional design is critical for growth because it lays out the groundwork for the system to be socially beneficial and acceptable to all members of society, or it can be redistributive and benefit some members of society at the expense of others without affecting their interests (Firmin-Sellers: 1995). Examining the institutional framework not only sheds light on the policy's contents and components, but also identifies the key actors who contributed to the policy's creation. This would lead to a deeper understanding of the processes that produce certain results. Examining the outcomes of these steps is crucial for developing more precise aims and objectives that reflect the rationale, components, and stakeholders of a given institutional plan. This would lead to a deeper understanding of the processes that produce certain results. After these steps are taken, the findings may be analyzed to have a better understanding of the stated objectives and goals that will help achieve this purpose and follow this strategy. Institutions were considered by Hodgson (2003) to be an independent class of social institutions that may influence agents to alter their behaviour, including their preferences and aims. Informal institutions are the unwritten social rules, practices, and traditions that shape how people think and behave. In their pursuit of equitable growth, development practitioners often overlook informal institutions in favor of more formal ones (Unsworth, 2010). [48]

One word often used in relation to institutions is the idea of nested institutions. The reason why Ostrom (2019) Because public and private interests often overlap in urban planning settings, making it difficult to implement a purely market or government-based system for service delivery, it is argued that multi-level organizations are necessary. To

[48] Unsworth, S. (2010), An upside down view of governance, Brighton: IDS.

rephrase, state flaws or market deficiencies may be addressed by a variety of appropriately nested organizations when a single institutional requirement is enforced instead of several rules.The multi-settled approach that Ostrom discusses in her work is crucial for bettering institutional designs and goals since it is often seen as foundational knowledge that sheds light on specific institutional game plans. Due to the study's focus on green energy-based entrepreneurship in rural areas, the institutional framework that supports the former and the individuals embedded within it are important parts of the research.[49]

The reason why Ostrom (2019) Public and private interests often work together to undermine service provision in urban policy arenas; as a result, the need of several, interconnected institutions is emphasized. To rephrase, the shortcomings of the state or the gross market may be remedied by imposing a patchwork of organizational norms rather than a single set of requirements from a single entity. Institutional structures and aims must take into account the multi-nested approach exemplified by Ostrom's work, as it may be seen as background information that informs particular arrangements. This study is particularly interested in the rural environment and more especially in replenishable energy-based entrepreneurship, therefore the institutional framework that supports the former and the individuals who are embedded within it are important components of the research.[50]

By drawing on ideas from social theory and institutional theory, empirical research provide insight on the relationship between development outcomes and institutional frameworks (Dasgupta & Serageldin, 2022). Informal and corresponding bodies co- evolve via the operations of organizations, ranging from households to rural groups, businesses, beneficiaries, and governments. [51]

3.8 INSTITUTIONAL ARRANGEMENTS AND DESIGN

To begin, you must understand that in order to get the most out of a public-private partnership, everyone involved has to raise awareness about the many options and the

[49] Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. Science . 325, 419-422.
[50] Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. Science . 325, 419-422.
[51] Dasgupta, P., & Serageldin, I. (2022), Social capital: A multifaceted perspective, Washington, DC: World Bank.

best approaches to make such partnerships. In order to understand the benefits and drawbacks of PPP, this is essential. Initial impetus for these types of agreements came from budgetary concerns and efforts to raise the bar on public service efficiency and quality. O (2003) states that in public-private partnership (PPP) schemes, the private sector primarily serves four purposes: (a) increasing capital generation; (b) developing an alternative formulation utilizing project skills; (c) enhancing value for beneficiaries or general individuals; and (d) facilitating greater need marking out of resource allocation. Implementing and designing such systems may be challenging, despite the advantages. The basic idea behind public-private partnerships (PPPs) is to harness the private sector's expertise and knowledge to achieve better value while distributing risk to those who are best suited to handle it. With an emphasis on rural regions, this research looks at the institutional structures that make renewable energy entrepreneurship possible. Additionally, it takes a top-down view of points b, c, and d. Evaluating and investigating point d (above, i.e., giving better identification of needs and best utilization of resources) requires an inclusive and participatory approach to rural life. Formal institutions may not always be able to do this due to the bureaucratic structure and the limited availability of information at the grassroots level. There is a wide variety of structures for PPP partnerships, and the ideas behind them are always evolving. This means that the specifics of each project and the partners' individual traits need to be considered. In this section, we shall examine the notion and relevance of replenishable energy technology (RETs, from now on) since the initiatives centered on entrepreneurs in context and rural development in this thesis are RETs-based.Laws, regulations, and procedures make up an organization's institutional framework. These help with governance, organization, and management of activities, as well as in collaborating with others to accomplish objectives. Institutional arrangements may be defined as various (in)formal frameworks and alliances for group action and inter-agent coordination. Examples of these include public-private collaboration and contractual schemes, organizational networking, and policy arrangements. Their formality or informality determines whether they elicit cooperation or opposition; they might be on a regional or global scale. Institutional arrangements may foster well-being, identification, solidarity, and a sense of belonging; they are dynamic systems of formal and informal norms and networks that are influenced

by economic transactions, socio-cultural standards, and political regimes. In development, it is challenging to understand how poverty, inequality, and resource degradation are linked to institutional systems that are weak, nonexistent, or unfavorable (Rodrik, 2012).[52] Organizational networking, public-private outsourcing, policy agreements, public-private contracting and cooperation schemes, and other forms of institutional structure are all possible (Geels, 2014). Popular public-private partnerships (PPPs) fall into one of two types: those based only on contracts and those having an institutional component. Institutional PPPs differ from their strictly commercial counterparts in that they bring together the public and private sectors to work together inside a distinct entity, rather than relying only on contractual relationships. In both cases, the traditional public sector functions will be outsourced to the private sector. In the first kind of PPP, duties and obligations are governed by an administrative contract or series of contracts. If the second scenario plays out, the company's laws and the shareholders' agreement between private and public organizations will back them up. There is contractual control in both cases. This analysis takes both PPP kinds into account.

Many people either don't care about or see social and institutional frameworks as something that slow down technology. The term ―social‖ describes an interaction among living things in which more than one person is participating. Groups and organizations facilitate social gatherings and interactions. Since humans are social beings at our core, it seems to reason that we would form communities, exchange ideas, and establish shared cultural practices. In any case, institutions stand for systematic ways to address long-standing societal issues. Poerschke (2016) cites Herbert Spencer, an early sociology, who defined institutions as the social components responsible for society's everyday operations. Standardized techniques are usually used by institutions to carry out their obligations. One example of an institution is a family. Other examples include schools,

[52] Rodrik, D. (2012), Where Did All the Growth Go? External Shocks, Social Conflict, and Growth Collapses, London: NBER.

churches, NGOs, development organizations, research institutes, and government agencies with particular missions. [53]

3.9 REPLENISHABLE ENERGY TECHNOLOGIES

The percentage of Brazil's and China's energy consumption attributable to renewable combustible sources fell from 30% and 20% in the 1990s to 25% and 13%, respectively, in the 2000s. According to vanderHorst and Hovorka (2009), renewable combustibles are becoming less popular in India, China, and Brazil. This could mean that when economies grow, people switch from using conventional renewables to fossil fuels. However, over the same time period, South Africa's share of renewable combustion products in total energy consumption fell by around 10% and Russia's share fell by about 1%. Renewable energy sources now satisfy between fifteen percent and twenty percent of the world's energy needs. Around 24% of the world's total power output in 1990 came from renewable sources, with estimates putting it at close to 2900 TWh (IEP, 2010). Including conventional bio-energy applications, renewable energy could provide around 18% of the world's energy need. Many of the hydroelectric projects that contribute to the current electrical supply have been running for quite some time, and they constitute the bulk of the renewable energy source. In the 1970s, no other means of generating electricity from a low base could match the growth of the most recent renewables, which include bio- energy, geo-thermal, PV, small-scale hydro, solar-thermal electric, and wind. Forecasts indicate that fossil fuels will meet over 90% of global primary energy demand by 2023, barring any changes in policy. When it comes to situations where environmental limitations are enforced, such those involving carbon dioxide emissions, replenishable energy has a lot of room to grow, according to big international research. In terms of installed capacity based on modern renewables, the main difference between developed and developing nations is that developed countries are more likely to be able to use PV sources. To grasp the relevance of electricity relative to overall energy use and production, it is essential to investigate the various energy sources that various countries employ to generate power (Bodas Freitas et al., 2012). The World Bank Institute (2005) found that coal accounted for 90% of South Africa's, China's, and India's electricity

[53] Geels, F. W.. (2004). From sectoral systems of innovation to socio-technical systems: Insightsabout dynamics and change from sociology and institutional theory. Research Policy. 33(6), 897-920.

generating input, while hydropower played a large role in Brazil's (82%). For 45 percent of Russia's power generation, natural gas was the main ingredient. There are comparable differences in the industrialized world's reliance on renewable energy sources to generate electricity. This study found that the BRICS countries' use of different types of energy, as well as the composition and growth of their renewable resource stocks, varies. While each country's reliance on renewable energy sources differs, there is little difference between the BRICS and the group of developed nations in this regard. In 2006, renewable resources were crucial for many countries, including Brazil and India. The adoption of photovoltaics stands out as the main difference between the BRICS and industrialized nations. During the period being considered, renewable combustibles were used more frequently by India, Brazil, and China than by industrialized nations overall, while Russia had the lowest rates. India continues to employ the most combustible renewables and garbage in its total energy generation, despite the fact that these levels have decreased considerably over time. Renewable and combustion sources accounted for around 40% of India's energy consumption in the 1990s, but by the 2000s, that number had fallen to 30%. In rural areas of India, non-commercial energy sources like wood, crop residues, and animal waste account for a large portion of this high percentage, while the replacement of traditional energy sources with more efficient ones seems to explain the decrease in the use of sustainable energy combustibles (KPMG, 2017). [54]

In 2019, the Replenishable Energy Association The term ―renewable energy technology‖ refers to a method of using energy services that is both environmentally beneficial and does not drain the planet's natural resources. These resources are sustainable because they can be managed in a way that allows for continuing usage without causing damage to the environment. The availability of inexpensive energy in isolated minor towns is enhanced by these technologies, which promote decentralization of power systems and locally relevant solutions that are more or less independent of the national network. Energy storage, district heating and cogeneration, recycling, process changes, transportation alternatives, transitioning away from fossil fuels to clean energy, coal

[54] KPMG (2007) India Energy Outlook – 2007 (Available online: http://www.kpmg.co.il/Events/india/conference/thought%20leadership/IndiaEnergy_07.pdf)

cleaning technologies, optimal monitoring and evaluation of energy indicators, and policy assimilation are all highlighted in numerous studies (World Bank, 2020). [55]

The focus on innovations in small-scale hydropower systems, which are ideal for decentralized energy production in rural areas. The authors highlight improvements in turbine design and cost reduction strategies that make small-scale hydropower a viable option for local communities. (Mukherjee, P., & Sengupta, A. 2023).Also if we talk about focus on advancements in battery storage technologies, particularly in solid-state batteries and lithium-sulfur batteries. These innovations are critical for storing energy from intermittent renewable sources like solar and wind, improving grid stability. (Wang, L., & Zhang, T. 2023)

Hosseini, S. E., & Wahid, M. A. (2023) explore the role of hydrogen as a long-term energy storage solution for renewable energy systems. Their study highlights advancements in green hydrogen production, storage technologies, and its potential to balance energy supply and demand in large-scale renewable grids.

3.2.9 SOLAR ENERGY BASED ENTREPRENEURSHIP CONTRIBUTING TO RURAL DEVELOPMENT

By depending on small enterprises and obtaining assistance from the government and official national organizations, the Emilia-Romagna region demonstrated how a rural area may achieve top export revenue levels. Rural entrepreneurs have also helped small-scale food producers in Western Massachusetts. Among solar sisters in Africa, green initiatives in particular have great growth-igniting potential, thanks to the support of local level women and youth entrepreneurs from various organizational arrangements, such as PPP and the development of enabling factors for grassroots innovation practices (Smiler, 1987). It is important to have a better knowledge of these many linkages between different players in order to study the overall impact of an effective institutional

[55]Replenishable energy Association (2019), Energy and environment. (Available online: http://www.r-ea.net/info/energy-info) (accessed 18 April 2021).

framework that allows entrepreneurial initiatives based on renewable energy on rural development.

An important factor in the success of green programs, especially Replenishable energy Technologies in rural areas of Africa, has been the public-private and private-private partnerships that government institutions have developed over the years. Gaining a better understanding of these complex processes is essential for educating policymakers to mainstream solar RETs-based interventions as a development approach for rural areas. The aforementioned accomplishments and limited success stories bring attention to the concerns raised by Sanderson (2004). These concerns include the sensitivity of tropical nations, communities, NGOs, and markets, as well as the absence of well-defined ideas for organizations to work together in creating regulations that both reward and alleviate rural poverty through increased productivity. Similar concerns were voiced by Lee and Barrett (2005), who argue that in order to tackle the problem of rural poverty reduction and renewable power conservation, it is necessary to thoroughly review and reevaluate the institutional mechanisms upon which such endeavors rely. The importance, relevance, and need of this research are included here.

Entrepreneurship was deemed a powerful instrument for promoting rural development in the research reviewed previously. Then, with a focus on India, we looked at how bigger investments in RETs in rural regions are on the rise. Below, you will find some successful examples and insights from developing nations and rising economies. These will help you explore the three aspects of this study that look at how solar-based entrepreneurship contributes to regional development. (1) The impact of renewable energy sources on rural development; (2) the relationship between solar renewables technology and entrepreneurship; and (3) the impact of entrepreneurs who have found success with solar energy on rural development. Success with solar RETs and distribution to impoverished rural communities and construction firms allowed Bangladesh to become the world's first solar powered nation (IDCOL, 2009).

Creative credit systems, appropriate product designs, effectively and efficiently managed after-sales services on a regional level, and other consumer-friendly alternatives are significantly impacted by the aforementioned instances, as shown by Nasreen and Rabbi

(2011). One of the main reasons for Bangladesh's success is that rural communities are given the ability to own and run solar RETs. This means that they may also get involved in introducing and growing RETs to their community. Along with the necessary technology, these firms also provide their target clients and stakeholders with opportunities for financing and business.

One well-known example of the positive impact solar RE may have on both local communities and society as a whole is the widespread adoption of solar home systems (SHS) among rural households and the subsequent use of this technology to start small companies. Using technology to start micro-businesses from the comfort of their own homes, families that received the SHS created and marketed a variety of handmade handicraft goods, including jute and silk products. Locals in their areas were often employed in greater numbers by these small firms. More than 6 million people living in rural areas of Bangladesh now have access to solar power, thanks to the installation of over a million SHS (IDCOL, 2011). Women, who constitute 36% of the industry, have been especially encouraged to start their own businesses as a result, according to UNEP (2009). There has been a recent uptick in the hiring of solar experts to build SHS, operate battery factories, and manage other accessory-related enterprises, and rural women are increasingly collecting solar accessories at technology centers located in their villages. Institutional structures take on contextual importance in the aforementioned circumstances for various reasons. Most studies have looked at the relationship between economic growth and institutions, which are often thought of as the rules and regulations that govern economic activity, both formally and informally (Acemoglu & Johnson, 2021). Nepal and India are two examples of countries where public-private partnerships have contributed to rural community development.

Gramin Bank, for example, lends modest sums to rural Bangladeshi women entrepreneurs who are selling photovoltaic systems and generating electricity for mobile phones using solar power (Barua, 2017). [56]Women in rural areas of India have been receiving solar lights and charging stations from the AIWC. During the day, women

[56] Barua, Dipal. (2007). Online interview.(available online: http://sinovoltaics.com/interviews/solar-for-the-poors-livelihood-improvement-interview-with-dipal-barua/ , accessed on November 2021)

charge the solar lanterns, and in the evening, they rent them out to those selling them on the street or whose houses don't have electricity or have long power outages. As part of AIWC's solar-powered water purification programs, local women provide the area with high-quality filtered water at a cheap cost. Another source of money comes from barefoot engineers from TILLONIA, and there's also another family level company that women formed using solar RETs. In addition to confidently building, installing, and mending parabolic solar cookers, women's organizations also build them. At BAHAI's women's group, you may find solar cookers made and sold by women from Madhya Pradesh. Solar air-dryers, developed by AIWC and CRT for use in Nepal, allow women to dry fruits and condiments in a clean environment while using zero energy. A variety of renewable energy technology (RET) models have arisen in Nepal, but none have been as successful as the government's MHP (Micro-hydropower) initiative. Collaboration between the public and private sectors is essential for the MHP sector's growth. In addition, the ADB/N mediates financing for the construction of MHP plants in Nepal by connecting the country's government with private companies. Evidently, rural households may speed up rural economic growth by creating local employment when they have access to a reliable and affordable power source. Because of this, local prospects have been strengthened, and solar RET-based projects have been inspired (Kirubi, 2019). The effective packaging of a rural energy-based program is crucial; the examples given above illustrate the integration of several components, such as capacity development, technology transfer, training, financing, and pricing. The REED program for job creation in environmental services is another initiative that helps businesses that focus on renewable energy (RE) and helps and facilitates the establishment of businesses that offer public services in RE and bio-waste handling while also supporting them to operate sustainably. Helping rural youth, women, SHGs, and micro-businesses launch new waste-to-fertilizer, replenishable energy, and maintenance and equipment supply ventures is the primary objective of the REED program.

Comparing SELCO's behaviour in Bangladesh to that in India reveals striking similarities. Raising capital, creating niche markets for RETs, and fortifying relevant institutions are among options that SELCO India Pvt. Ltd considered as they sought to empower women and the poor, provide employment opportunities, and advance rural

development (Islam, 2021). Not only did the aforementioned programs achieve remarkable success in helping the poor and fostering small-scale female entrepreneurs, but so did Bright Green Energy Foundation and Grameen-Shakti. Women in India are the principal consumers of home energy for cooking and heating, and several successful organizations and networks have recognized this. These include SEWA (Self Employed Women's Association), TIDE, AIWC, and SELCO (Solar Electric Light Company of India). Specifically, we want more women to become involved and learn how to start their own energy businesses. Adoption of Solar Energy by Small and Medium Enterprises in India: Challenges and Opportunities where study highlights that small and medium enterprises (SMEs) in India are increasingly adopting solar energy due to the economic benefits and operational efficiencies it provides. However, challenges such as high initial capital costs and insufficient technical support act as significant barriers to adoption. Despite these challenges, the potential for long-term savings and energy reliability remains a major driver for SMEs considering solar solutions. In addition, the study notes that limited access to technical support and a lack of expertise in installation and maintenance hinder the smooth adoption process. The study emphasizes the need for more accessible financing mechanisms and better technical training for SMEs to capitalize on the opportunities presented by solar energy.(Kumar, A., & Singh, R. 2021).Understanding the Impact of Government Policies on Solar Technology Adoption in India where this emphasizes the critical role that government incentives, such as subsidies and tax benefits, play in promoting solar technology adoption. While these policies have led to an increase in adoption rates, the inconsistency in policy implementation creates uncertainty among entrepreneurs, making it difficult for them to make long-term investments in solar solutions. The study suggests that clear and stable policy frameworks are needed to enhance confidence in solar investments. However, researchers point out a significant issue: the inconsistency in policy implementation and the frequent changes in government regulations and subsidies. This uncertainty causes hesitation among entrepreneurs, who fear sudden policy shifts that could impact their financial viability. The study suggests that to foster long-term investment in solar technologies, the government needs to ensure more stability in its policies, with clear, long-term commitments to renewable energy adoption. (Chaudhary, S., & Kumar, R.

,2022). If we talk about the importance of innovative financing mechanisms, such as pay-as-you-go models and micro-financing options, which have successfully facilitated access to solar technologies for small businesses. These models allow entrepreneurs to avoid large upfront costs, making it easier for them to adopt solar energy. The study underscores the need for financial institutions to develop more inclusive products tailored to the specific needs of small and medium enterprises.The study also shows that these financing solutions have been particularly useful in rural areas, where access to capital and traditional financing is limited.By integrating these innovative financial mechanisms, entrepreneurs can invest in solar technologies without facing overwhelming financial risk. Patel and Mehta emphasize that greater awareness of these financing options and improved collaboration between financial institutions and solar providers could further boostadoption rates. (Patel,P.,& Mehta, A. 2023).the importance of tailoring solar solutions to the local context, taking into account geographic, economic, and cultural factors which argues that entrepreneurs are more likely to adopt solar technologies when solutions are customized to fit local needs and conditions. This study highlights the need for region-specific approaches to ensure higher success rates in solar adoption across different parts of India.By examining case studies of solar adoption in various regions, they show that tailored solutions that address local conditions are far more successful than one-size-fits-all approaches. They also point out that local entrepreneurship plays a critical role in determining the success of solar projects. When solar solutions are adapted to the specific needs of local communities, and when local entrepreneurs are involved in the process, adoption rates increase significantly. (Nair, A., & Gupta, S. 2023)

CHAPTER-4
RESEARCH METHODOLOGY

CHAPTER-4
RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN

The researchers in this study used a mixed-methods strategy known as the integrated research design, which used both quantitative and qualitative techniques. Embedded research design refers to a randomized, controlled study that collects and analyses qualitative data. In this kind of results study, the researcher collects and analyses qualitative as well as quantitative information. The research may make use of the qualitative data at any point before, during, or after the intervention. One possible use of the qualitative data is to inform interference design. So, qualitative data improve the outcomes study, which is a typical approach in diffusion and implementation research (Palinkas, Aarons, Horwitz, et al., 2011). For quantitative study, data was collected using a structured questionnaire survey; for qualitative research, it was collected using semi- structured interview questions.

4.2 EXPLORATORY RESEARCH

Going farther into a topic is, in a nutshell, what exploratory research aims to do. When the issue has to be more thoroughly described and new information is needed before establishing a strategy, a design based on exploratory research is utilized (Bernard, 2002) in business research. The development of a plan for decision-making is an uncommon application of it. Similarly to the exploratory design phase, the data is not tightly specified. Informal analysis in exploratory research requires the collection of secondary or primary data in unstructured forms. Exploratory research designs, because to their objectives and structure, incorporate the least amount of scientific process and rigor among the three kinds discussed before. Surveys, focus groups, and in-depth interviews are all examples of research designs that might be used to explain anything. Entrepreneurial activities in India that are based on solar energy technology (SET) and the ways in which various institutional frameworks encourage them are the subjects of this research.

4.3 QUALITATIVE METHOD

This multi-pronged study aims to better understand what drives SET-based entrepreneurship and how to create an environment that encourages entrepreneurial endeavors that contribute to rural development via the identification of relevant elements and an analysis of relevant institutional frameworks. By dissecting hierarchical structures, it aspires to understand how different types of institutions are put together. Furthermore, the research intends to comprehend the impact of entrepreneurship on neighborhood and regional levels, as well as the role of institutional links in supporting entrepreneurs. Scientific investigations may be qualitative. This explanation is added by Bryman (1988): The following are some of the hallmarks of a well-designed research inquiry: (a) the formulation of questions; (b) the use of established procedures to answer those questions; (c) the collection of supporting evidence; (d) the extension of knowledge beyond previously established limits; and (e) the drawing of conclusions with implications transcending those limits. Qualitative research incorporates all of these elements. Also, it seeks to understand a certain study topic or issue from the community's perspective. Gathering culturally relevant data via qualitative research is very advantageous. [57]

According to Shank (2002), it is systematic, structured, and publicly accessible. It is also carried out in compliance with standards set by specialists in qualitative research. When he says that this kind of study is based on first-hand knowledge, he really means it in an empirical sense. Denzin and Lincoln (2000) argue that a pragmatic and interpretative strategy is necessary for qualitative research. Therefore, qualitative researchers seek to comprehend or interpret events by looking at them in their natural contexts through the lens of the meanings that people ascribe to them. [58] This study uses a qualitative methodology to investigate the existing institutional frameworks that encourage SETs entrepreneurship and how this trend has affected rural development in India. This is an attractive market to target because, according to E&Y (2016), India is the third most attractive country in the world for renewable power generation.

[57] Bryman, A. (1988), Quantity and quality in social research, London: Unwin Hyman.
[58] Denzin N. and Lincoln Y. (Eds.) (2000). Handbook of Qualitative Research. London: Sage Publication Inc.

4.4 QUANTITATIVE RESEARCH

Systematic analysis of phenomena is characterized by quantitative research, which involves collecting quantifiable data and using statistical, mathematical, or computer methods. Quantitative research gathers information from present and potential clients via the use of sampling methods and the distribution of online surveys, polls, and other data collection tools. After this data gathering is complete, the results may be expressed quantitatively. When you have a firm grasp of these figures, you can foretell how a product or service will fare in the future and shape it accordingly.

A mix of qualitative and quantitative methods is used in this investigation. The goals and scope of qualitative research were discussed before. The research methodologies used in this study were quantitative in nature and included survey surveys and interviews. As part of the quantitative study, we polled entrepreneurs, end-users, and officials from several RET support organizations in India to assess the opportunities and challenges of solar technology uptake and deployment.

4.5 RATIONALE BEHIND USING MIXED METHOD RESEARCH (MMR)

(1) Combining qualitative and quantitative techniques might be better than using only one since it will probably provide rich insights into the study phenomena that cannot be completely understood using either methodology alone. To further investigate complex issues, researchers might use mixed-methods designs, which incorporate and integrate many data sources (Poth& Munce, 2020).

(2) There are six primary advantages of combining quantitative and qualitative data in a single study.

(3) One major argument in favor of an MMR approach is the expansion of research. This suggests that researchers may expand their inquiry with sufficient depth and breadth using an MMR technique. When a researcher wants to generalize the results to a community and get a detailed understanding of what a phenomenon or concept means for individuals, it’s helpful to collect both closed-ended statistical results and open-ended

qualitative information. This helps with comprehending the research problem (Creswell, 2003).

(4) Another reason to combine the two approaches is the belief that both are valuable and complimentary to one another, and that doing so would provide better results. Maxwell in 2016

(5) Lund (2012) found that researchers might better understand a study subject when they combined the two methods. Qualitative research methods provide for a more thorough examination of smaller data sets, which aids in studying processes and changes, as well as a sensitivity to various interpretations, logical support, and a high degree of methodological flexibility. As an example, concepts may be defined operationally in a quantitative method by defining well-defined measurements, recording trends and connections, making comparisons, and sometimes employing big and test items.

(6) Lastly, it is recommended to combine qualitative and quantitative methodologies in a manner that balances each other out. This will allow for more detailed findings (Plano Clark &Ivankova, 2016). In other words, when a qualitative strategy doesn't work, a quantitative one could.

(7) An additional perk of an MMR approach is the triangulation component. Data triangulation is the process of validating results from each individual approach in a mixed-methods research (Bergman, 2008). One way researchers try to get a better image of a study topic is by comparing the results of different methods (e.g., quantitative and qualitative approaches) side by side (Plano Clark &Ivankova, 2016).

(8) The last and sixth justification is that it is possible to improve the accuracy and utility of subsequent methods by leveraging the results of earlier ones, whether descriptive or qualitative. According to Plano Clark and Ivankova (2016), page 86. Researchers interested in the causes of childhood obesity may, for instance, claim that in order to understand what characteristics are important predictors, it is required to quantitatively measure them. Then, they may do qualitative follow-up studies to find out why those components were significant.

4.6 DATA COLLECTION METHODS

In 2021, both qualitative and quantitative studies were carried out via fieldwork. Researchers that are well-versed in the institutional setting tend to have a leg up, as shown in the study of Barley (2010: 779). Problems with language and difficulties in conducting research in a new institutional setting were lessened by having a situational awareness of the language in one state and employing a translation in another. For quantitative study, data was collected using a structured questionnaire survey.In order to accomplish its data gathering goal, the research made use of both primary and secondary sources of information. For a more complete understanding of the RET programs and their impact as a whole, both of these approaches were useful. The use of secondary sources to supplement primary data collecting, for example, yielded reliable and accurate results. Furthermore, new secondary information, including numbers, statistics, and specific reports, may be found by using secondary data while collecting main data. Methods, plans, and processes for gathering data are detailed in the sections that follow.

First to be questioned were academics from prestigious Indian universities who collaborate with the government to develop regulations and new initiatives for the renewable energy sector.Among these institutions were the Indian Institutes of Technology (IIT), the University of Delhi, JNU, and TERI (The Energy Research Institute). Policymaking and long-term planning include the majority of the people mentioned before. It was critical for the data gathering process to go into such depths before considering the appropriate degrees of examination for the different types of data.

4.6.1 PRIMARY DATA

The bulk of the information came from academics and policy researchers, government agency representatives, company owners, managers headed by SETs, SETs businesses, and technology suppliers. In addition to analysing their individual contributions to the Indian RE industry, the research also delved into the dynamics between these groups. Quantitative and qualitative data were mostly gathered by questionnaire surveys, key informant interviews, observations, and interviews with key informants. Questionnaire surveys were vital for gaining a comprehensive picture of the factors that motivated influential players to establish institutional frameworks and garner support for energy-

based businesses. Talking to well-known experts who were well-versed in the institutional frameworks that encourage entrepreneurship in India was a crucial part of the interviews. Among those who took the survey were officials from various government agencies, SETs producers, policy think tanks, academics, and civil society organizations. All of the respondents are very knowledgeable about India's SETs business and hold prominent positionswithintheir respective firms. One non-probability sampling technique is the ―Snowball Procedure,‖ when participants in one study choose others to participate in subsequent studies. As previously stated by Katz in 2006 At this stage of the data collection process, no more information was needed to generate case summaries. We managed and collected data at the same time. Reviewing interview replies and comparing them with any accessible secondary data as soon as feasible (where possible) was important to verify the quality and trustworthiness of the data, for example, since the fieldwork entailed frequent travel and simultaneous visits to numerous institutions.

4.6.2 QUESTIONNAIRE SURVEY

In order to gather the required information, respondents were sent structured questionnaires via email. The goals of the research were significantly revised after a pilot study was executed in June 2021 and the data was used to inform the revisions. This study's standardized questionnaires were sent out to all participants and covered all the bases of the declared research objectives.

We questioned each responder one-on-one to glean additional useful information from the survey. Subjects covered in the interview and questionnaire included the functions of regulatory bodies, legislators, SETs manufacturing companies, policy think tanks, government agencies, academic institutions, and representatives from other groups and civil society. Because of this, the researcher was better able to understand how to ask survey questions to the participants.

4.6.3 SEMI-STRUCTURED INTERVIEWS

To get to the bottom of what influenced institutional contexts and led to support for energy-based businesses, interviews were a must. Talking to well-known experts who were well-versed in the institutional frameworks that encourage entrepreneurship in India was a crucial part of the interviews. Among those who took the survey were officials from various government agencies, SETs producers, policy think tanks, academics, and civil society organizations. Most of the people we spoke with were high-ranking executives from various firms.

Case study data may be gathered by observational methods such as qualitative interviews and semi-structured interviews (Taylor & Bogdan, 1998). While the investigator will certainly strive to ensure that each subject gets the most pertinent questions, the semi-structured method nudges them to ask more if needed. The participant is motivated to provide more details and maybe steer the conversation in an unexpected direction when given the freedom to discuss whatever they deem important (Miller et al., 2007). Spradley (1979) states that a semi-structured interview is most effective when it combines prompts with open-ended questions. Grand tour questions, according to him, are those that seek verbal tours of something known from replies. The question's main strength is that it starts conversations, but only when used appropriately. One possible drawback is that respondents can be too focused on the interesting or what they think should happen every day (Brooks, 1980). Because they encourage participation and discourage the interviewer from becoming too sentimental, prompts play an equal role to questions in semi-structured interviews (McCracken, 1988). To interview the entrepreneurs, we used this method, which allowed us to steer the conversation in a more specific way if needed.

Most of the study's participants have been working in the business for a long time, so they have a good grasp of how the market works and reacts to new entrants or changes, which is why semi-structured interviews were useful. Therefore, instead of giving a set of questions, the interviews with the respondents reveal a variety of perspectives and the ways in which each stakeholder defines success according to their own achievable criteria. This is shown, for instance, when asked how the effectiveness of a SETs

intervention is measured. These general questions don't go into specifics, which helps to keep the conversation going until better, more in-depth questions can be asked during the interview.

Similarly, the questions were presented in an impartial manner with a critical tone to encourage exploratory debate. Participants' remarks revealed interesting themes in response to each topic. Respondents had ample opportunity to elaborate and strengthen their arguments throughout this process, which made it all the more important to guide the interview in a way that wouldn't derail the research's primary points while simultaneously considering new examples of timely subjects and issues brought about by the respondents' diverse backgrounds.

Because of the importance of the respondents' individual perspectives in many cases, it is essential to thoroughly analyze and interpret the data in order to live up to the comprehensive nature of this research. For example, SETs companies were basically compensated to build infrastructure and provide technology to underserved areas, while government officials had a different perspective on rural development. Their professional and personal identities shaped their perceptions of success and their feelings towards therapies based on SETs, which in turn shaped their perspective. Because many of the first ideas and codes were based on reading and field reports instead of real experience in the field, the researchers' perspective was critical. With proper guidance, grand tour questions and prompts may lead to fruitful discussions.

Table4.1: Codes in interview questions

Codes embedded in interview questions	**Concepts identified**
Perception of RE sector, RE based businesses, micro entrepreneurs, perception of success, SETs interventions	Institutional structure, nature of support provided to entrepreneurs, stakeholder partnership involved in the process
Academic and industry research benefitting SETs planning	Evidence of triple helix, pattern of interaction between actors
Tangible and intangible benefits of SETs based micro enterprises	Community empowerment, women led micro business success stories

Distribution of responsibilities of different stakeholder in a given institutional structure, consequence of a fall out	Growing indigenization, increasing communication and connectivity between stakeholders, importance of _last mile' agents

4.7 SAMPLING FOR PARTICIPANTS

The data was gathered using a snowball procedure, which involves recruiting more subjects from existing study subjects' social networks. This process continues until there is no more information to be collected, at which point case summaries are prepared (Katz, 2006).

The term ―judgment sampling‖ describes the process of selecting an informant on the basis of their attributes. This approach doesn't assume anything or demand a certain number of people to take part. As long as all relevant information is gathered, the number of informants that may be included in a purposive sample is unlimited (Bernard, 2002). Seidler (1974) examined various sample sizes of purposefully selected informants and found that at least five were necessary for the results to be reliable. The fieldwork's adaptable methodology was made feasible by the use of improved and modified semi-structured interviews. The quality of the questionnaire survey, the debate, and the interviews all enhanced because of this, because it generated some of the most important questions.

4.7.1 SAMPLE SIZE COMPOSITION & RATIONALE

Quantity: sixty-one solar energy technology (SET) led business managers made up the sample for this research. This study's universe consisted of hundreds of managers working for various firms in the National Capital region of Delhi that produce and trade replenishable energy products and services. However, only 60 managers were selected for the sample. Collecting 60 samples was somewhat easy for the researcher. Four hundred entrepreneurs whose businesses are based on solar technology The researcher had no trouble collecting 400 samples for the subject study because, according to estimates, hundreds of individuals/firms in the National Capital region of Delhi are involved in the business of replenishable energy products. Collecting data from

these entrepreneurs was comparatively easier than other sample methods. Twenty researchers/officials from institutions/organizations that promote the growth and development of entrepreneurship.

During the COVID-19 pandemic, when the researcher was gathering data, access to institutes and organizations that promote and support entrepreneurship was even more limited, as was allowed by authorities according to pandemic behavior protocols. It was unrealistic to expect the researcher to accurately gauge the number of officials involved with each group. The authorities involved with these groups were also always preoccupied with their regular duties or meetings. Thus, in order to meet with them and gather data for this study, the researcher had to repeatedly postpone their encounters. Even though the researchers had confirmed meetings with these individuals, they often returned empty-handed from their offices. In light of how time-consuming and difficult it was to meet with and get data from these authorities, a sample size of 20 seemed appropriate.

Officials from Government Agencies, numbers 20, the availability of the relevant government authorities is already problematic due to the sensitive nature of their job and the high level of secrecy that is expected in their offices; the situation was considerably more dire during the epidemic. It was unrealistic to expect the researcher to accurately gauge the number of officials involved with each group. Again, this made it very difficult for the researcher to schedule visits with them to discuss the study's topic. In order to meet with these authorities and gather data for this study, the researcher had to repeatedly postpone their encounters due to their extreme busyness and workload. Thus, these considerations may provide justification for the sample size of twenty.

A total of 500 participants were selected for this mixed-methods study; this number includes 60 business managers led by solar energy technology (SET), 400 entrepreneurs in the agribusiness sector, 20 researchers and/or officials from organizations that support the growth and development of entrepreneurship, and 20 officials from government agencies.

Given that both quantitative and qualitative methods were used in this study's mixed research strategy, it would be prudent to display the sample makeup for each technique

independently. The current study's sample makeup for both the quantitative and qualitative methods is shown in the next section.

4.7.2 SAMPLE COMPOSITION FOR QUANTITATIVE RESEARCH METHOD

Table 4.2: Sample composition for quantitative research method

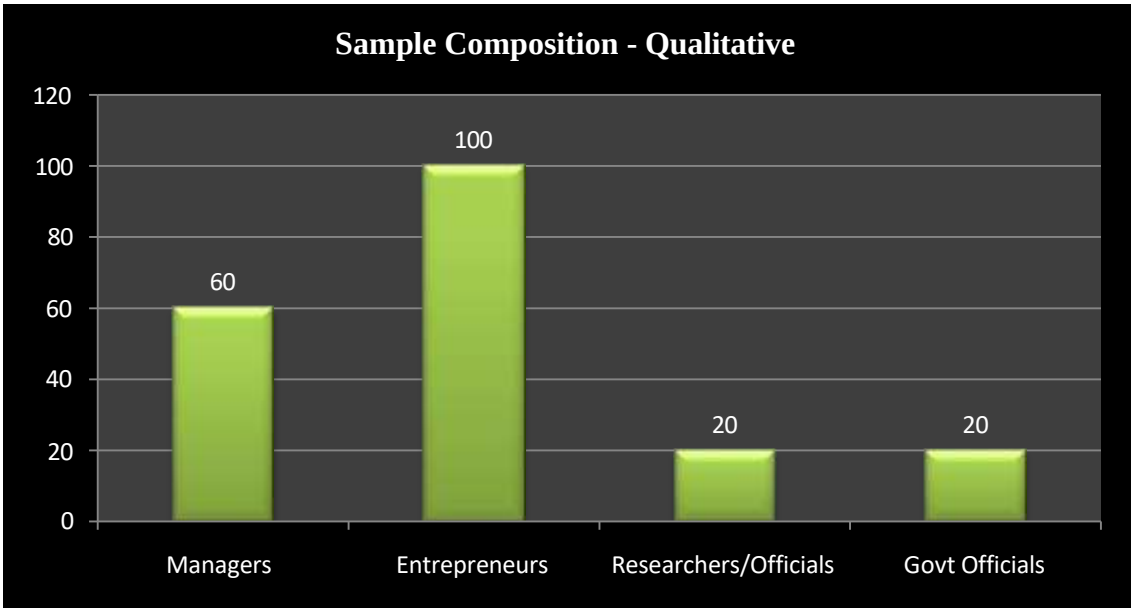
S No.	Particulars	Sample size (in numbers)
1	Renewable Energy based Entrepreneurs/Owners	400

4.7.3 SAMPLE COMPOSITION FOR QUALITATIVE RESEARCH METHOD

Table 4.3: Sample composition for qualitative research method

Sample	**Size**
Solar energy Technology(SET) led business managers	60
Entrepreneurs involved in SET-led agri-enterprise (It should be mentioned that the 100 business owners chosen for the sample were the same ones used for quantitative research; so, the genuine total sample size would be 500 rather than 600.)	100
Academicians and/or representatives from groups that work to foster the expansion of entrepreneurial ventures	20
Government agency officials	20
Total	**200**

Figure 4.1: Sample composition for qualitative research method



PILOT STUDY

To be sure the study will work on a bigger size, it is necessary to do a smaller trial run first, known as a pilot test. This is similar to doing research on a small scale. Consequently, in order to achieve the set objectives, a pilot test was carried out in this research. A preliminary mini-study was carried out to assess the validity and reliability of the research tool. Two, it aimed to find out additional specifics about the study's real settings. Thus, the researcher would have a higher chance of anticipating and fixing problems that may arise over the course of the real inquiry. The pilot test primarily aims to determine the instrument's validity and reliability. The term ―instrument validity‖ describes the extent to which a measuring equipment is accurately measuring the target variable and not any other variables. The dependability of a measure, on the other hand, is a description of its error-freeness, consistency, and stability throughout time and across all aspects of the scale. This section provides a synopsis of the results of a pilot study that aimed to identify opportunities and challenges that Indian company owners encountered while integrating solar technology.

Methodology

A random sample of solar sector entrepreneurs from the NCR of Delhi was selected for this research since it is a pilot test for an ongoing thesis. Malhotra (2008) argues that if a test involves more than one stage, the sample size should be much larger, even if pre-tests typically have a modest number of responders (anything from fifteen to thirty). Consequently, 65 questionnaires were hand-delivered; 53 were returned; 2 were missing data and were thus not included for analysis. The pilot research used a sample size of 51. Sekaran and Bougie (2010) state that the most used inter-item consistency reliability test is Cronbach's alpha coefficient. Consequently, the internal consistency of the instrument is evaluated in this research using the Cronbach alpha test. In order to analyze the data, SPSS for Windows was used. Before the questions were delivered, experts and an average participant were asked to review the drafting for face and content validity. It took four weeks to finish the whole process.

Tools for Measurement and Control

The quantitative research used a controlled questionnaire consisting of multiple-choice questions with no room for free-form responses. Considering that the bulk of the survey questions are designed to investigate the factors that motivate entrepreneurs to start their own businesses, specifically looking at how the agricultural sector is embracing solar power. It is believed that a Likert-type scale would be more appropriate and reliable for entrepreneurs employing solar technology (Miller, 1991). The tool measures the research's major elements using a 5-point Likert-type rating scale, ranging from strongly disagree to strongly agree. When deciding on the 5-point itemized scale, the recommendations of Krosnick and Fabrigar are considered (1997). According to them, the five-point scale is the best and most reliable tool for research like this. The purpose of this is to provide a more robust scale so that respondents may more simply and clearly express their ideas. The researcher may more gently differentiate between the perspectives of various entrepreneurs on the study subject using such a scale. A scale with a midpoint is used because Krosnick and Fabrigar (1997) noted that encouraging participants to answer in a certain way might cause measurement error to

rise. Including intermediate options on a scale enhances correlations between viewpoints, as stated by Schuman and Presser (1981). Similarly, Krosnick and Fabrigar (1997) found that including a midpoint in a scale tended to improve data quality and reduce the consequences of interviewer bias. It is crucial to provide respondents the freedom to express their feelings, as some of them may not have a high degree of education. The study's most important variables are

1st objective: Investigate what factors influence solar technology uptake in the agricultural sector as it relates to entrepreneurialism, here are the variables: 1. Level of awareness; 2. Governmentpolicies; Thirdly, Solar Market Materials; 4, Involvement of local community members; 5. Trust from stakeholders; 6. User-friendliness; 7. Low maintenance; 8. Relevant experience; 9. Standardof living; 10. Additional companies

2ndObjective: study the impact of solar technology entrepreneurs on their firms' performance, Here are the variables: 1. Sales; 2. General Financial Success; 3. Expanding Company; 4. Satisfaction of Customers Level; 5. Quality of Service; 6. Employee's Satisfaction; 7.Level ofProgress on Product Innovation; 8. Progress on Process Innovation; 9. Quality of the Product.

Therefore, in order to accomplish the aims, the study questionnaire was designed (See Appendix). Only questions that are directly related to collecting data for the research are included in the questionnaire. Similarly, surveys that ask personal questions are omitted from the survey (Sekaran and Bougie, 2010).

Results of Validity and Reliability Tests

The measure's content and face validity ensure that it has an adequate and representative set of items that probe a certain notion. What this means in practice is that the scale's capacity to measure the target variable will be systematically assessed. Therefore, it is necessary to contact an expert panel and/or a small sample of typical respondents in order to ascertain whether the questions selected to evaluate a construct are suitable (Sekaran & Bougie, 2010). In light of the above, researchers sent a preliminary version of the study's instrument to subject-matter experts for feedback on its validity, reliability and appropriateness in assessing the components under investigation. After the experts from

TERI and D.U. expressed their concerns about three questions, they were eliminated from the final questionnaire draft. Not only that, but two other questions were also removed from consideration since they did not achieve the minimal standard set by Cronbach's Alpha Test (0.58 Cronbach value). We also reached out to a number of Ph.D. students familiar with the study's contextual context to assess the instruments' clarity. Several questions were revised or rephrased to ensure that the structures were evaluated thoroughly and that prospective respondents could easily access them. It just took two weeks to complete the process of obtaining an expert opinion. The researcher incorporated the experts' feedback into an improved version of the instrument before using it for the pilot test.

As far as reliability tests go, Litwin (1995) states that the internal consistency reliability test is by far the most used. The reliability of an instrument's internal consistency between individual items is evaluated using Cronbach's alpha, which is considered the gold standard by Sekaran and Bougie (2010). For this reason, we check the survey's internal consistency using the Cronbach alpha test. With values ranging from.710 to.716 for the second goal and from 0.944 to 0.945 for the first, data analysis using the Windows version of SPSS demonstrated that the measures consistently had a very high reliability standard.

1st objective: Investigate what factors influence the adoption of solar technology in the agricultural industry as a whole.

Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.741	.740	30

2nd objective: Research the relationship between solar technology entrepreneurs and entrepreneurial firm performance.

Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.710	.716	9

The findings suggest that the data set was reliable and appropriate for future research, as the Cronbach's Alpha value is more than 0.5 in both cases.That fits well with the standard, according to which a coefficient of 0.60 indicates moderate reliability and a value of 0.70 or above indicates good reliability (Sekaran and Bougie, 2010). Researchers generally consider an alpha value of 0.70 to be the bare minimum, while Hair et al. (2007) acknowledge that lower values could be acceptable. The table above summarizes the dependability results. Based on the pilot test findings, all of the constructions that were examined had Cronbach's alpha values more than 0.70, as shown in the table. Given the established benchmark of 0.70, all the constructs are dependable, therefore there's no reason to remove any.

As stated earlier in this section, the objective of this research is to conduct pre-tests of the reliability and validity of an instrument that is utilized in an ongoing thesis in order to be ready for the large-scale study. Consequently, the conclusion is pertinent to the study's objective, which mostly consists of statistical and qualitative elements. The research's practical implications were found after the primary study was finished. Data collected on a smaller scale for the pilot test was the focus of the investigation. Some questions were reworded after content and face validity checks, and two were removed because they were too similar to other questions. Furthermore, no item was deleted due to the inter- item reliability test showing that all items were reliable with Cronbach Alpha much greater than the criterion of 0.70.

4.8 INTERVIEW PROCEDURE

Important factors were discussed and taken into account throughout the data gathering phase, which helped shape the themes that would serve as a basis for future study. When discussing a specific SETs project in a certain region, for example, a participant from a formal institution brought up relevant and comparable aspects of the research. This led to more in-depth interviews covering more ground (such as how one strategy is chosen from other accessible options). If any additional questions or conversation prompts were uncovered, they were included so that subsequent participants might go even deeper into these issues.

The interview approach was therefore continuously improved upon, yet the essential questions stayed the same. Only targeted inquiries were included, and those were only sent to those who have the necessary skills. Thus, the interview schedule was followed by the semi-structured interviews, which featured the same subjects and questions but were conducted as a conversation, occasionally and properly directed by specific questions.

Interview Procedure

- Getting in touch with the respondent and gathering their opinion (by phone, email, snowball reference, or in-person contact) is the first step in the research process. In the second step, the interviewee confirms the appointment and receives the participation agreement permission; in the third stage, the interviewer meets with the interviewee in person and asks them questions for an hour. After obtaining participants' consent (if needed), the fourth step is to record the interviews. The fifth step is to transcribe the interviews. Finally, the sixth step is to extract themes from the data.

4.8.1 KEY INFORMANT INTERVIEWS

Qualitative in-depth interviews with relevant locals (e.g., community leaders, specialists, or average citizens) about a subject of interest (Carter & Beaulieu, 1992). Talks with a small number of individuals who can provide the information, opinions, and background required to solve a problem are thus an integral part of these methods. cited as in Two distinguishing features of key informant interviews are the limited sample size (often less than ten persons) and the emphasis on qualitative data collection and analysis. responses that are grounded only in the individual's perspective.

As you can see from the interview criteria, we covered a lot of ground throughout the session. The interviews really take place in a casual setting, similar to a chat with friends. The purpose of using this data during interviews was to get a sense of the institutional and local resources that solar entrepreneurs and group-based businesses believe they have access to. It was necessary to meet with key informants face-to-face in locations where a single individual or small group had community-wide decision-making power, as most of the village visits were accompanied by representatives from the institutions under scrutiny. It is beneficial to comprehend their perspective on the functioning of SETs-

based businesses since without these individuals, it is impossible to make progress in a community. By drawing on their extensive knowledge and experience, these local experts can shed light on the nature of the problems and provide suggestions on how to resolve them.

4.8.2 PARTICIPANT OBSERVATION

Organizational scholars often use participant observation because it provides a window into businesses as communities with distinct norms and customs (Jick, 2013). This approach was chosen for this thesis because it offered a glimpse into the management style of SETs-led enterprises and provided data on the perceptions of assistance from both the company owners and the organizations that provide it. Two separate patterns of organizational research are identified by Evered and Louis (2001): the outside inquiry system, in which the researcher maintains an objective distance from the organization's context, and the inside inquiry system, in which the researcher actively engages in the research. Researching a company can be done in two ways: either by working for it (inside inquiry) and being involved in the phenomenon under study, or by using data that the company has created, such as its financial records, corporate files, etc. (inquiry from the outside). The writers provide anecdotes on their own struggles to adapt to different job settings.

Papers authored by industry practitioners seemed to be more useful and relevant in understanding the new organizational context, as opposed to academic research. The main author argues that players in an organization may trust and benefit more from data collected from within the company. Unique challenges await you in the field of management studies. Due to their heavy workloads, managers may be reluctant to allow access unless there is a strong commercial need to do so. Fieldwork authorization could be hard to come by and, even granted, might be fraught with confidentiality obligations (Evered & Louis, 2001).

4.8.3 OBSERVATION CHECKLIST

• Factors include business hours, handling of RET assets, self-resolution of small issues (if required), advantages obtained from RETs, handling of transactions, and contacts with consumers and business partners.

4.8.4 OBSERVATION PROCEDURE

All of the following put together: While the entrepreneur is present during business hours, sitting aside from the accompanying staff from the host institution Taking a post- hours trip with the entrepreneur to see SET in action, as a consequence of the nature of the observer's job, participant observation might arise from time to time in professional settings. Being professional entails a method for identifying issues and developing solutions. Dealing with situations that are basically unpredictable, out of the ordinary, and unstable is what managers in the field are supposed to accomplish. These situations are appropriately called messes by Schon. Top experts in their fields have excellent pattern recognition, anomaly detection, and occurrence detection abilities, as well as the ability to adapt their actions based on this information. Unconscious, implicit, and instinctual thought processes may occur. Working in this capacity allows the researcher to get an in-depth, first-hand understanding of a real-world situation.

4.9 SECONDARY DATA COLLECTION

Secondary data was gathered to supplement the information informants provided during interviews, and it also provided background information or up-to-date data that was not accessible during primary data collection. A participant may learn a lot about a firm by seeing how a managed microbusiness operates on a daily basis, but it would be much better if they had access to data that reflected the enterprise's success in the past. Finally, to fill in the blanks that primary data can't reveal or cover, and thirdly, to verify the veracity of data gathered from primary sources, if such information is accessible. For this study, we relied on secondary sources such as regulatory papers, presentations, expert panel discussions, conference proceedings, reports from industry organizations, firm-level initiatives, corporate websites, consultant publications, and magazines. Both the public and commercial sectors contributed to the collection of these figures.

Information gathered from interviews and field notes was supplemented by the businesses' project reports.

Secondary Data Sources

Secondary data provided critical background information that were not accessible during primary data collection. These sources helped verify the reliability of primary data and fill in any gaps that primary sources could not cover.

Key secondary sources include

Corporate Reports and Presentations: Data from company presentations, project reports, and firm-level initiatives gave insights into business performance and strategic goals.

Expert Panel Discussions and Conference Proceedings: These sources offered expert opinions, industry trends, and the latest developments in the field.

Industry Reports and Publications: Reports from industry organizations, consultants, and magazines provided sector-specific data and market trends. (1.Reports include: Renewables 2021: Assessment of India's Solar Sector, Transitioning India's Power Sector to a Renewable Energy Future 2. Magazines includes: Energy Future)

Corporate Websites and Online Resources: Websites of relevant firms and industry bodies were used to gather the most current information on operations and achievements in the business environment.(Websites includes: MNRE, NISE, IREDA Online Resources includes: Energy Data Exchange)

This combination of secondary and primary data strengthened the overall analysis by validating findings and providing a richer, more holistic view of the topic under investigation.

4.10 DATA ANALYSIS TOOLS

Quantitative Research Method

As for quantitative research, the goals set forth in research objectives 1 and 2 were achieved via the application of the Regression Analysis technique. Primary goal of the research

Regarding Research Objective -1, which sought to investigate the factors that influence the adoption of solar technology in the agricultural sector, this study targeted solar technology entrepreneurs as its sample population and sought to identify the most important factors influencing entrepreneurialism among them. The following ten factors were considered to have an effect on the entrepreneurs' choice to use solar energy in their company. In order to find out if the entrepreneur was willing to use solar technology for their firm, all the factors that were found were compared.

After these criteria were identified, we polled company owners for their thoughts on how to prioritize them when making a solar technology adoption decision. Using the Regression Analysis, we determined the statistical significance of each independent variable. With a R Squared value of.582, the model meets the authors' criteria for continued investigation, which is anything above.500.

Objective 2 of the Research: Understanding the startup success rates of individuals involved in solar energy for agriculture was the primary focus of this objective. The following 10 key performance indicators were all taken into account in this research.A regression analysis was carried out to statistically evaluate the significance of the components listed before. An R Squared value above.500 is ideal for this model, but any value above.666 is considered sufficient for future exploration. The regression test was used to find the statistical significance of each independent variable.

QUALITATIVE RESEARCH METHOD

Research Objective-3 and Research Objective-4

Data collected using qualitative techniques, such as interviews, may be better understood through the use of thematic analysis, a tool in qualitative research. I used theme analysis as my analytical technique due to the qualitative nature of my study. In fact, theme analysis is by far the most used qualitative technique for conducting comprehensive interviews. According to Braun and Clarke (2006), thematic analysis is a method for discovering, analyzing, and describing recurring ideas or patterns in data. (79) in 2006). For some reason My advisors suggested that I employ a theme method since it allows for in-depth analysis focused on certain research objectives (Braun and Clarke, 2006, p.97). This strategy allowed for a comparison of the interview data from two angles: first, from the research question's viewpoint; and second, from the data-driven and inductive coding angle, ensuring that the data were relevant to the study's goals and provided useful information.
The purpose of a thematic analysis is to find overarching themes that help explain a phenomena (Daly et al, 1997). A meticulous examination and evaluation of the data is required to discover patterns (Rice & Ezzy, 1999: 258). Analytical categories are generated from emerging themes using data pattern recognition of this kind. This study constructed a hybrid approach to qualitative theme analysis by combining the data-driven inductive technique proposed by Boyatzis (1998) with the deductive a priori templates of codes method proposed by Crabtree and Miller (2001) (1999).

Before going on to the interpretation step, the coding process involves picking and encoding a crucial event (Boyatzis, 1998). One way to evaluate coding quality is by looking at how well it captures the phenomena's fundamental characteristics (Boyaztis, 1998: 1). Encoding makes it easy to extract themes from the data. Following Boyaztis's definition, a theme is ―any pattern in the data that at least classifies and classifies the available observations‖ (1998:1). In order to prepare data for analysis, Crabtree and Miller suggest using a codebook's code as a template (1999). Researchers choose the codebook or template they will use before diving into a data analysis. Although this

study's concept was prepared in advance, codebooks are sometimes built by theoretically based and topical preliminary content screening.

4.11 CODING

Because it is a method for categorizing and collecting data, coding entails arranging and classifying information. They may also assist you in finding patterns in your data and synthesizing them. Coding lays the groundwork for building the analysis by connecting data collection and interpretation. In theory, creating a story is an essential part of data classification and qualitative analysis. This is why, before, during, and after data collection, it is essential to consider the assessment's primary objective.

4.11.1 CREATING CODES

Giving each coding group a phrase, word, number, or symbol is a common practice throughout the several methods of encoding (CER, 2009). These are systematically located by analyzing interview transcripts, field notes, and personal accounts. Using the categories, we code thoughts, ideas, and themes. Code generation may be done in a controlled or uncontrolled manner.

Pre-set	**Emergent Codes**
Before beginning data collecting and coding, it is useful to have a start-list to pre-set codes. These initial codes are derived from several sources, including the theoretical model, a list of study fields, and a list of problem locations.	Codes that emerge as a result of data analysis and interpretation are the ones that manifest. What follows from the data that deviates from the previously established codes are the ideas, theories, deeds, associations, interpretations, etc.

4.11.2 HOW THIS RESEARCH HAS USED THEMES AND CODES

The term ―theme‖ is used to describe anything that conveys the main notion of the data with respect to the research question and indicates that there is some predictability or relevance in the data set (Braun and Clarke, 2006, p.82). According to Bazeley (2009, p. 6), themes only fully emerge when they are linked to form a unified explanatory model or image: A simple three-step strategy for conveying the results is explain, contrast, and

connect. According to Braun and Clarke (2006), there are two ways to gather knowledge on themes and patterns: conceptually from the top down, or inductively from the bottom up (Frith and Gleeson, 2004). (Boyatzis, 1998; Hayes, 1997).

Table4.4: Respondents, codes and methods used

Type of respondent	Workplace	Template of Codes	Tool
Scientists and researcher (Academics)	JNU, TERI, DU, IIT	How partners are seen, the significance of research, the partners selected, and their ideas of success	Semi- structured Interview
Policy makers and Ministry staffs	MNRE, TERI, DST	What we think about partnerships, who we choose to work with, and how we define our mutually beneficial outcomes	Semi- structured Interview
SETs manufacturers And service providers	TATA Power Solar, CSE, SELCO, SKG Sangha	Business model, client/beneficiary inclusion in the model	Semi- structured Interview
Entrepreneurs	SELCO, AIWC, TERI beneficiaries / client	Operational management, business sense, role of partners, use of business income	Participant observation, Semi-structured interview, Key informant interview
NGOs and SETs based institutions	AIWC, Green Grants, SELCO	Entrepreneurial education, how	Methods: Semi-structured

		people view their own success, and who they decide to work with	interviews, and participant observation

The table above details all of the groups that were polled as well as the precise techniques that were used to do so. While the interview questions were initially free-form, they subsequently became more semi-structured in order to better capture the participants' roles and duties as well as the study topics. Data function and code extraction was accomplished by looking for similarities in the answers of many interview samples. According to Braun and Clarke (2006), analysis often moves through phases in a cycle. This means that it isn't fixed in stone, and that further knowledge and smaller datasets may be included into the analytical process at various points.

4.11.3 STAGES OF DATA CODING

Building a code manual and code template (based on theory) is the first stage; Step 2: Codes are evaluated for reliability; Third Step: Summarizing Data and Identifying Initial Themes; The fourth step is to identify commonalities and connect the theory and data- driven codes; At step 5, we validate and verify the coded themes; The semi-structured interview questions used codes taken from the conceptual model as well as the literature. First things first: develop a standard manual and code format (theory driven); As a second step, we need to verify the codes are authentic. Due to the fact that these conceptual framework components had previously been used in institutional analysis, there were obvious advantages to generating codes from them. Some codes have to be disregarded because of the nature of the investigation.

In order to identify overarching themes, the third step was to systematically summarize the data collected from the audio interviews. Accompanying the interview transcripts was a synopsis of the key issues brought up by respondents in reaction to the questions asked. We combined the codes of the conceptual framework with the developing codes to build a list of replies that would give greater clarity in the fourth stage of code-connecting and

theme-finding (theoretical and data-driven). Coding starts with finding patterns and themes in the data (Crabtree & Miller, 1999).

Finally, we get the aggregated results of the coded text's recognized themes. Developing Step 5: Backing Up Your Claims with Data Results are ―confirmed‖ when they are double-checked or confirmed (Crabtree & Miller, 1999). We transcribed and processed interview and focus group material by topically organizing the talks for data analysis. The data went through many stages of processing. Careful reading of each interview transcript allowed for the development of themes. All of the stakeholders' identities and the organizations to which they officially belonged were examined in conjunction with each tale or case study's response (all of the instances have been given previously in this chapter). The first mention and discussion of this strategy was made by Lieblich, Tuval- Mashiach, and Zilber (1998). Every individual brings their own distinct perspective to the table as they work together to build meaning. Symon and Cassel (1994: 188) based their findings on studies of SET programs as well as Indian business practises and issues. Step two included doing a systematic analysis of the data by drawing out and integrating recurring second-order themes from all of the case studies (which included secondary as well as primary sources). Topics covered included partnership development, stakeholder engagement, institutional design, and stakeholder hierarchy. An attempt was made to raise the analysis from an individual to a collective level as most of the themes were formed from a group of responses pointing to a common fact or phenomenon based on a range of interview results. We could make broad assumptions about the problem if common threads appeared in several comments.

4.12 APPLYING THE CONCEPTUAL FRAMEWORK

Finding out how sustainable power entrepreneurship in India has fared as a result of individual and group efforts is the primary goal of the study. Below is a schematic of the study's theoretical model, which draws on the OECD/EUROSTAT framework and the OECD/EUROSTAT structure, among other approaches, to address the research questions. This study's conceptual framework and qualitative methodology—which made use of key informants, observational methods, and interviews—aided in the development of the exploratory research design. I used a qualitative approach for my research, and the

theoretical model helped me figure out what codes to use to build themes once we ran the analysis.

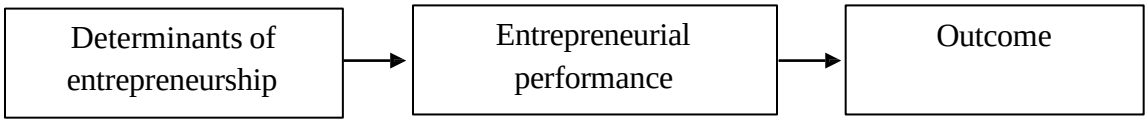


Figure: The conceptual framework

Investigated in this paper are the processes and outcomes of various institutional configurations, including public-private partnerships. Next, we take a look at how entrepreneurship rooted on SETs might contribute to society's progress. Additionally, the framework was used for data analysis due to the comprehensive picture it offered of the institutions, the advantages of renewable energy-based entrepreneurship, and rural development. Thus, the frameworks aided in the creation of new codes to facilitate the presentation of topics and subsequently results, and indicators to facilitate the preparation of interview questions for an examination of institutional setups.

4.13 RESEARCH CONTEXT

4.13.1 OVERVIEW OF THE INDIAN RE CONTEXT

The principal fuels used to generate energy, which include coal, oil, and natural gas, are responsible for one-third of the world's greenhouse gas emissions. If we want to raise people's living standards, we must provide cleaner, more dependable electricity. As the government works to achieve its present economic growth goals, energy consumption in India is increasing. Any country's economic growth depends on its ability to produce more and more energy. In its National Energy Plan [NEP], the Ministry of Power lays out a comprehensive 10-year strategy to provide electricity to every citizen of the nation. The plan also includes a backup plan to make sure that electricity is distributed efficiently and affordably. India ranks #4 globally for carbon emissions in 2017, behind only China (268.3%), the US (14.36%), and the EU (14.36%), according to a research by the World Resource Institute. 9.66% off. A disruption of Earth's natural balance might result from climate change. The United Nations Framework Convention on Climate Change and the Paris Agreement have both received Nationally Determined Contributions (NDCs). The goal of the latter group was to keep global warming below 2 degrees Celsius. The World Energy Council predicts that global power consumption will peak in 2030. India

consumes a significant amount of coal globally, making coal imports from the country expensive. More over three quarters of the world's energy comes from fossil fuels. During the years 2013–14, 2014–15, 2015–16, 2016–17, and 2017–18, the total amount of coal imported was 213 million metric tons. In the previous five years, there were rises of 171 million metric tonnes, 215 million metric tonnes, 207 million metric tonnes, 195 million metric tonnes, and 213 million metric tonnes, respectively. Therefore, finding alternative power sources is of the utmost importance.

The government will rapidly and globally transit to renewable energy technologies to ensure long-term growth and avert climate change disasters. For sustainable, long-term power with little environmental effect, replenishable sources are essential. There may be a significant drop in emissions if renewable energy sources could power most of the world's electrical demands. The government has been planning for a reliable source of renewable energy for some time now. Advocates for renewable energy sources including solar, wind, biomass, garbage, and hydropower have urged the public to reduce their energy use. The use of renewable energy sources is clearly less expensive and more secure. India aims to achieve 175 GW of renewable power by 2022 using 100 GW of solar power, 10 GW of bio-electricity, 60 GW of wind power, and 5 GW of small hydropower projects. Over 270 GW of total capacity has been pledged by investors, far surpassing the ambitious expectations. The following is a rundown of the promises: Donations of 58 GW came from multinational corporations, 191 GW from private enterprises, 18 GW from the public sector, and 5 GW from the Indian Railways. New estimates show that by 2047, solar power will have contributed over 750 GW, while wind power will have accounted for 410 GW. There would need to be an increase of 330,000 jobs and job opportunities in order to meet the government's lofty target of generating 175 GW of renewable electricity by 2023. While India's renewable energy potential is enormous, the country may need investor-friendly policies and stringent regulations to become a world leader in this field.

4.13.2 THE SIGNIFICANCE AND FOCUS ON SOLAR

By addressing the nation's energy security issue, advancements in solar energy technology and innovation contribute to the country's economic growth while reducing environmental impact (MNRE, 2013). When it comes to international initiatives to tackle climate change, India has the potential to make a big splash. Solar power has played a significant role in the expansion of the United States' energy infrastructure, as stated by the MNRE. It is no longer seen as a renewable energy source since it will soon make up a significant portion of the nation's energy consumption. The National Action Plan on Climate Change (NAPCC) was released in June 2008 by India with the aim of achieving development objectives, enhancing ecological sustainability, and combating the effects of climate change.

With an increase from 20 GW to 100 GW by 2022–2023, the MNRE set a new target for grid-connected renewable energy projects. The National Solar Mission was responsible for this. In 2008 and 2009, just 6 MW were generated. As a result of the government's Made-in-India strategy, which promotes local manufacturing, solar installation capacity in India rose at a record-breaking pace. India now ranks eighth globally for installed solar capacity, as per the latest statistics. With 25,212.26 MW in service as of the end of 2018, solar energy has already exceeded the 2022 target, and an additional 22.8 GW of capacity was either tendered out or was being operationalized.

With the intention of selling off the excess solar power production each year in 2018– 2019 and 2019–2020, MNRE intends to construct 100 GW of capacity by March 2023. We would still have two years to finish the project under this scenario. A competitive bidding mechanism will be used to determine tariffs, which is anticipated to result in significant price reductions (reverse e-auction). Solar energy's most affordable per- kilowatt-hour price was 2.44 Indian rupees in July 2018. Back in 2010, solar power in India cost INR 18/kWh. The amount of land reserved for solar farms exceeds ten million acres, with an additional seventy-five thousand acres already contracted. A total of 47 parks have been constructed using solar electricity, having a combined capacity of 26,694 MW. The combined capacity of all the solar parks' panels is 4195 MW (floating solar power).

4.14 ACTORS AND INSTITUTIONS IN THE INDIAN SETs SECTOR

The private sector contributed 82,715 MW to India's total installed generating capacity of 243,030 MW (Barpatragohain, 2015). Government officials are pushing for public- private partnerships that generate renewable energy in an effort to curb emissions of greenhouse gases and keep up with the nation's soaring electricity demands (MNRE, 2009). According to Palit (2003), the Electrical Act of 2003 encourages competition and establishes an environment that is favorable to power market investments from both private and governmental sources. Near Eco P., on a body of water, the Arka IGNOU College of Renewable Energy will install a 15 KW solar power producing system (Barpatragohain, 2015).It will generate floating solar electricity and will be the first of its kind in the country. M/S Solar Town, headquartered in Chennai, has been utilizing a novel marketing strategy to sell solar systems to individual homeowners. So far, 70 homes have installed 100 KW of solar power, bringing Solar Town closer to its goal of 1 MW by March 2015. ―Barpatragohain‖(2015)

From their inception, India's public sector enterprises have played a pivotal role in the country's economic and social progress. With the goal of bolstering energy security and promoting replenishable energy via large-scale solar, wind, and offshore wind projects, the MNRE and MoPNG have signed a Memorandum of Understanding (MoU). Small and medium-sized firms play a vital role in the manufacture of solar cookers and lights for rural areas, even if large corporations dominate the solar industry (Rai, 2002). To aid in the expansion of renewable energy, many policies have been devised and implemented by governments, local groups, NGOs, and the corporate sector. The government has enacted several beneficial regulations to promote alternative energy investment by small and medium-sized firms (Palit, 2003). Since solar cells have been exempt from import duties for the last three years, businesses in the solar power industry are free to source their products from anywhere in the world. The MNRE has been in communication with both developed and developing countries to explore potential partnerships in the renewable and alternative energy fields. In an effort to forge connections between Indian and international institutions, the interaction for cooperation aimed to devise plans for researchers to share data and for research and development

centers in the two countries to work together on the design, development, presentation, and manufacturing of innovative and renewable energy systems and devices. Both bilateral and global collaboration frameworks have been set up (Barpatragohain, 2015). The importance of international collaboration and the exchange of technical information about alternative energy sources is something that India is well-aware of. Benefiting from new technology, attracting foreign direct investment, and promoting the import and sale of items using alternative energy sources are just a few of India's positive policies. Norway has funded a solar mini-grid electrification project that would benefit 28 villages in Madhya Pradesh, Uttar Pradesh, Jharkhand, and Jammu and Kashmir.

―Barpatragohain‖ from 2015. M/S First Solar, located in the United States, is planning to build a 45 MW solar power plant in the Indian state of Telangana. An Indian company has agreed to sell 75 million kWh of power to the regional utility for 20 years at a rate of $6.49/kWh (Barpatragohain, 2015). It is also feasible to communicate with the United States, China, South Korea, Japan, Canada, and Australia via the APPCDC global collaboration framework. The sections that follow include a list of public and commercial organizations in India that are involved in solar efforts, as well as cooperation structures that support these activities.

4.14.1 PUBLIC

Domestic regulatory initiatives may increase private capital's contribution to long-term development, according to Manslet and Martinot (2000). Because they control crucial organizational, legislative, and financial resources, rural energy programs can only grow and succeed with increased government backing (FAO, 2000: 46). More and more, governments are seeing innovation and technology management as an integral component of sound economic policy (OECD, 1999). New laws that encourage public-private partnerships and private sector involvement are also influenced to a large extent by governments. Successful initiatives, according to Weingart and Lee (2000), are a reflection of a desired market condition, which is often influenced by intentional governmental incentives. Within the context of all-encompassing national plans, enabling policies and legislative frameworks for renewable energy may be put in place to build

robust market ecosystems. Effective cross-departmental and cross-level coordination of efforts is a part of this.

4.14.2 MINISTRY OF NEW AND REPLENISHABLE ENERGY (MNRE)

The scientific cabinet-level ministry of India known as the Agency of New and Replenishable Energy (MNRE) is in charge of solar energy and solar photovoltaic technologies. It establishes a plan to encourage the creation of environmentally friendly energy goods and services in the area. Plus, it helps companies in the renewable energy industry get performance requirements and specifications, and it brings the prices of renewable energy goods and services up to par with international norms.In the MNRE standards, all states detail the rules that encourage investment from the private sector and boost business endeavors. It also uses the construct-own-operate-model (BOOM) as a unique aid mechanism to entice international investors to create projects that produce electricity from renewable energy sources (IAEA, 1014). You can be eligible for exemptions and reduced excise taxes if you manufacture sustainable systems and instruments such as solar panels, solar water heaters, solar photovoltaic panels, and wind turbines. At last, IREDA and a number of nationalized Indian banks and financial institutions may provide consumers and developers of commercial and near-market technologies with competitively priced, soft loans.

4.14.3 FINANCIAL SUPPORT FROM IREDA

In order to finance specialized replenishable energy projects, IREDA provides funding. Parts manufacturers for solar systems are eligible for assistance from IREDA's refinancing programs. By 2015, MNRE aims to have incubated 500 green entrepreneurs who are producing RE products and technology, therefore creating new RE employment. You may find this objective detailed in the online version of the ministry's 2010 final report on HRD Strategies for the Indian Renewable Power Sector. The growth of the real estate industry has the potential to increase employment creation, and MNRE aspires to strengthen banks, financial firms, and venture capitalists by drawing their attention to this possibility. In addition to conducting environmental entrepreneurship education programs across India with an emphasis on RE, provide targeted funds or loans via IREDA and other financial institutions to support the expansion of both new and existing small and medium-sized enterprises (SMEs) in the renewable energy sector. Introduce channels and

microfinancing systems to make it easier for consumers to buy RE-related items; this will increase production capacity and push up costs. More than just handing out incentives, MNRE could host contests or institute initiatives to foster budding businesses. Many alternatives were accessible. I think they could have achieved all of these aims far more effectively than just giving me an allowance and saying it's fine, even if subsidies are necessary in very poor places. In my view, this discourages individuals from starting their own businesses. Research and development aimed at developing the industry was the driving force behind the establishment of MNRE. (New Delhi's TERI Faculty) Similar to how the SREDAs practically implement most of the MNRE's decisions and operations, the State Nodal Agency (SNA) is crucial. The National Institute of Replenishable Energy, the Centre for Wind Energy Technology, and the Solar Energy Centre are three technical entities that are under the supervision of the Ministry. Improving and coordinating their actions with the Ministry's overarching goal is of the utmost importance. Along with large-scale deployment and an effort towards indigenization, which are already part of the solar mission, the MNRE is specifically planning to promote entrepreneurship in the direction of electricity production in rural areas through SETs and make it easier for financial institutions to provide funding for the same purpose.

4.14.4 JAWAHARLAL NEHRU NATIONAL SOLAR MISSION (JNNSM/SOLAR MISSION) INITIATIVE

Research into possible domestic replenishable energy sources was a deliberate policy move by the government to diversify its energy supply, boost energy independence, and satisfy growing energy needs. The NAPCC encompasses a number of projects, one of which being JNNSM. The target implies a gradual shift away from fossil fuels and toward renewable energy. Collecting solar energy in India on a grand scale is the goal of the JNNSM. The mission is divided into three 15-year segments that correspond to India's 12th FYP era, which runs from 2012 to 2017 (see to table below for details). An increase of 20,000 MW in grid capacity and 2,000 MW in off-grid capacity by 2022 are the long-term goals, with the short-term goal being to encourage investment in solar energy. Solar power generating capacity of more than 2,000 MW is estimated to be operational at present.

Table4.5: Three phases of JNNSM

Phase	Time period	Grid-connected power	Off-grid solar applications	Solar collectors
Phase I	2007-2012	11,000 MW	200 MW	7 Million sq mt
Phase II	2012-2017	10,000 MW	1,000 MW	15 million sqmt
Phase III	2017-2022	20,000 MW	2000 MW	20 Millionsqmt

(MNRE, 2012)

- • The states are liable for sub-transmission and distribution. The Indian government's short-term goal is to foster an environment that encourages private investment in solar energy, thus it offers incentives to do just that. The mission used the following tactics to achieve this goal:
  • Bundling, which allows the federal government to choose how to distribute its 15% (thermal) electricity allotment to the states. Developers sell their power to the federal government at market prices under this plan. One price- based incentive for modest grid solar plants (100 kW to 2 MW) linked to state utilities is the GBI. These plants are then combined with the power collected from developers and sold at a reduced cost utilizing the discretionary quota power. With this in mind, businesses are considering charging more for electricity.
  •Viability gap financing (VGF) is a kind of government assistance that may be used to finance infrastructure projects that have low projected income.

4.14.5 PRIVATE

Private sector efforts are attractive as a practical way to meet the energy needs of rural areas, according to actual data from project deliveries (Weingart and Lee, 2000). These data show that market-based procedures promote quality assurance, after-sale operations, and the creation of new technologies. For the benefit of society, this section includes the names of relevant private organizations that have participated in RE initiatives. After the list, it goes on to explain the most current initiatives. Individuals from India's private

renewable energy industry who have made significant contributions to rural development are listed in Table 4.6.

Institution	Founder	Areas of contribution
Auroville Replenishable energy	Hemant Lamba	1. Providing solar products for rent to replenishable energy entrepreneurs 2. Entrepreneurial financial solutions that are innovative
Azure Power	Inderpreet Wadhwa	1. Providing clean energy applications to Indian governments, communities, and business users. 2. Providing access to knowledge and microfinance possibilities
Sunkalp Energy	Kanika Khanna	1. Solar laboratory equipment that was built in-house and is included with every school project. 2. Providing engineering, procurement, construction, subsidy approval, and loan aid services to their clients.
Mera Gao Power (MGP)	Nikhil Jaisinghani	1. Installing solar microgrids in several villages 2. Micro grids generate enough electricity for more than 30 households to run low-wattage appliances for seven hours every evening.

Table: Private sector firms and initiatives in the RE sector in India

4.14.6 THE COMMERCIALIZING REPLENISHABLE ENERGY IN INDIA

The Commercializing Replenishable Energy in India (CREI) project is a collaborative effort between UNDESA, WI, and WII. It offers a fresh perspective on encouraging private investment in the creation of replenishable energy projects and businesses by offering support to entrepreneurs who are interested in this venture. Financial enablement services, seed funding, and upstream entrepreneurship incubation all aim to help entrepreneurs solidify their ideas into projects that banks and other financial

organizations are interested in funding.The project stands out because it can link the commercialization of companies that use replenishable energy technologies to real-world problems, with ongoing efforts to support environmental rural livelihoods in Andhra Pradesh by the UK's Department for International Development (DFID-UK), and with ongoing measures to strengthen agricultural entrepreneurship capacity (CREI, 2014). One way CREI has helped established rural businesses go from product novices to informed experts is by creating and distributing a technician kit. As part of their rural development programs, DFID and Syndicate Bank already provide business incubation services; this initiative will only enhance those offerings. At present, these services assist company owners in developing renewable energy businesses that produce revenue and contribute to the expansion of capital and service chain connections.

4.14.7 AGA KHAN RURAL SUPPORT PROGRAMME

The Clean Replenishable Energy Investment (CREI) program, which was created by UNDESA, WI, and WII, is an innovative approach to getting corporations to invest in RE R&D. It does this by making it easier for new RE-related businesses to get off the ground. The team's upstream services of entrepreneurial development, seed capital investment, and budgeting enablement match the downstream equity aims of finance organizations that are looking to build a strong portfolio of clearly defined projects. A technician kit, created and distributed by CREI to rural entrepreneurs, has been important in turning small company owners become product specialists. This project is an extension of the business incubation services offered by DFID and Syndicate Bank as part of their rural development programs. One of these programs focuses on assisting business owners in creating renewable energy businesses that can produce income while also facilitating the establishment of connections between capital and service providers.

4.15 PARTNERSHIP MODELS

In this part, we'll take a look at the public-private collaboration paradigm, which is prevalent in many RE-based institutions in India. A number of groups, notably the United Nations Economic and Social Commission for Africa (ESCAP), have proposed a new kind of public-private partnership (PPP) that would add a public component to the

already existing PPP. In order to create inclusive programs and include all parties involved in their effective execution, a fresh approach like this is necessary. Promoting the private sector is an important goal of MNRE, in addition to regulating and subsidizing India's real estate market. The private sector's RE-based businesses are far more welcoming to individuals of different backgrounds and experiences. This study's research topic may be better answered by considering the different institutional structures.

4.15.1 ONERGY – INDIA

Providing decentralized overall energy solutions to underserved homes and institutions, ONergy (Punam Energy Pvt. Ltd.) delivers a comprehensive variety of solar products. Ecosystem development for environmental sustainability and rural empowerment, consumer solar financing, high-quality product manufacture, and a robust after-sales support network are ONergy's core competences. Solar water heaters, lamps, inverters, streetlights, cook burners, and KW installation for homes and businesses have impacted 2,50,000 lives (ONergy, 2013). Novel and state-of-the-art items including solar TVs, computers, micro-grids, and irrigation systems have also been introduced by ONergy. One of ONergy's distinctive offerings is its full-service distribution infrastructure, which it has built via its Replenishable energy Centers (RECs). Well-established NGOs, SHGs, and MFIs and experienced rural enterprises make it work. It is linked to distant villages in West Bengal, Odisha, and Jharkhand via RECs.ONergy is the MNRE Solar Mission channel partner. To provide consumers new solutions, it collaborates with worldwide leaders. IN 2017, ONergy will power one million rural lives; by 2023, ten million. 2014 ONergy

4.15.2 TERI

Indian autonomous, non-profit research organization TERI was founded in 1974 to study energy, the environment, and sustainable development. The main goal has always been to provide cutting-edge energy solutions to address climate change on various continents, community-based forest conservation, urban transportation and air pollution, and sustainable Indian industry. A TERI program, LaBL helps small-scale solar firms in poor or neglected regions deliver high-quality solar lamps at low costs. It uses startup power service delivery principles. This fee-for-service approach promises to provide cheap,

renewable power to rural India. Solar lantern users pay the charging station operator fee for operation and maintenance. TERI funds the village station's initial expenditures via government, commercial, and local donations (TERI, 2010). Power outages affect rental fees based on how much kerosene is required to keep the lights on. This has enabled individuals to switch from smokey kerosene to clean, efficient solar panels. Establishing a rural solar business network may increase penetration, acceptance, and durability. TERI uses research to develop cutting-edge technologies, assure cost-effectiveness, and meet field demands.

4.15.3 ALL INDIA WOMEN'S CONFERENCE

Founded in 1927 as a national women's organization, the AIWC was an early NGO committed to raising women's status, empowering them via education and training, and elevating them through community consciousness on a variety of topics. There are now more than 125,000 volunteers and 500 AIWC chapters throughout India. They are primarily focused on promoting awareness campaigns, increasing literacy, rechargable energy delivery, and legislative change (AIWC, 2016). They run solar-powered poverty alleviation initiatives and disseminate educational materials on energy saving and efficiency. Educating and empowering women to take on leadership roles is a primary focus.

With a special emphasis on helping women attain economic independence via the establishment of microbusinesses, the AIWC has served as the MNRE's central hub for the spread of knowledge about technical consciousness and non-conventional energy sources. Efforts to fight poverty in India are being spearheaded by the AIWC, which also conducts awareness campaigns and training sessions on energy conservation and efficiency. They have been assisting women in launching SETs-based businesses, one of which is a solar drier for agricultural goods. Many micro-businesses in India's cities and villages have benefited from solar-powered appliances, such as dryers, lanterns, lights, and lamps. Among AIWC's many initiatives include the creation of solar charging stations, the distribution of solar lights to women, and the promotion of micro-businesses based on solar energy technology (SETs). However, their solar dryer programs have been

completely implemented, teaching company owners how to utilize solar dryers and transform agricultural goods into products with added value.

4.17 STUDY SITE: NCR DELHI

Countless zones spread out over the National Capital Region (NCR) of Delhi, which encompasses not only the capital city but also New Delhi, Gurugram, Noida, Faridabad, and Ghaziabad. Delhi was selected as the location for the study due to its abundance of important stakeholders in India's SETs sector, including universities, SETs-based non-governmental organizations (NGOs), research think tanks, solar technology businesses, and ministries. Kotak Urja, TATA Power Solar, and BP Solar are the three leading solar-based SET manufacturers in Delhi. The location of the MNRE also has a significant impact on the real estate industry as a whole, both in terms of policymaking and the creation and enforcement of incentives within the sector, both of which are necessary for the success of any national SETs effort. At the state level, the MNRE has its own extension ministries called SREDAs. It also has a financial element called IREDA that handles budgeting and grants to groups and subsidiaries. Listed in Table 4.7 are the following New Delhi-based institutional institutions concerned with energy: MNRE, IREDA, IRADs, Teri, and APCTT.

4.7.4 RELIABILITY AND VALIDITY OF THE DATA

4.7.4.1 RELIABILITY

For customers to have faith in the company's data, it must be based on precise and comprehensive details. In addition to maintaining data security, data quality, and compliance with regulations, data integrity programs guarantee data dependability. By computing the Cronbach's alpha coefficient, one may ascertain the reliability of a test or scale. In order to gauge how trustworthy such consistency is, Cronbach's alpha might be used. The reliability of a measurement is proportional to the consistency with which it applies to a certain idea. We compare the variance in all scale item scores and correlate each scale item's score with the overall score for each observation. This all-encompassing evaluation of a measure's dependability is provided by the resulting reliability coefficient, which may take on values between zero and one. When

all of the components on the scale are uncorrelated with each other, the value is 0. As the number of items on the scale approaches infinity, will approach 1 if there is considerable covariance between any two things. More variables are measuring the same underlying notion when their coefficients are bigger, since they share co-variance. Coefficients below 0.5 are often ignored, particularly on supposedly one-dimensional scales, while several methodologists recommend a minimum of 0.65-0.8. While the appropriate scale's conceptual foundations are critical, the criteria for a good coefficient are totally subjective. In this study, we created the quantitative data set for the first and second goals by doing quantitative research in connection to those objectives. Results for the two goals of the Cronbach's alpha reliability test, which was used to assess the data set's reliability, are as follows.

1st objective: Investigate what factors influence the adoption of solar technology in the agricultural industry as a whole.

Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.741	.740	30

2nd objective: Research the relationship between solar technology entrepreneurs and entrepreneurial firm performance.

Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.710	.716	9

Here, we find that the data set we gathered is credible enough to be considered for further study (Cronbach's Alpha is more than 0.5 in both instances).

4.7.4.2 VALIDITY

In both quantitative and qualitative settings, the validity of a study is usually determined by the questions that the researcher asks the participants. When results are based on reliable facts, we say that they are valid. It is usually best to draft the survey questions after finishing the literature review. Since these ideas serve as the basis for a variety of

research topics, the researcher is usually in the best position to decide which ones are most important. While doing this, it is very essential to remember the research goals and questions that are relevant to the study. In this study, the researcher put a lot of effort into crafting the research goals and questions that would be asked in the survey questionnaire (for both quantitative and qualitative research) after finishing the literature review. To further validate these difficulties, the researcher visited TERI, AIWC, and DU, three organizations and institutions that are building institutional support for replenishable energy. In order to get input on the suggested questions, the researcher met with various level-of-staff officials from these organizations. Generally speaking, the authorities were satisfied with the questions as they were; although, on rare occasions, they did provide recommendations for revisions that would improve the quality of the data collected. By following all of the suggestions made above, the researcher was able to validate the questionnaire used in the study.

CHAPTER-5
DATA ANALYSIS & INTERPRETATIONS

CHAPTER-5
DATA ANALYSIS & INTERPRETATIONS

5.1 INTRODUCTION

This chapter summarizes the study's critical analysis, comments, and important findings. Reviewing the study's stated goals is a good first step before diving into the analysis and debate. The precise research aims of this study were to:-evaluate the pros and cons of solar technology adoption by entrepreneurs in India's agricultural sector. First, we want to find out what factors influence solar technology uptake in the agricultural industry so that we may better understand what motivates entrepreneurs. This study's secondary objective is to look at how solar technology entrepreneurs in the agricultural industry fare in terms of their firm's performance.Thirdly, we want to learn more about the pros and cons of solar energy so that business owners in the agricultural industry may make an informed decision. Fourthly, we want to learn more about the institutional frameworks that make it possible to foster an atmosphere conducive to solar- powered entrepreneurship projects that aid in rural development.

We used quantitative research techniques (Regression Analysis) to achieve Research Objectives 1 and 2, and qualitative research methods (thematic analysis) to accomplish Research Objectives 3 and 4. For the reader's benefit, the analysis and important results are presented in the next part in an objective-wise fashion. The following research goals were achieved using the quantitative analysis that is presented in this section:-

Research Objective-1: To examine the Determinants of entrepreneurship in the context of solar technology adoption in agriculture sector.

The primary goal of this study was to identify the important drivers of entrepreneurship and to analyze their relevance according to the entrepreneurs who made up the target sample in order to better understand the factors that influence the adoption of solar technology in the agricultural sector.The following ten factors were chosen and studied from the reviewed literature because they were thought to influence the entrepreneurs' choice to use solar technology in their firm. In order to find out if the entrepreneur was willing to use solar technology for their firm, all the factors that were found were

compared.

After the factors were found, we asked the entrepreneurs who participated in the survey how they would rank the importance of the factors described above in terms of solar technology adoption.

5.2 REGRESSION ANALYSIS

The table below presents two methods for calculating this explained-variation: the Nagelkerke R square and the Cox and Snell R square. The so-called ―pseudo R2‖ values will be lower than the ones obtained via multiple regressions. Still, the same care is used in understanding them. This means that our model explains 58.0–56.0 % of the observed variance in the dependent variable. If the value is more than.500, this model is suitable for further inquiry with a R Squared value of.58.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.763[a]	.582	.556	.24293

a. Predictors: (Constant), Determinants of entrepreneurship in the context of solar technology adoption in agriculture sector

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	30.888	23	1.343	22.756	.000[b]
	Residual	22.190	376	.059		
	Total	53.077	399			

a. Dependent Variable: A_Adoption_of_SolarTech_1

b. Predictors: (Constant), Determinants of entrepreneurship in the context of solar technology adoption in agriculture sector

Assuming the model's predictions are in agreement with the data is something that Hosmer-Lemeshow checks. It is common practice to compute a chi-square statistic in order to compare the anticipated frequencies with the actual frequencies when using a linear model. The data fit the model very well, as shown by the non-significant chi-square

value (30.458) in the table above. The statistical significance of each independent variable may be assessed using the regression test. The significance level of the test is shown in the Sig. column. The results show that A1-Awareness (p =.017), A2- Governmental directives (p =.028), A3-Suppliers for the Solar Market (p =.012), A4- Participation of local area residents (p =.010), A-5: Experience (p=.011), A-6: Stakeholders Trust (p=.003), and A-7: Makes Life Easier (p=.011) contributed significantly to the model/prediction. However, A8-Comfortable Maintenance (p =.940), A9-Living standards (p =.834) and A10-Other businesses (p =.675) did not contribute significantly to the model.

Coefficients[a]

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.	Avg. Value
	B	Std. Error	Beta			
1 (Constant)	-.453	.125		-3.616	.000	
A-1 Awareness						
Do you agree that promotional initiatives or programs by the government in relation to solar technology adoption benefits made you aware about its benefits?	.061	.013	.221	4.663	.000	
Did the training programs which you attended before adopting solar technology made you aware about its benefits?	.052	.012	.197	4.409	.000	**0.017**
Did the prior knowledge/experience which you had of solar technology made you aware about solar technology?	.027	.014	.088	1.956	.051	
A-2: Governmental directives						
Do you agree that the Governmental directives and schemes in relation to solar technology help in providing	.026	.013	.081	1.896	.053	

financial stability to its adopters?						
Do you agree that the Governmental directives and schemes in relation to solar technology help in reducing illiteracy amongst its adopters?	.019	.013	.064	1.429	.015	**0.028**
Do you agree that the Governmental directives and schemes in relation to solar technology help in reducing social vulnerability amongst its adopters?	.050	.013	.176	3.820	.000	
A-3: Solar Market Supplies						
Do you agree that solar energy market suppliers are Easily Available at your location?	.080	.012	.291	6.510	.000	
Do you agree that solar energy market suppliers provide materials at a reasonable Price?	.028	.013	.093	2.078	.038	**0.012**
Do you agree that solar energy market suppliers provide materials of a decent Quality?	.079	.010	.288	6.245	.000	
A-4: Participation of residents of local area						
Do you agree that Participation of residents of local area in solar energy technologies improves Economic Growth of the region?	.030	.014	.095	2.163	.031	
Do you agree that Participation of residents of local area in solar energy technologies improves Social Growth of the region?	.078	.010	.288	6.210	.000	**0.010**
Do you agree that Participation of residents of local area in solar energy technologies improves Educational Growth of the	.061	.012	.220	4.504	.000	

region?						
A-5: Experience						
Do you agree that having experience in solar energy helps in identifying its Environmental Benefits?	.038	.012	.208	4.808	.000	
Do you agree that having experience in solar energy helps in promoting its Sales?	.022	.011	.078	1.868	.024	**0.011**
Do you agree that having experience in solar energy usage helps in promoting Business Profitability?	.028	.016	.068	1.762	.001	
A-6: Stakeholders Trust	.048	.012	.197	4.409	000	
Do you agree Stakeholders Trust improves Sales?						
Do you agree Stakeholders Trust improves Business Growth?	.054	.016	.188	4.232	.011	**0.003**
Do you agree Stakeholders Trust improves Overall Growth?	.058	.016	.167	4.012	.000	
A-7: Makes Life Easier						
Do you agree that solar powered products are Easy To Use?	.038	.014	.177	3.986	.018	
Do you agree that solar powered products have made day-to-day life Easier?	.022	.014	.074	1.760	.014	**0.011**
Do you agree that solar powered products have made world more Accessible?	.028	.018	.064	1.680	.001	
A-8: Simple to Use and Maintain						
Do you agree solar energy equipments have reasonable Running Cost?	-.003	.054	-.010	-.060	.952	
Do you agree solar energy equipments have reasonable	-.004	.051	-.013	-.084	.933	**0.94**

Repair Cost?						
Do you agree solar energy equipments have reasonable overall Maintenance Cost?	-.003	.054	-.010	-.060	.952	
A-9: Improves job quality and Living standards	-.001	.444	-.002	-.003	.998	
Do you agree that adoption of solar energy sources reduces energy bill?						
Do you agree that solar energy sources are Applicable Everywhere?	-.006	.015	-.013	-.362	.718	**0.0834**
Do you agree that adoption of solar energy sources helps in job creation?	-.003	.404	-.006	-.005	.786	
A-10: Impact of other commercial activity						
Do you agree that the presence of other business units in your area help in reducing operational cost?	-.001	.010	-.004	-.112	.911	
Do you agree that the presence of other business units in your area helps in ensuring better infrastructural facilities?	-.010	.009	-.040	-1.177	.240	**0.675**
Do you agree that the presence of other business units in your area helps in improving overall competitiveness of the business?	-.003	.392	-.003	-.006	.874	

a. Dependent Variable: Adoption_of_SolarTech_1

5.3 INTERPRETATION AND SUPPORT FROM PREVIOUS RESEARCH FINDINGS

The following factors are most strongly associated with solar technology entrepreneurs' choices to use solar technology in agricultural contexts, as shown by the regression analysis.

A1: Awareness (p =.017)

With a significant factor at the.005 level, the results support the acceptance of Hypothesis H1a: Awareness of the benefits of solar technology-based products and processes enormously affects the adoption of solar technology.

Rai and Beck (2015), who emphasize that increasing awareness of solar energy's benefits is critical to adoption, especially in rural and agricultural contexts. Müller and Rode (2013) similarly noted that awareness of cost savings, environmental benefits, and energy security plays a crucial role in motivating farmers and entrepreneurs to adopt solar technology. This suggests that promoting knowledge about solar technology's advantages is a key driver of adoption

A2-Directives from the government (p =.028)

Governmental regulations and standards for solar energy equipment production and consumer protection have a significant effect on solar technology adoption (factor significant at.005 levels), so we accept Hypothesis H1b: These factors profoundly influence solar technology adoption.

Painuly (2001) pointed out that policies and subsidies for renewable energy, including solar power, can greatly accelerate adoption by reducing financial barriers. Additionally, Lund (2019) found that favourable government policies, such as tax incentives make solar technologies more appealing to businesses. It reflects that government directives have a strong influence on solar technology adoption in the agricultural sector.

A3-Solar Market Providers (p =.012)

Hypothesis H1c: Solar energy market providers for the essential accessories greatly effect the adoption of solar technology is accepted because this indicates that solar energy market suppliers have a considerable impact on solar technology adoption (factor significant at.005 levels).

Jacobsson and Bergek (2004), who found that the availability of solar technology suppliers and a well-established supply chain significantly impact the diffusion of solar technology. Ghosh et al. (2020) also emphasized the importance of a reliable network of providers for the widespread adoption of solar products, especially in rural and agricultural areas where accessibility can be a challenge.

A4: Locals' Involvement (p =.010)

According to the findings, there is a strong relationship between local citizens' involvement in solar energy technologies and the adoption of such systems (factor significant at.005 levels).So, we accept Hypothesis H1d: Local people' involvement in solar energy technology design and execution greatly affects adoption of solar technology.

Wüstenhagen et al. (2007), who argued that the participation of local communities in renewable energy projects, including solar energy, boosts acceptance and adoption rates. Mulugetta et al. (2013) similarly emphasized that involving local stakeholders in the design and implementation of solar technology can increase community ownership and trust,leading to higher adoption rate.

A5-Work History/Experience (p =.011)

Since there is a statistically significant relationship between prior experience with replenishable energy technologies and the uptake of solar power, we accept Hypothesis H1e: The uptake of solar power is significantly affected by prior experience with replenishable energy technologies.

Rogers' Diffusion of Innovations Theory (2003), which posits that individuals with prior experience with similar technologies are more likely to adopt new innovations. Yildiz (2014) also found that experience with renewable energy positively impacts adoption decisions, as familiarity with the technology reduces uncertainty and perceived risks.

A6-Trust in Stakeholders (p =.003)

We accept Hypothesis H1f: Stakeholders Trust greatly effects the adoption of solar technology since the results show that stakeholders do play a major contribution towards the adoption of solar technology among the entrepreneurs (factor significant at.005 levels).

Walker et al. (2020), who found that trust in stakeholders, including suppliers, government bodies, and local community leaders, is critical for the success of renewable energy projects. Sovacool and Blyth (2015) similarly noted that trust in the reliability of solar technology and the competence of stakeholders increases adoption rates. **7-Usability (p =.011)**

With a significant factor at the.005 level, this supports the acceptance of Hypothesis H1g: The ease of use of solar powered equipment significantly affects the adoption of solar technology. This suggests that entrepreneurs are influenced by how easy it is to use solar technology equipment. Among solar technology entrepreneurs, the following are the characteristics that do not substantially effect the use of solar technology in agriculture.

Dincer (2011), who found that the ease of use of solar technology is a key determinant of adoption, especially in less technically sophisticated settings like rural and agricultural sectors. Balachandra et al. (2010) also highlighted that for solar technology to be widely adopted in developing regions, it must be user-friendly and adaptable to local needs.

A8- Satisfactory maintenance (p =.940)

As a result of the results here suggesting the opposite (factor insignificant at.005 levels), we reject Hypothesis H1h: The ease of maintaining solar energy equipment significantly

impacts the adoption of solar technology. This is despite the fact that solar technology equipments are typically very easy and convenient to maintain.

The non-significant effect of maintenance ease on solar adoption contrasts with findings from studies like Hansen et al. (2015), which suggested that low maintenance requirements of solar technology are a key benefit that encourages adoption. However, Nygaard and Hansen (2015) found that in some contexts, especially where maintenance services are unreliable or expensive, the ease of maintenance may not be enough to drive adoption

A9-Living conditions (p =.834)

The findings indicate that solar energy does not have a major influence on people's living standards, which in turn does not mean that it is widely used (factor insignificant at.005 levels). So, we may exclude Hypothesis H1i: Solar energy's ability to raise living standards has a substantial effect on the spread of solar power.

Mondal et al. (2010), who found that solar energy significantly improves the quality of life, particularly in rural areas by providing access to electricity, improving health, and enabling economic activities. However, Kaundinya et al. (2009) noted that the perceived improvement in living conditions might vary depending on local economic conditions and the extent to which solar technology meets the specific needs of a community

A10-The effect of additional business operations (p =.675)

The results indicate that the presence of other local businesses does not have a significant effect on the entrepreneurs' choice to implement solar technology. As a result, we can reject Hypothesis H1j: The influence of other local businesses greatly encourages entrepreneurs to adopt solar technology.

Painuly (2009) suggested that this influence may be more pronounced in urban or industrial contexts, where competition and business interdependence are stronger, while in rural or agricultural settings, this effect may be weaker.

RESEARCH OBJECTIVES-2:

This study aims to examine the relationship between agricultural entrepreneurs using solar technology and the entrepreneurial firm performance.Examining the Performance of Entrepreneurial Firms was the primary emphasis under this aim.

5.4 REGRESSION ANALYSIS

Both the Nagelkerke R square and the Cox and Snell R square are shown in the table below as methods for calculating this explained variation. A range of 66.0% to 65% of the dependent variable's observed variance may be explained by our model. With a R Squared value of.666, this model meets the criteria for further study within this framework, which considers values above.500 to be suitably high.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816[a]	.666	.658	.16747

a. Predictors: (Constant), Entrepreneurial Firm Performance in relation to entrepreneurs engaged in solar technology in the agriculture sector

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	21.821	9	2.425	86.446	.000[b]
	Residual	10.939	390	.028		
	Total	32.760	399			

a. Dependent Variable: B_Firm_Performance_1

b. Predictors: (Constant), Entrepreneurial Firm Performance in relation to entrepreneurs engaged in solar technology in the agriculture sector

Assuming the model's predictions are in agreement with the data is something that Hosmer-Lemeshow checks. It is common practice to compute a chi-square statistic in order to compare the anticipated frequencies with the actual frequencies when using a

linear model. With a chi-square value of 21.821, which is not statistically significant, the data fit the model quite well, as seen in the table above.
The statistical significance of each independent variable may be assessed using the regression test. The significance level of the test is shown in the Sig. column. Sales (p=.016), profits (p=.000), service quality (p=.025), customer satisfaction (p=.000), product innovation (p=.000), and product quality (p =.000) significantly contributed to the model/prediction, while business growth (p=.980), employee satisfaction (p=.057), and process innovation (p=.508) did not.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.472	.057		-8.323	.000
	Do you agree that your Sales have grown after the adoption of solar technology based products in your enterprise?	.029	.012	.111	2.423	.016
	Do you agree that your Profits have grown after the adoption of solar technology based products in your enterprise?	.085	.013	.308	6.588	.000
	Do you agree that your Business has grown rapidly after the adoption of solar technology based products in your enterprise?	.000	.012	.001	.026	.980
	Do you agree that your Service Quality has improved after the adoption of solar technology based products in your enterprise?	.019	.008	.080	2.253	.025
	Do you agree that the overall Customer Satisfaction has increased after the adoption of solar technology based products in your enterprise?	.103	.013	.383	7.834	.000
	Do you agree that the overall Employee Satisfaction has increased after the adoption of solar technology based products in your enterprise?	-.019	.010	-.083	-1.910	.057

Do you agree that your business has witnessed greater Product Innovation after the adoption of solar technology based products in your enterprise?	.066	.009	.292	7.103	.000
Do you agree that your business has witnessed greater Process Innovation after the adoption of solar technology based products in your enterprise?	.007	.010	.028	.662	.508
Do you agree that your business has witnessed greater Product Quality after the adoption of solar technology based products in your enterprise?	.033	.009	.130	3.573	.000

a. Dependent Variable: B_Firm_Performance_1

5.5 INTERPRETATION AND SUPPORT FROM PREVIOUS RESEARCH FINDINGS

The regression analysis revealed the following factors as the most critical determinants of solar technology company success.

Revenues (p =.016)

According to the results of this study, the company's marketing of solar-powered goods and services has significantly increased sales (factor significant at the.05 level), indicating that these efforts have been instrumental in the success of the business. It is acknowledged that the adoption of items based on solar technology has a substantial influence on sales growth.

Research by Kwan and Yoon (2017) indicates that firms adopting renewable energy technologies experience increased sales, driven by a growing consumer preference for sustainable products. This is supported by a study from the National Renewable Energy Laboratory (NREL), which found that companies investing in solar technology gained a competitive edge due to enhanced brand reputation and consumer loyalty.

Earnings (p =.000)

Businesses that invest in solar energy probably enjoy a growth in profits, which boosts their overall performance (factor significant at the.05 level). It is well acknowledged that the adoption of items based on solar technology significantly affects profit growth.

The research by Røpke (2004) highlights that the integration of renewable energy sources leads to significant cost savings and operational efficiencies, ultimately enhancing profitability. Furthermore, a report by the International Renewable Energy Agency (IRENA) indicated that businesses engaged in renewable energy initiatives saw improved profit margins due to lower energy costs and incentives.

Quality of Service (p =.025)

Based on these results, solar-powered businesses have clearly succeeded in improving product quality and, by extension, their overall performance (factor significant at the.05 level). The hypothesis that items based on solar technology have a substantial effect on service quality is accepted (H2d).

A study by Bhatia and Kaur (2016) found that organizations in the renewable energy sector improved their service quality by adopting green technologies, which led to increased customer satisfaction. This improvement is often due to enhanced operational processes and the adoption of more reliable energy solutions.

Satisfaction of Customers (p =.000)

The data clearly show that companies in this industry have been successful in increasing customer satisfaction levels across the board. Therefore, we accept H2e: The adoption of solar technology based products significantly impacts customer satisfaction.

Zhang et al. (2019), who found that companies adopting solar technologies often experience increased customer satisfaction due to the environmental benefits and cost-effectiveness that these products offer to consumers. Similarly, Mittal et al. (2015) argued that customers are more likely to favour companies that engage in sustainable practices, such as adopting solar technologies, which leads to higher satisfaction levels.

New Product Development (p =.000)

As a result of these results, it seems that solar technology companies have improved their product development processes and are now more successful (factor significant at.005 levels), thus we accept H2g: The adoption of solar technology based products has a significant impact on product innovation.

Rao and Holt (2005) found that firms adopting renewable energy technologies often lead in product innovation, as the adoption of green technology drives research and development efforts to create more efficient and environmentally friendly products. Tidd and Bessant (2013) also highlighted that adopting new technologies, including solar energy, encourages firms to innovate faster, allowing them to develop new products that cater to the growing demand for sustainable solutions.

The quality of the product (p =.000)

Company performance has improved overall (factor significant at.005 levels) as a consequence of solar technology businesses' efforts to raise product quality, the results show.therefore, H2i: Solar technology-based product adoption significantly affects product quality is acknowledged.

Olson et al. (2015) argued that businesses in the renewable energy sector often prioritize quality improvement to meet the technical requirements and regulatory standards associated with solar technologies. Hart and Dowell (2011) found that companies adopting solar energy tend to invest in better processes and technologies, which naturally lead to higher product quality. This focus on quality is essential for customer trust and long-term sustainability in the industry.

The following factors do not significantly impact the prosperity of solar technology firms.

Company Expansion (p =.980)

The data does not support H2c: The adoption of solar technology based goods has a substantial influence on the company growth since this element does not significantly

affect the elements leading to business growth in this sector (factor non-significant at.005 levels).

Zeng et al. (2017) found that renewable energy adoption, including solar technology, often leads to expansion opportunities through increased market demand and investment. However, Linnenluecke et al. (2013) suggested that while solar adoption can drive market demand, it does not necessarily lead to immediate company expansion, as firms might face challenges such as high upfront costs and regulatory hurdles, which could
Delay growth.

Employee Satisfaction (p =.057)

Data suggests this factor has a little influence on employee satisfaction at enterprises in this sector (p =.05), therefore rejecting H2f: Products based on solar technology significantly affect employee contentment.

Renwick et al. (2013) found that companies engaged in green practices, including renewable energy adoption, tend to have higher employee satisfaction due to the positive work environment and sense of purpose these initiatives create. However, Sharma and Sharma (2017) suggested that the benefits of green technology on employee satisfaction are not always immediate or direct, especially in sectors like solar technology, where operational pressures and technological changes can create uncertainty among employees.

New Methods for Processes (p = 508.)

In light of the data, we may conclude that process innovation suffers (factor non- significant at.005 levels), and we can thus reject H2h: Products based on solar technology have a substantial influence on process innovation.

Christmann (2000) suggested that process innovation in the context of renewable energy might not occur at the same pace as product innovation, as it requires more complex restructuring of organizational practices.

Research Objective-3: To identify and analyze the overall opportunities and challenges for solar technology adoption by the entrepreneurs

5.6 THEMATIC ANALYSIS TO IDENTIFY AND ANALYZE THE OVERALL OPPORTUNITIES AND CHALLENGES FOR SOLAR TECHNOLOGY ADOPTION BY THE ENTREPRENEURS

The following discussion, drawing on the aforementioned concepts and field data, will throw light on the opportunities and challenges that solar technology presents to entrepreneurs.

FIRST ORDER CODES	SECOND ORDER CODES	THEMES
• Product Promotion • Scaling up a company as an idea • Acquiring New Workers	• Promote yourself from buyer to agent in the final mile • Moving from business owner to corporate executive	**Business acumen**
• Concept of illuminating additional houses • Help local families	• Connecting monetary incentive to social change • The use of in-state resources	**Entrepreneurial community Impact**
• The Option of Door-to-Door Leafleting • - Displaying promotional banners	- Incentives for spreading the word about a product	Applying business skills and networking more broadly
Hire local women to craft leaf dishes.	Increase RET usage in conventional	Impact of women-led occupational activity on

	manufacturing	society
- Getting many households involved in solar companies; employing replenishable energy technologies (RETs) in social gatherings;	- The use of RETs in contexts outside of business	**Community bridging and Empowerment**
Protecting crops using RETs Keep away animals	- RETs in everyday use	Technology offers intangible personal and societal advantages.
Gathering materials for handmade RET manufacture Self-repairing and maintaining equipment	RET-making and maintenance training for business members	Company incubation Spreading Information

Table: Identification of themes (Source: Author's compilation)

5.6.1 BUSINESS ACUMEN

My father operated the fruit industry before I joined in 1997. My modest store is catering to a consistent clientele; it can turn over 1200 rupees in a day, and I reinvest 200–300 of those revenues. During the winter, I mostly use the lantern since I also sell fruits and veggies, along with flowers. The lamp gives me an additional three or four hours of light. Therefore, I am able to run the company every day until about 9:30 or 10:00 in the evening. — New Delhi-based street seller.

Management demonstrates wisdom and maturity by reinvesting the funds in the company. The shopkeeper demonstrates a respectable level of business acumen in his considerations of opening hours, his commodities that are susceptible to spoilage, and the possible advantages of using lamps at night in the cold. Monthly earnings for solar sector entrepreneurs range from 1,500 to 3,000 rupees. Participating in the project from all around the country, over 1600 solar-entrepreneurs have been active. Across the country, 1600 solar entrepreneurs have been employed by the initiative. Riding high in New Delhi while representing LaBL, This is a reliable source of revenue as there is a discernible difference in earnings before and after the solar lights are used. There is hope for the future of the industry as a whole thanks to the promotion of more entrepreneurial options.

5.6.2 WIDER APPLICATION OF BUSINESS ACUMEN AND NETWORKING

Dozens of solar lights are now at my disposal. Together, my mom, wife, and I instruct our kids after dark while simultaneously making and selling handicrafts at the Mandi market once a month. The opportunity to meet new people in the Mandi community and get their contact information makes this a lucrative business venture. Our neighbor, who is also a friend of my mom's, uses the other light and pays our rent daily. At a central station run by authorized people, we may all charge our lights at once. Because so many individuals in this area began buying houses last year, the concept of renting is going away, which is why I want to buy more so I can rent it out to more people.(solarlight entrepreneur based in New Delhi)

Businesses that rely on solar power should also diversify their activities. Solar lights and charging stations have many applications, therefore as demand increases, business owners often rent or purchase more of these items. Take the story of the TERI-backed entrepreneur who saw potential in the lanterns when he began offering after-school tutoring lessons. He then rented five more lanterns from Lighting a Billion Lives and gave them to his neighbors, who used them for things like feeding animals, cooking at night, and women doing arts and crafts like silk weaving. You may see the effects of using a lantern in both home and work settings. It's fascinating to see how individuals are finding ways to make money from the comfort of their own homes, like silk spinning, which is made possible by lanterns.

5.6.3 COMMUNITY BRIDGING AND EMPOWERMENT

Famed entrepreneur Geeta Sharma has long been a champion for social change in her hometown. More than 20 families have benefited from her efforts to help them become self-sufficient. In Ghaziabad's commercial pursuits, she has been acknowledged as one of the LaBL activities, which is a fresh addition to her resume. Her solar charging station is now supplying the hamlet with lighting amenities. Not only does this serve as a source of illumination for the residents' homes, but it also illuminates major community events, cultural festivities, and weddings in her hamlet and the surrounding communities.(LaBL Radiant One, NCR Delhi)

The story demonstrates the obvious indirect impact of solar RETs. Additionally, it encourages individuals to work together. An examination of major and current social capital studies was part of the earlier parts of the thesis, which dealt with rural development. In a village where people tend to live in tight-knit communities, the word exemplifies how social events can unite individuals. In a social atmosphere, people are more likely to open up and discuss their experiences. There are certain companies among them, and then there are some that utilize solar RET and others who don't. One of these realizations is the phenomena of solar technology's impact on everyday life, both at home and in the workplace.

5.6.4 BUSINESS INCUBATION, KNOWLEDGE SHARING

Sunita decided to open a business in the neighborhood because of her talent with needles and thread. After helping out around the home with her mom and sister-in-law during the day, she'd rent a solar-powered light and work the night shift at her business. Because she had access to light, she could complete her needlework and sewing chores in the early hours of the morning. She had a modest beginning, but her company grew with her clients, and she is now the happy owner of her own boutique. By sharing her knowledge and opening doors for other women, she has encouraged them to follow in her footsteps and become needleworkers. Task force for LaBl. Everyone in the area, not just one family or business owner, stands to gain from this trend. Information exchange that results in entrepreneurial education is a good first step toward empowering the community in which new micro-businesses are sprouting up. A trainee's understanding of the business and its management may also be enhanced via these types of interactions between instructor and trainee. Additionally, the essential action may be done at any time that is convenient for you since sunlight is always available.

5.6.5 INTANGIBLE PERSONAL AND SOCIAL BENEFITS OF THE TECHNOLOGY

Many real estate-based entrepreneurs, particularly women, are starting businesses that employ a large number of people in the area and also offer financial support for their families. Because of this, women's voices are being heard more and more in village councils and city governments. By speaking up for things like improved sanitation and a healthier environment, they are helping to have a positive impact on society. Everyone, including Panchayat, acknowledges and appreciates my entrepreneurial endeavors, and the lanterns provide much-needed illumination in emergency medical settings. Considering that this has not been started yet, I am advocating for the building of neighborhood bathrooms during our weekly meetings. When it comes to women, I agree with them. (New Delhi, recipient of LaBL)

Because most communities without electricity still lack basic sanitation facilities, and because it becomes pitch black in such areas after 6 or 7 o'clock in the evening, it paints a negative picture of a society's progress. Both of these spheres are now seeing growth as

a direct result of the influence of these well-known women entrepreneurs and community activists. Many things will improve as a result of this modification. Children who are able to use the extra light to read and write benefit from it since it is accessible after dark, when the lights are not being used for commerce. Some tutoring and after-school programs have gotten a lot of help after switching to solar lighting. With solar lights, not only can you see what you're cooking with, but you also reduce the danger of respiratory diseases and spend less time in the kitchen overall. For rural communities to grow, these factors are crucial.

5.6.6 WOMEN-LED VOCATIONAL ACTIVITIES AND SOCIAL IMPACT

In keeping with previous community development initiatives observed in the study locations, it is clear that women-run micro-businesses often employ other women from the neighborhood. Whether they are running tuition centers, making handicrafts, painting, or weaving silk, women entrepreneurs always include other members of the community in their activities. To be clear, gender inequalities in business are not the primary emphasis of the research; rather, it is rural entrepreneurship that makes use of renewable energy sources. But it has been clear all along that women comprise about a third of these would-be business owners, and that groups like TERI often aim their efforts squarely at women for various reasons. Consequently, this part must stress the rationale for selecting women as the intended recipients.

Shubha is now demanding a monthly fee of around Rs. 1500 for only 50 bulbs. Her spouse asserts that the use of conventional power has been reduced thanks to the solar lights provided by the LaBL initiative. She laments the fact that very few people in the little town showed any interest in or concern for her and her family when she was a child. Thanks to the charging station, she has been able to meet local ladies and get involved in the community. Since then, she has been instructing the ladies of her village on the many uses of solar lights, such as how to construct leaf cups and plates for use in nighttime study and vegetable cultivation. The kerosene lamp wouldn't have helped her make around Rs. 600 per month making leaf plates for two hours in the evening. With her newfound flexibility, her SHG team may meet throughout the day more often than before. The solar light, says Kanika, has lifted the emotions of the local ladies. There

have been fewer health risks since kerosene is not used as much. (Real estate entrepreneur based in New Delhi)

My ability to make and sell sarees determines the amount of money I make. However, I now have a reliable revenue stream thanks to my solar charging station. (Based in New Delhi, solar entrepreneur) New insights into solar enterprises owned by women are offered by these findings. Lastly, the fact that women are less likely than males to leave their communities has been known for a long time. Men often forego stable employment in lieu of seasonal, high-paying occupations in cities, particularly in the construction sector (think: rural fairs and trade booths). If the company's operations rely on payments owing to the individuals or organizations who supplied a certain piece of technology, this can cause issues with the income and repayment schedule. It has been shown that this is very unlikely to happen when women plan to stay, bring in other women from the area, try to build the business, and create social capital as it grows. The growth phase is particularly difficult for these women-owned businesses since they often manage them alone while simultaneously caring for children and spouses who may have to work long hours in the city. But with the help of other women—and sometimes men—these companies figure out how to become stable and expand. When a business grows, women often step up to the plate, which benefits everyone.

Future research should do a more in-depth examination and investigation of the phenomena of women-led solar-RETs-based firms in light of several intriguing findings and discussions. Not only are solar microbusinesses beneficial in both concrete and abstract ways, but organizations are increasingly recognizing the value of women as company entrepreneurs. There is a need for more research on the causes of this rising tendency. Although this isn't one of the study's aims, it is presented and discussed extensively.

5.6.7 ENTREPRENEURIAL COMMUNITY IMPACTS

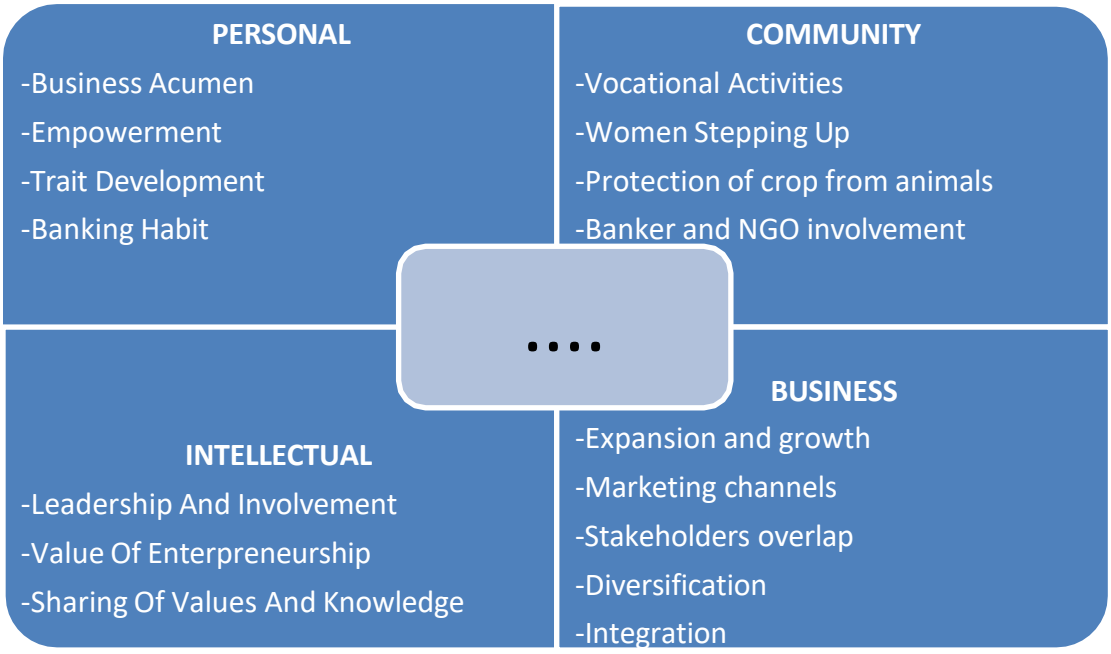
Even though Solar Charging station rental revenue is little, the solar lighting have helped enhance my income. The lights taught me survival techniques that would help me and all local life. (New Delhi Solar Business Launch) Hari was picked to manage a sustainable

charging station despite just finishing eighth grade and being unemployed. He wanted to hire solar lights from his charging station to brighten the region and generate money. He now gets Rs. 1600 monthly for supplying light bulbs to forty families. He's pleased and offers to finish for a price. The reason is evident. He believes he and the people had kept wild animals at bay and extended the harvesting season to the night the previous summer. Instead of losing money, he earned Rs. 5,000. Since his earnings has increased, he can cultivate more cashews and turmeric on the same property. The local development commitment meeting might be conducted at night using a solar lamp instead of kerosene. He became the local development committee secretary because of his passion. Dad must make his two kids read before bed now that they're in school. He and his wife made lead plates that evening under the sun-lantern's bright light. The man says the light helps him produce Ayurvedic medications even at night. The lantern affects Stadt Sohna (Haryana) when residents use their traditional knowledge to benefit their community. Everyone agrees that good company governance reduces waste and replaces resources (Clellandetal., 2000). CSR and green firm sustainability are synonymous in certain regions. Money or green earned. Like many intellectual undertakings, measuring predicts outcomes despite contradictory facts. Ambec and Lanoie (2008) analyzed the literature on why being green is lucrative and found many strategies to gain money. Sustainable practices provide financial benefits, according to Ambec and Lanoie (2008). These include faster market access, distinctive goods, revenue from sustainable technology promotion, improved risk mitigation and interactions with multiple parties, cheaper materials, facilities, energy, funding, and labor.

Levinsohn (2013) believes that small and medium-sized firms (SMEs) are vital to local communities' long-term development yet frequently go unnoticed. Zu (2014) claims that sustainable business has become a global movement encouraging corporations to consider their social and environmental implications. Two recent special issues of peer- reviewed journals, the Journal of Cleaner-Production (Volume 19, Issue 8) and the Journal of Business Venturing (Volume 5, 2010), featured the phrase ―green development‖ to characterize entrepreneurship's positive social consequences. A multi- level viewpoint analysis is needed to understand the complicated transition to a sustainable model (Geels, 2011). Technology, policies, government, governance, the

economy, commerce, markets, society, language, and public opinion are interconnected in this process. Farinelli et al. (2011) found that environmentally conscientious company owners promote economic growth by creating jobs. Entrepreneurs in industrialized countries generally use free market techniques. Organizational, institutional, social, and economic factors impact businessmen's decisions to start natural resource companies, according to Nikolaou et al. (2011). Pacheco et al. (2010) explored public-private cooperation to make sustainable practices more feasible. Ashraf et al. (2014) found that networking increased carbon performance in underdeveloped economies. Non-governmental organizations coordinate reform demands and stimulate bottom-up action via lobbying and networking (Lorek & Spangenberg, 2014). While assessing the complex restrictions of RE-based enterprises, the benefits to people, society, and the intellect were considered. The chart below shows how these four benefits connect to the theme results. The argument also shows how these four components are interrelated. Progressive character improvements may increase societal benefits, which boost economic and cognitive advancement.

Figure 5.1: Overall opportunities and challenges for solar technology adoption by the entrepreneurs.



(Source: Author's compilation)

5.7 INTERPRETATION

The actual number of options is far larger than the simplified list given by the empirical studies. Looking at the numbers from the study shows that there are additional variables that could influence the overall opportunities and threats that company owners face when they use solar power. It is crucial to highlight that some of these possibilities and challenges are essentially intangible and will have major consequences in the long run. Though the subject analysis delves into the results, the framework clarifies the connection between entrepreneurial growth and its effect on regional development. This proves that the results of the thesis are related to its theoretical foundations. In addition to the elements already mentioned by OECD/EUROSTAT in the present framework, the research and topic analysis offered here allow for the inclusion of many more in the conceptual viewpoint. This will be helpful for future research. Objective 4: Research on the institutional frameworks that facilitate the establishment of a favorable setting for the promotion of solar-powered entrepreneurial endeavors that advance rural development.

5.8 SELCO

8.1 ACTORS

Many different people and organizations will need to pitch in for SELCO's business strategy to be successful in its management and operational aspects. First, you must take notice of what they are and how they communicate before you can understand their relationships. To begin, SELCO has been collaborating with credit-cooperatives, micro-finance institutions, and RRBs to provide its solar system buyers with the essential financing options. When you live in a remote region, it could be difficult to get a loan from a traditional bank since such places won't provide credit unless you have the standard collateral, guarantee, and margin money. For a micro-business that harnesses solar electricity, SELCO steps in as a surety and more of a facilitator to help an entrepreneur get funds. Particularly in more remote areas where payback schedules and preferences might be daily or weekly instead of monthly, the remembering mechanism is one of the main reasons banks can be resistant. The administrative and transactional burden on the bank is increased as a result. Nevertheless, SELCO often arranges micro- business finance via a bank in cases when an owner has bought solar-equipment from the

organization. On rare occasions, SELCO may also provide a bridging loan to customers who are deemed financially unable to obtain the necessary margin funds. Additionally, SELCO only partners with regional vendors. Reliable electrical components are essential for rural India, and SELCO is willing to sacrifice some technical expertise to get them. Meeting with local businesses is a common SELCO practice for brainstorming new and improved ways of doing things. Thirdly, SELCO collaborates with a wide range of community-based groups and NGOs since they know that supplier contacts can't foster innovation in every way. One example is the partnership between SELCO, SEWA, and other rural community- and volunteer-based groups. Civic organizations' ability to connect with SELCO and give the company with local expertise is crucial because without it, the corporation would have a very hard time accessing communities. Given that SELCO develops products with each customer's needs and feedback in mind, the ability to interact with consumers and company owners is even more important for the team. Consequently, local organizations play a crucial role as stakeholders for SELCO in this situation. Fourth, SELCO's marketing and R&D divisions are also essential stakeholders, along with the business owners. As previously stated, entrepreneurs are the foundation of innovative products and design inventions. Therefore, it is critical for SELCO to stay in regular contact with entrepreneurs while also finding innovative ways to help their operations by creating solar-based technologies that are better suited to specific problems or purposes. An further consideration is that SELCO refrains from spending money on advertising or promoting their products. Instead, their technical staff dedicates their time to engaging with local consumers and comprehending their specific demands and requirements. Clients and SELCO often exchange information and expertise because of this.

5.8.2 PATTERNS OF INTERACTION AND OUTCOMES GENERATED

Understanding the patterns of interaction within SELCO and the advantages and externalities that result from these patterns is crucial for promoting solar-based entrepreneurial activity. To achieve this goal, one must analyze SELCO's operational structure as well as the frequency of their communications with various stakeholders, including but not limited to clients, distributors, sales representatives, and research think

tanks. Code for doing a theme analysis is provided in each of these sections. When considering all of the services that SELCO provides, four distinct patterns of consumer interaction become apparent. An overview of a few of these repetitive patterns is shown below.

Businesses need to maintain constant channels of contact with customers in order to design goods and services that fulfill their needs. For the convenience of its consumers in rural India, SELCO maintains a network of 25 service facilities. A practical and reasonably priced lighting option, SELCO's solar lights are tailored to customers' demands and their capacity to repay loan amounts. As a result, solar-RETs are often customized to meet the specific needs of each client. This process begins with a thorough evaluation of the property's requirements by the sales and R&D teams, who then establish the customer's expectations. The data refute the idea that SELCO provides standardized technological solutions to houses to save costs. Due to SELCO's constant engagement and word-of-mouth, customers and business owners save money on advertising and marketing. As solar systems' benefits are more recognized, more people will purchase them, and word-of-mouth may reach rural locations. In a typical SELCO transaction, the client's monthly debt payment capacity is determined first. The client and SELCO professional discuss the fixed and variable expenses of energy to the home. SELCO illumination lets him work more hours, saving him INR 50 per month on kerosene (SELCO India, 2009). Intangible benefits include saving time by not buying kerosene or forest wood. All things considered, the consumer may be able to repay the loan at 150 INR each month. He could afford a two-light fixture. However, the dining room, bedroom, living room, and cowshed must each have one light. 2011 (New Delhi) After reviewing his lifestyle, it becomes clear that he needs light in all four areas, but not simultaneously. His chef-cowherd wife will require home electricity. Even more unusual is the concept that a home requires bedroom and living room lights on concurrently. To save expenses and satisfy the customer, SELCO will wire every room, give four light spots, and provide a two-light system. If the family could quickly attach and remove the lights from all four points, they could move them throughout the house. A house's architecture may allow a light fixture on the wall between two rooms to illuminate both rooms uniformly. SELCO maintains a four-light system twice for regular maintenance

and once for emergencies for INR 250 per year. SELCO workers evaluate each solar array twice a year to guarantee optimal performance. SELCO's expert technicians will react quickly to any concerns since their solar panels are crucial to many customers' daily life. Most facilities are in distant areas, making project coordination and administration harder. SELCO works to better respond to inquiries; presently, they can answer 65% in one day.

SELCO has helped countless rural Indian firm owners succeed. Nighttime street traders may exhibit their items using SELCO solar lamps and household solar lights. Businesses rent the lights daily from SELCO as street sellers won't always require them. This company gave street vendors money when no bank or credit union would. Customers and SELCO routinely exchange feedback, so information flows readily. The firm owner may save time and money by incorporating new ideas into the design process and improving customer-SELCO communication.

5.8.3 Providing clients with innovative financial support via bank partnerships

The RE sector's economic expansion under SELCO has changed banks' relationships with RET-based firms and rural entrepreneurs. With its comprehensive understanding of housing demands and cost limits, the business created this idea.

All day long, most of the target market—from entrepreneurs who constantly lease out solar lights to market vendors and vegetable sellers who buy or lease solar lamps, lanterns, or lighting fixtures—prefers to make regular cash-repayments. This insight informed SELCO's decision to provide weekly and monthly disbursement alternatives for its loans, while the company also provided daily and biweekly disbursement options. There are a lot of potential problems with this. For one, regular banks wouldn't give SELCO customers credit because they don't have the necessary collateral or sureties. Secondly, it would be expensive and difficult to offer them protection against weekly and daily repayments, which isn't how commercial banks usually do business. But the commercial banks that SELCO collaborated with trusted it, so today the communities can take use of both the unique financial model for energy loans and traditional banking services.

The right financial arrangements have been secured for SELCO's customers via working with RRBs, co-operative societies, and micro-finance groups. However, SELCO will not fund itself. However, in rare occasions, SELCO may step in and provide a credit line if they determine that a certain area or person is in such dire financial straits that they cannot even secure the margin funds. To prevent any appearance of bias, even in these cases, the entity responsible for collecting the remaining cash nevertheless pays SELCO. To back this up, the SELCO annual reports cover all the bases when it comes to the management, risk, and functioning of these short-term loan funds.

5.8.4 CONTINUOUS AND INTERACTIVE RELATIONSHIP WITH SUPPLIERS

The lighting system, battery, battery charger, and solar photovoltaic modules are the four main parts of a solar light. TATA BP has been working with SELCO for quite some time, and they provide 90–95 percent of the panels that SELCO uses. When it comes to delivery timing and quantity, TATA BP has already been accommodating to SELCO. Having a close source of supplies also helps SELCO save Rs 15 million in inventory across all 25 service facilities. Shakti Electronics, a local supplier of SELCO, works closely with the company to create batteries tailored to SELCO lights, and the company supplies the majority of the batteries that SELCO uses.There is a great deal of interdependence due to the participants and the design of their interactional behaviors. Reliable electrical components are essential for rural India, and SELCO is willing to sacrifice some technical expertise to get them. Every one of SELCO's suppliers is forthright and honest with the company, and they rally around each other if problems arise. Stakeholder participation would cause the market to change, and the level of cooperation and comprehension between regional and local ties increases the company's reach and longevity, to the indirect and direct advantage of SELCO's customers.

5.8.5 Collaboration with community organizations to develop new products

As can be seen by looking at the company's operational model, SELCO has several important stakeholders that help make the goods and services they provide to customers better over time. Women who work as midwives, flower pickers, manual laborers, masons, and other service industry workers now make up the majority of customers, in addition to street vendors and vegetable sellers. Most rural women hire midwives to give

birth since there isn't a hospital in the region. When there is no electricity from the grid, it is common practice to use a mirror to direct the sun's beams onto the delivery area. But because the midwife would only use a table light or candle during the day or when it was raining, this improvised setup was impractical. They collaborated with SEWA to develop SELCO's solar product line. Furthermore, SEWA assists SELCO in penetrating untapped markets.

Among these items are a smokeless stove, solar tents for artisans and workers, and headlights for midwives and flower pickers. Home sellers of fruits and vegetables may utilize the solar lights to keep their company open for longer. In locations where there is a paucity of electricity, the atmosphere turns dark after 6 o'clock, which has a significant impact on child-birth delivery but receives less attention overall. In order to aid the midwives during labor and delivery, SELCO developed a solar-powered light. Now we may go on to how SELCO collaborated with flower collectors from three in the morning to midnight. With a petro-max light in one hand and a flower basket in the other, they struggled to choose the right flowers. Because of this, their production would fall. They were able to gather twice as many flowers in the same amount of time by using solar headlamps. In order to maximize the usage of the solar lights and enhance income creation, the midwife and the flower pickers would rent them from the SELCO on a daily or hourly basis. According to SELCO, more than 20% of its customers are now seeing a direct increase in revenue due to the increased productivity of SELCO lighting. In this regard, their cooperation with SEWA Bank was invaluable. The founding members of the firm saw a need in the industry for solar headlights and decided to fill it by making them available for rent. Most of the flower pickers work for a vendor who sells their wares at the village's morning market. Despite an increase in the supply, the amount required to pay the flower pickers has remained same. Customers may purchase lamps, along with other solar RETs, at 8 p.m. after they have been charged all day.

This information is supported by data from UNDO (2011). Solar lights are better for the environment than kerosene or firewood, which are polluting alternatives. Unfortunately, no one has tried to put a number on this impact so far. Not only has SELCO's business strategy created jobs for its employees, but it has also given rural entrepreneurs the chance to rent solar lights to institutions and enterprises. Success typically increases

expectations, therefore people are continuously asking SELCO's leadership, including MD Harish, how they want to grow the company. But the standardization needed for expanding is at odds with SELCO's business model, which entails making solutions unique for each customer. They think other companies should just mimic their concept instead of trying to build upon it. A cautious approach to scaling has been taken by SELCO because it thinks that the organization's overarching objective may take precedence over the requirement to grow. As previously stated, SELCO's institutional frameworks have generated employment opportunities for its workers and a slew of new entrepreneurs who are exploring the possibility of leasing solar lights to nearby establishments and street sellers. There is the formation of partnerships at every level, and it is arguable that social value, both intrinsic and extrinsic, is created. To rephrase, there are major players at the national and regional levels where advice is available, but there is a lack of a rational model for communicating with rural residents. On the other hand, local institutions are more interdependent and linked, which could actually aid in the industry's market maturity.

5.8.6 A Thematic Analysis of Solar Entrepreneur Support

Table 5.1: SELCO India Data Analysis Structure Source: Author compilation

Interaction and result patterns	First-order codes	Second-order codes	**THEMES**
1. By catering to individual consumers' wants and needs, a company can increase sales.	1. Household requirements are taken into account when designing products. 2. Ongoing communication and feedback loop	1. Intense interaction between SELCO's clientele and service team 2. Taking into account the specifics of domestic lighting requirements	Facilitating communication between SELCO and its customers and receiving their comments to better meet their lighting needs
2.Building a new type of financial product	1. Diffusion of information via interpersonal channels	1. SELCO is helping their client by obtaining bank	Financing options for solar-based businesses, evolving banking

	2. Relationship building between SELCO customers and employees 3. Improved reaction time to RET product problems 4. Villagers and banks interacting 5. Financial institutions that provide financing for solar energy companies 6.Monetary institutions receive payments on a daily	lending facilities. 2. Relationship building between customers and banks	policy

5.8.6.1 Sharing knowledge, feedback loop between Selco and clients, understanding individual lighting needs

An immediate takeaway from the codes and the theme is SELCO's commitment to listening to and responding to client feedback throughout the design process and catering to their wants and needs. It is clear from the above interview statements and secondary data that the lights are used for important purposes that affect the customers' everyday life. One such usage is renting out RETs for financial gain, in addition to providing house illumination. Consequently, there is a tremendous emphasis on the quality of the provided products and services. On top of that, it's obvious that a solar RET business model is taking shape, one that benefits companies and street sellers alike.

5.8.6.2 Quicker product development, client issues response

New product development may benefit from partnering with a local supplier or a small firm that provides customization. These suppliers are minor and do not have official partnerships with big RET makers. Also important is the duration of these ties. Their

relationship helps SELCO remain safe and competitive. Trading suppliers often would make it hard for SELCO to cut costs, innovate, and provide customized products and services. Open and honest communication with the provider ensures contract legality and product quality. Previous sections showed that SELCO regularly utilizes customer feedback into product development and service quality assessments. Thus, this still affects IT designers and providers. With this communication pattern, stakeholders may increase service quality, connection, and reliance. Another interview and observation comment supports the preceding opinion. Additionally, solar firm owners may enhance their products with easy improvements that SELCO can implement.

5.8.6.3 Working with local communities, creating new needs, and building network trust

Both the designs and the products are cutting edge. Similarly, SELCO has partnered with NGOs and community organizations since breaking into a rural industry without local relationships is difficult. Although certain traditional cultures find giving birth and the rituals surrounding it to be sensitive, one way to overcome opposition to change in rural India is to construct a solar lamp (midwives delivering babies). Two further things to consider are the potential dangers and how active the local community has to be. According to the results, headlights are well-received and have many positive effects on the community. The reason for this is that SELCO recognized early on that community engagement was going to be crucial in acquiring the skills and technologies needed for the project, thus they actively sought it out. Because of this major shift in society, both the flower pickers and the midwives are doing well now. Not only did SELCO reap these benefits, but they also earned the confidence of the community via their close cooperation on this sensitive issue.

These developments and enhancements to the institutional arrangements were also made feasible by SELCO's connections to A) SEWA and B) the area where they first introduced the solar technology. Even constructing renewable energy systems would have been a huge challenge for SELCO without SEWA, let alone accessing a community to conduct sensitive problem study on childbirth deliveries. In this light, SEWA's involvement in the agreement enhanced its final product. Furthermore, the midwives'

early involvement enhanced the end result for the benefit of the community. It keeps coming up how important it is to a) include the end user in the design process right from the beginning and b) investigate the origins of demand and need thoroughly. Both of those characteristics work with the solar and candlelight options offered by SELCO. For the sake of this research, it is crucial to pay close attention to the length and breadth of the customer conversation. When comparing the monthly cost of kerosene for one domestic helper to the amount of extra work hours made possible by SELCO lighting, a member's commitment to accuracy and willingness to take the customization of the innovation and financing model seriously are shown. Even without taking into account the nebulous advantages of improved health, less time spent harvesting forest wood, and more time in school, it is clear that this is a great addition. If your client uses RETs to keep their company open later, this data will be helpful to them. The table below shows some of the advantages of switching to renewable energy sources.

No matter whether a company owner sets aside an hour a day to do nothing but work or if other family members use time for paperwork, the crew is always watching. For instance, one solar lantern may extend the amount of time light remains after dark by three to four hours. The employees are showing the company owners how to manage and keep up with their technologies. It could be difficult for rural areas to properly use even the most fundamental of these technologies at first, even if it seems easy to someone living in a city. The IAD model provides a description of the patterns and effects of interactions among SELCO, its clients, and its users, and this is relevant here. Customizing and b) enhancing wellbeing, decreasing time spent gathering forest-wood, and increasing the amount of study time for children will not manifest in the results unless these types of interaction are prioritized, sustained, and provide the desired results. After thoroughly analyzing the client's usual energy use and available funds, SELCO tailors its technology offerings to meet their specific needs. The case we examined earlier exemplifies this point even more; the personnel failed to illuminate all four rooms in a residence even though they were clearly necessary. This discovery exemplifies the breadth and depth of the idea's expansion and availability, as well as the company's investigation. That the firm willfully shuns uniformity across all of its products is the most crucial finding. Since

SELCO isn't very keen on sales scalability or a cookie-cutter approach, it sees it as at odds with its aspirations.

5.8.7 SUPPORT FOR RE BASED ENTREPRENEURSHIP

Many RE-based firm owner programs begin with SELCO. Ensuring technology is used properly requires regular field inspections and site visits. This major insight has the potential to revolutionize how continually functioning technologies are evaluated and monitored and renewable energy regulations. Every SELCO local branch is within 30 kilometers of a customer's home or neighborhood. They may investigate a problem and find a solution in the time they would have spent house hunting. Second, the team is known for responding quickly (80% of complaints and 65% of emails within 24 hours). Besides ensuring high output, this wins over local consumers. RE-based enterprises like those that rent solar lights, lanterns, or house lighting systems have daily operating and cash flow issues. If they want their firm to succeed, they must get technical help right now. A robust communication and support structure may benefit any entrepreneurial enterprise, big or little.

New RET rental and sales enterprises need money. Collaborations with RRBs, credit cooperatives, and microfinance institutions allow SELCO to lend customers without using its own capital. They also bridge rural-financial supporter communication, a gap that existed before the organization was founded. Rural businesses demand stable, predictable, and secured commercial bank funding as well as adaptable technology and rapid repairs for technical concerns. The above has several rural development implications. The field study's findings and recommendations improve capacities and information communication. Microbusiness owners that use SELCO's solar solutions create good credit and a good connection with the bank, which benefits them in future professional and personal relationships. The SELCO debt payback schemes, which may be done weekly or daily, ensure firm owners good credit and financial judgment. The study found that majority pay off their debts on promptly, often in full. Business owners and SELCO's long-term aims of boosting entrepreneurship and improving villager-banker relations may benefit from this circumstance. The self- employed Women's Organization provides most loans to SELCO's rural Gujarat

customers. Their latest book and the fact that other North Indian governments are copying the strategy suggest that the case was successful. Collaboration with SELCO and its clients provides knowledge exchange, feedback loops that improve product design and usability, and user-provider integration that helps tech-dependent firm owners. Additionally, corporate owners provide trust, an intangible advantage, to an operation. SELCO relies on them as stakeholders and experts.

SELCO can design and create products that meet client needs due to its long-term relationships with local suppliers. Product designs must be inventive to attain this purpose. SELCO's suppliers acquire market trust and operational credibility by maintaining excellent connections with other partners, notably banks and credit cooperatives. They profit financially and non-financially from this. The fact that SELCO can typically respond quickly to firm owners' maintenance or technical demands is encouraging. If so, procedure costs, wait times, and hazards may decrease. SELCO's institutional framework and multi-level stakeholder interaction boost legitimacy and practicality. SELCO partners include social entrepreneurs, academic institutions, local financial firms, and NGOs. This kind of organization helps enterprises function and serve rural customers and entrepreneurs, making them direct and indirect stakeholders. Customers benefit from each member's unique abilities and knowledge when they cooperate. These configurations may show that, despite each player's individual process setting and decision-making style, the group's purpose is defined by a single outcome when they cooperate. We may study SELCO's RE-based business initiatives' impact on all stakeholders more closely.

5.9 All-India Women's Conference

5.9.1 ACTORS

International organization AIWC has branches throughout South Asia and is headquartered in India. It leads the MNRE in promoting renewable energy and its benefits for women. IREDA, MNRE's financing arm, funds AIWC-managed training and pilot programs. A longtime collaborator with MNRE, the group has close ties to the Ministry's green company incubators and RET development centers. Educational

institutions, scientific think tanks, volunteer organizations, and NGOs create and teach most AIWC training courses. Each experimental program and orientation starts with Consciousness distribution and continues with open meetings and workshops for women business entrepreneurs led by moderators from AIWC partner universities. Without these partners, education and incubation programs would struggle to succeed. The AIWC buys RETs from VOs, NGOs, and TATA PowerSolar and UrjaUnlimited. They also teach women in underprivileged areas how to build basic RETs at home and create micro businesses. AIWC has successfully trained local populations on lighting, air dryers, and solar water heaters. Solar RETs are also made, repaired, and maintained by women in Delhi and Gujarat slums. Anyone may learn to manage a real estate company from home or a street stand.

4.9.2 Interaction patterns and results

AIWC's operational approach and interactions with stakeholders—particularly women entrepreneurs, research centers, MNRE, and IREDA—can illuminate solar-based entrepreneurship communication patterns and results. These sub-parts provide theme assessment-relevant information. This examination of AIWC's many services covers these issues.

a) Increasing training and development course involvement with other organizations Every solar-powered microbusiness lacks basic information. Small solar equipment difficulties, installation, maintenance, and repair are beyond women and young solar entrepreneurs. Time- and resource-intensive processes rely on external sources. Thus, the AIWC's training program empowers low-income women and adolescents from relocation provinces to become self-sufficient and construct an ecosystem in their communities by discovering and developing their capabilities. To be effective, the model must teach young women and girls how to start businesses and create money. Since our NGO colleagues have addressed RETs, we are aware of their importance even if we are starting from scratch. The courses are well-structured and have basic instruments. You should start here. Women are particularly interested in the fact that RETs may be used to launch a home-based business that employs other women. (AIWC, Faridabad, female entrepreneur)

When the AIWC held training sessions in Noida or Delhi resettlement locations, 15–20 trainees each group attended. A month of academic and practical instruction was covered in 20 sessions. Urja Unlimited's technical guidance and tools enabled these initiatives. Professionals also discussed peat pot production, vermin composting, conical/box cookers, rubbish disposal, and global warming. AIWC included academic and practical courses. Each training finished with a testing and assessment workshop. The test included a drawing creation, viva, and multiple-choice section. These workshops were led by guest specialists. The training convener oversaw these courses with the point person and local NGOs.
Participants believe a month is enough time to sustain their excitement because they are more concerned with the program's long-term impacts than their present problems. Thus, they assess participants—most of whom have passed—after 20 sessions every month, which requires a lot of information. However, some smart women keep in contact and seek more instruction. (New Delhi-based AIWC Chairman Formerly)

The preceding paragraph describes the program's structure and content. Since most participants originate from rich or moderately well-off homes, programs that disturb their daily routines for a long period may cause them to leave. Most of these programs include many teachers or groups, and a third person mediates questions and difficulties. This is vital when choosing a 15–20-person group. Because training courses are practical, professors and TAs can give each student the attention they require, increasing productivity and engagement. Talking to young ladies and jobless males The above players contribute differently to the final output at each step. Participants generally have a certain period to work with a business. AIWC, the MNRE's nodal agency, has a strong network of enterprises with whom it may engage to help adolescents and women flourish. They get help to start a solar charging station or repair firm after their apprenticeship, offering consumers a one-stop technical solution. Repair and maintenance firms are mostly run by women, whereas solar charging outlets are usually installed by men. As mentioned above, these trainings are generally conducted during the education and awareness campaign. Running a solar charging station requires stakeholder participation and operational management, but repair shops need greater technical skills. Over time, the AIWC team or NGO they work with improve both talents.

By helping grassroots members and stakeholders collaborate, NGOs help organizations flourish. After consumers accept the technology, only a bottom-up method, adopted by NGOs, can raise demand. Inspiration requires a catalytic mindset that simplifies the process in the local context after researching the community's conditions, needs, and culture. NGOs may learn about technology's merits and downsides from users. Users must be trained to operate and maintain transmitted technology. When someone discovers a neighbour is a solar designer, their colony or suburb neighbours want to copy. This includes employing existing lighting and cooking equipment to start local businesses and side occupations and installing solar-powered charging stations. This region changes over time. Savita had twenty regular clients with batteries, lights, and stoves at her repair store for two months. Savita's neighbours eventually allowed her to sell flowers in the colony after dark to workers who came home after seven. People did not have this propensity before using these tools, but now they realize they are benefitting financially in time and opportunity.Reimagining the business concept with partners in various places, including AIWC, a New Delhi network of female entrepreneurs, AIWC employed solar panels and air-dryers to simulate RET consumption. The American Wind Energy Association introduced the Southwest and Midwest Solar Air-Dryer Programs in 2011. Comparable capacity was originally developed in New Delhi and Kerala. One paradigm surprisingly succeeded while the other failed, which helped create knowledge and lessons learnt. The key aims were to show that sun-drying fruits and vegetables as a micro-enterprise might provide money for poor women. Secondary aims included examining the processed fruit and vegetable sector, particularly solar-dried products. For the sun drying firm, we intended to study asset ownership and financing methods. Penultimate step: developing food-specific solar-dryer and processing standards. An example of the RETs' business model can help you visualize the concepts.(In 2013, AIWCBrief case overview)

Drying fruits is crucial to preserving India's abundance. Fruits and veggies too. Common drying techniques include sun drying. India produces just 2% of its food, while the US, Thailand, and the Philippines process 70%. Fruit pulp makes up 2.22 percent of processed food, or 33,000 tons per year (AIWC, 2018). Cottage businesses in urban, semi-urban, and rural areas dehydrate fruits and vegetables in dirty, unhealthy ways.

Unregulated open sun drying produces pollutants such dust, filth, dead insects, and rodent and bird droppings. Solar drying allows fruits and vegetables to meet national and international cleanliness and sanitation requirements without energy-intensive processing. Solar dryers have these features:

To control product moisture, adjust drying time based on sun strength. On sunny days, the cabinet temperature ranges from 40 to 65 degrees Celsius, while the air temperature outside is 15 to 30 degrees lower. A thermostat that uses both solar and electricity is programmed to maintain the desired temperature. Closed trays speed product loading and unloading. For specific situations, a special glass screen reduces solar intensity and UV radiation. These dryers provide a clean, well-prepared product that exceeds ASTA standards in the US and elsewhere. Air is circulated by solar PV fans. AIWC found solar dryer technology suitable for small-scale food processors seeking clean, high-quality food. This supports the premise that business facilities should emphasize renewable energy. They tried similar method in Tamil Nadu after its success in Delhi. Instructional production, dryer installation in four locations, and trial production followed. We tested the strategy for local requirements and tastes using a variety of goods. Mango bars, ginger powder, need powder, fenugreek powder, and diabetic dry coconut powder are mentioned.

Figure 5.2: Business process breakdown of AIWC

(Source: Author's compilation)

The accompanying graphic illustrates the sequential running of the simulation. A solar-dried mango bar making demonstration was part of the training program in the chosen regions. The bulk of the show was devoted to Shubha's mango-bar preparations. Sun drying tomatoes, ginger, coco, chili peppers, curry leaves, and fresh basil was also shown. An example of proper sanitation and hygiene in food preparation was also shown conceptually. In New Delhi, nine women's group representatives, including those from AIWC, were present. After seeing the RET in action, participants agreed that it would be perfect for the micro-level supplements used in self-help groups. Ten members of self- help groups and three members of the Mahila-Samagam branch were among the thirteen people who participated in a five-day solar dryer training session in Kerala. The activity included making mango bars with a total weight of 17.3 kg.

Table 5.2: Solar Air Dryer Marketing

Product prep and marketing	Marketing Info
1. The commodities were picked based on season, local market produce, and a market analysis.	1. Production expenses determined prepared products price. Retailers and canteens tested packaged goods samples. All solar dryers pushed marketing using existing links till pilot.
2. One Tamil Nadu branch tried tomato, curry, kasurimethi, and bitter gourd powder.	2.The AIWC booth at the main office in Delhi gave samples of tomato-slice packs to eateries and specialized stores and other merchandise. Ginger powder, mango bars, and methi leaves were popular.
3.Ginger, amla, kasuri-methi, mango-bars, tomato, and dried tomato slices were made by the Delhi Pilot. Delhi residents dried drumstick, pudina, and basil leaves.	

(Source: Author's compilation)

The marketing process is shown in the table above. An examination of the Delhi market and first-hand experience indicate that selling mango bar sweets in school cafeterias may provide substantial profits. The Kerala branch attempted to market the items via its

networks (Ventat, 2017).The Tamil Nadu pilot attempted tomato powder, kadileaf powder, kasurimethi, mango bars, and bitter gourd powder, while Delhi's pilot tried ginger powder, mango bars, kadimasala powder, and tomato slices (Iyengar, 2018). Kerala pilot research used rice, tapioca wafers, black pepper, curd green chilli, and curd bitter melon. The availability of raw resources influenced cautious item selection.Nevertheless, there weren't many things that were badly impacted by the misalignment between marketing objectives and real consumer tastes.

Results

Specialty stores with established relationships with suppliers are a wonderful place to locate these products. One reason Delhi Pilot's tomato-powder was so popular was that it could be used to create tomato soup. The first thing you should know is that producing tomato powder in southern India is more profitable. Second Lesson: If you want to know what foods work best in a solar air drier, you have to think about what people like. RETs don't have enough diversity. To add heat to curd, both northern and southern Indians utilize these powders in their recipes. A pilot hailing from Delhi, India, developed the kadimasala powder. People bought the goods and showed their support for the business by placing an order. It turned out that Delhi is a good place to sell the goods. The first lesson is to know how to identify the product and how to sell it effectively. Second Lesson: Before beginning a micro company based on RETs produced food, it is still important to consider consumer desires and local circumstances. Lessons learned and shared from the case, When SHGs or individuals implement the solar dryer idea in a business setting, they will draw on the skills learned throughout the program. The women in the program are given the chance to turn their experiences into a source of income. In addition to providing them with a means of subsistence, this would also help the women achieve financial autonomy and stability. Use the cheap raw materials that are accessible in the raw market to identify the items. The best time to make the items is when the city's factories have enough of supplies of necessary materials. Another possibility is to negotiate a deal with the farmers where the unit commits to purchasing a certain quantity of food at a wholesale price. It is important to consider the tastes of the local consumers. Because of cultural differences in food preferences, one product is well-liked in Delhi but reviled in Chennai. It would be wise to investigate the regional marketplace. In order for

marketing to be simpler, the product has to match early market demand. Solar drying and sanitary preparation must be clearly stated on all products.

Fostering an entrepreneurial spirit among females and youths in the energy industry Solar charging outlets for small businesses, educational and training courses, and the opportunity to learn from other organizations' successful models are just a few of the many services offered by the AIWC. This is a significant indication of the increasing autonomy of young people and women in managing energy-related enterprises. In addition to AIWC, there are several linked organizations and persons who are crucial to the successful completion of the project, its delivery, and assessment. However, as you can see from the following quote, most people who get these gifts end up feeling rather independent.

For a variety of initiatives over 20 years ago, we made sure these ladies had the proper training. We began with a novel and straightforward concept: parabolic solar cookers. Solar charging stations have come a long way since then and are now found in most towns. The AIWC India project team in action, One of the two supplementary ideas put up here is the importance of women feeling secure and protected in their own communities. In the business world, entrepreneurs whose companies rely on renewable energy sources are more likely to be male. A woman's anticipation that her business may be conducted from home without giving up her established setup can only be fulfilled with AIWC's assurance. In addition, the entrepreneurs are informed that AIWC's support system begins with early Consciousness sessions and continues with training and skill enhancement for entrepreneurs until the start-up of the firm. The motivation, steadiness, and safety of any organization, no matter how big or little, would be greatly enhanced by this.

5.9.3 Thematic analysis of solar-based entrepreneurship support

Table 5.3: AIWC Data Analysis Structure

Interaction patterns and results	**CODES**	**THEMES**
Collaboration with other organizations to train and develop	1. Learning through Doing 2. a test of practical	Training and education through participation; simulation possibilities

	ability 3. Programs that act as models 4. An organised and interactive procedure	
Working with underemployed individuals who have the skills to become solar engineers.	1. Help from the beginning of an apprenticeship all the way through the launch of a new venture 2. Encouragement of group study 3. In the solar industry, women perform maintenance and repairs.	Women restoring RETs, long-term assistance for female entrepreneurs
Joining together with local partners in order to spread the company's model worldwide	1. The Role of Circumstantial Considerations 2. Addition of business owners to the simulation to facilitate knowledge exchange 3. How to pick and develop a successful company 4. Develop your sense of initiative and enterprise.	The availability of starting capital, the importance of considering local characteristics when choosing a company model, and the challenges of determining the correct business to pursue.
Help young people and women become financially independent so they can start and run energy-related companies.	1. Early Warning Conferences 2. Increasing self-reliance	Entrepreneurs gaining self-sufficiency through education and information dissemination

	3. Maintaining peace and order 4. Help with anything from initial education to launching a company	

(Source: Author's compilation)

The AIWC's public-private partnership is remarkable. Players work with AIWC at different degrees. These include NGOs, MNRE, IREDA, sustainable power producers, trainees, and industrial and academic executives. Supporting firm development via technology (Urja Unlimited), training program finance, Consciousness campaigns (with NGOs), and seminars for trainers and research groups. Without these parts, AIWC cannot work. RETs and efforts to empower female entrepreneurs need social support, particularly from inside women's families, making awareness-raising campaigns critical. Non-governmental groups are also undervalued. The success of such a project depends on a well-nourished, sensitive population that has been educated of the merits and drawbacks of change.

Cultivating knowledge by virtual means, whereinInstances like this illustrate how the AIWC and its partner organizations work together to plan and implement training and education initiatives. Instructors and moderators from educational institutions work side by side with entrepreneurs to guide action learning and address any concerns that may arise throughout the training sessions. In order to ensure that they have grasped the material, they are shown both giving and receiving feedback. The business modeling approach teaches entrepreneurs how to use solar air dryers to improve food product quality while also gaining a better understanding of the contextual factors that substantially impact company success. Success for business owners and AIWC as a whole depends on their ability to learn from their mistakes and successes.

All-encompassing, long-term assistance for female entrepreneurs, individuals repairing green technologies, and company owners, Already stated in this part is the fact that

AIWC cultivates solar engineers who are also female entrepreneurs. On the other hand, solar charging stations are sometimes managed by men and maintained and repaired by women. AIWC goes through a lengthy procedure to encourage female business owners. An informational campaign outlining the benefits and drawbacks of RETs is the first stage. Not only should the benefits of renewable energy and entrepreneurship be emphasized, but also ideas like the fact that women may stay in their communities and that working from home offers them safety and security should be emphasized. Not only do the organizations provide money, but they also teach valuable business skills. The initial steps include raising awareness, educating people, and developing the necessary skills. Other organizations' participation is necessary for this, as stated above. AIWC stays in touch with successful companies often to monitor their growth and provide support for entering new markets.

Critical factors include the company's situational traits, choosing the right endeavor, and finance that is specific to the area.Knowledge of people's eating patterns was crucial for making adjustments that would spread the word about solar cookers, dryers, and pumps. For example, depending on the kind of cattle kept at home, a gobargas plant may support five or six animals. Along with the quantity, which is out of the ordinary, the animals' well-being and food supply will also be considered. When standards are too stringent, failure is inevitable. On rare occasions, government personnel built gobargas plants without consulting or educating the locals. Collaboration between NGOs and the government is crucial for raising public awareness of new technologies and ensuring the effectiveness of any initiatives. That's why it's crucial for organizations working on projects that will be seen by the public to begin formulating their program strategy and design in conjunction with a wide range of local experts involved at all levels. The AIWC maintains strong relationships with the MNRE, the IREDA, and the GreenGrantsAssociateofIndia.To start, the Ministry of Natural Resources and Energy (MNRE) designated the AIWC as its go-to group for unconventional energy training and technology distribution. Second, IREDA is the primary funder of all AIWC-initiated initiatives and programs. Since it's probable that some costly initiatives won't provide the desired results, this serves as an additional preventative measure. Given the dynamic nature of demands and how it impacts costs, AIWC's list of stakeholders includes

replenishable energy sources. Because of its central location in the country, AIWC is able to provide customers with the best deals and the most extensive warranties on MNRE. Academics and professionals in the renewable energy sector are invited to speak at AIWC, where audiences have the opportunity to learn from these speakers and elevate their own consciousness. These experts evaluate the group's performance on the exam to see how effectively they've learned and applied the content. They provide recommendations for improving the shows' structure and content based on their own experiences and knowledge of how demand is changing across various sectors. Another common feature of most AIWC programs, particularly the more recent ones that have focused on bringing renewable energy technology to rural areas, is the involvement of non-profit groups. This is in addition to the components already discussed. Charitable organizations engage directly with families and communities to assist them embrace change, and as a result, the public's awareness and comprehension of different energy- saving gadgets has grown. Furthermore, there has been a noticeable increase in both interest and comprehension of the same. This is significant because, with the help of nonprofits, a process known as customisation is necessary before any new technology or development can be brought to rural regions. The many years of success that AIWC has had in enhancing rural communities' standard of living have served as an inspiration to many other groups, both at the state and federal levels. Specifically aiming to assist women in peri-urban and rural areas, AIWC has provided innovative technology, appropriate training, and business assistance.

The majority of the courses taught participants how to construct, disassemble, operate, maintain, and test solar appliances such parabolic solar cookers, solar lights, and solar cookers for homes. The building, maintenance, and quality assurance of the solar systems are entirely within the receivers' control. This suggests to the organization that they might train kids and women to perform these jobs for a living, which would be great for the community. An adequate training program allows this. AIWC organized many technology-focused projects. The program included biogas plant maintenance and installation training, solar cooker improvements, and vendor marketing for wind turbines, solar stills, solar dryers, and solar lights. Program demonstrations countrywide may be arranged easily and successfully thanks to AIWC, one of MNRE's most famous nodal

organizations. The stability and predictability kept participants interested and excited, and proponents of using RETs to start viable micro-businesses were won over.

5.10 TERI

5.10.1 ACTORS

TERI works with regional NGOs to secure rural help. Lights a Billion Lives, founded in 2007, provides affordable solar lights to off-grid and rural Indian villages. A quarter of solar energy enterprises are owned by low-income women. LaBL has brought continuous lighting to 350k unconnected Indian households. All 22 Indian states may participate. It connects Afghanistan, Pakistan, Nepal, Bangladesh, Myanmar, Uganda, Kenya, Ethiopia, and others. Indian solar entrepreneurs will share their thoughts here. Certain viewpoints will come from TERI, while others will come from my fieldwork talks. Each LaBL node features a market rate chain of energy enterprises to stimulate entrepreneurship. The Program has seen several enterprises providing crucial energy services to rural homes flourish and emerge. TERI's New Delhi Office Social Transformation Department Head.

This market value chain provides backup services and high-quality replenishable energy sources locally. Technologies and services focus on last-mile delivery. Building a sustainable energy company chain requires more capacity development, mentoring, and financing. One way the initiative is expanding local and regional services for energy-related businesses is by connecting them to potable water supply. TERI is seeking students and young professionals to assist deliver solar light sources to 1 billion rural people as part of their breakthrough worldwide initiative Lighting a Billion Lives (LaBL). These lights will enlighten their houses with clean, white light and minimize power plant kerosene and fossil fuel consumption. People who carry the flag are flagbearers. This diagram shows how TERI collaborates with consumer/energy entrepreneurs, bankers, local businesses, NGOs, the MNRE, and RE providers.

Figure 5.3: Stakeholders of TERI

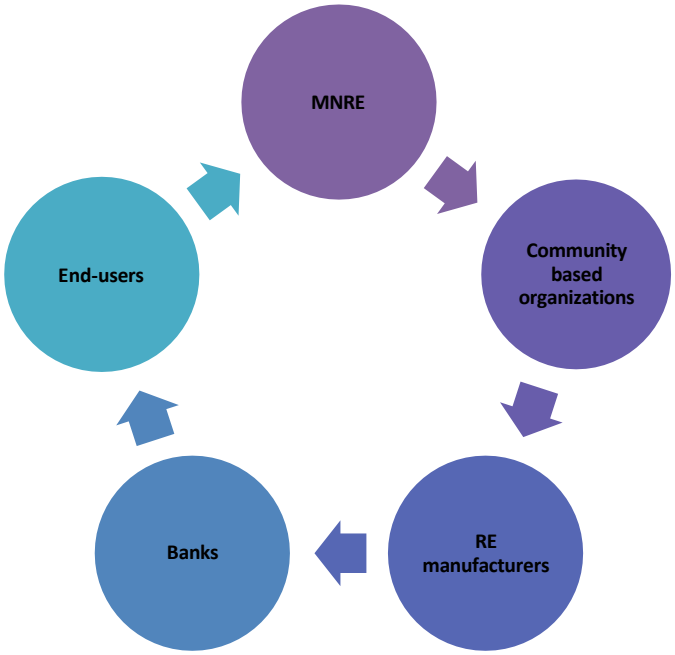


Figure: Stakeholders of TERI (Source: Author's compilation)

The primary roles of the other partners, particularly community-based organizations, are to a) raise local residents' consciousness on the pros and cons of using the new methods and b) assist with the end-to-end system setup. Financial institutions are among the organizations with whom TERI works to ensure that low-income families have access to the initial capital they need to purchase renewable energy equipment.

5.10.2 Interaction patterns and results

a) Collaboration with MNRE and area community organizations, TERI's strong connection with the community-based organization may be observed from two angles, as stated below. Local people are friendlier and more responsive to community-based company workers because they connect to each other's geographical viewpoints, norms, cultural features, work attitudes, and change conceptions. Doing so will help people comprehend supply principles, energy shortages, and possible remedies. LaBL TERI New Delhi Assistant Director, This thesis shows that all three organizations follow a similar process to incorporate native local groups in impoverished and rural regions. Project viability and long-term strategy depend on this. By working with MNRE and RE

producers, TERI gains a global perspective. A feedback loop is in place throughout product development, and customer desires are becoming more important. Since they are profit-driven and huge, renewable energy (RE) producers may not want to open in rural areas to entrepreneurs employing stabilizing strategies. The Energy and Resources Institute (TERI) works with RE firms to write bid and tender proposals for the Ministry of New and Replenishable Energy (MNRE) and obtain RETs via RE producer networks for village-level initiatives. Many interview instances from course fieldwork may illuminate the aforementioned. In each new market, TERI partners with a local NGO to achieve two things: first, assess the region's energy status and lack; second, identify prospective energy entrepreneurs. This reveals how terrible the village's energy issue is and how much wood residents consume and its consequences. Due of these two difficulties, TERI worked with area non-governmental groups to provide solar-powered home lighting choices.

b) Supporting clients after purchase with banks. The P-P-P partnership approach may assist development projects like TERI's LaBL program, which strives to enhance rural electricity availability. To fund the campaign, TERI switched from grants to service charges to equity and investments. This strategy solved two significant financial industry issues: extending operations and enhancing system variety. by showing assurance via results that support the notion. LaBL provides a strong financial base, specialized technology, an efficient monitoring system, and a government-aligned strategy to promote justice. Their microfinance bank agreements allow them to lend energy businesses door-to-door. LaBL works with microfinance institutions to support new and veteran rural enterprises. Solar charging stations were built by NABARD and rural livelihood project recipients. They are designing and executing a scalable semi- commercial strategy plan to finance innovative solar charging stations with YES Bank Limited.

TERI created EnergyEnterprises (UttamUrjaShops), a commercial platform. LaBL provides training, capacity building, after-sales support, and micro-implementation of project deliverables via local institutions. Energy Enterprises (EEs) in the defined region may sell LaBL solar charging points (SCSs), solar lamps, and other TERI-recognized renewable energy products. They also provide after-sales service. The EE provides

dependable after-sales support and helps rural youth create local capacity to implement new energy access projects.New Distribution Methods TERI provides sustainable energy and energy access via P-P-P, fee-for-service, and credit-finance methods. The examples may help real estate businesses.

Working with Mawana Sugars and Usha International to provide solar lanterns and sewing lessons to rural women at LaBL solar charging stations; Working with the Indian government's department of telecommunication to increase the variety of solar-powered mobile phone chargers; and Teaching rural women how to sell mobile telecom services. This table indicates two important things: first, that the initiatives strive to enhance a range of social programs; and second, that many individuals are engaged and have defined aims to ensure program success. MNRE and TERI collaborate well on planning because they exchange information. However, state and local institutions matter in operations. When the MNRE requests us to install 100,000 solar panels in a municipality, we choose bigger companies due to economies of scale. On the other hand, our technical team and the MNRE have identified consumer trends and worked with local manufacturers and suppliers that are eager to adapt their products.

c) Launching more energy-related micro-businesses with energy corporation's The objective has always been to form a regional energy consortium to promote and aid renewable energy initiatives. To promote entrepreneurship, we engage with as many industries as possible. We are working with various local governments on this issue. Project Head at TERI, LaBL, A rural businessman developed the central solar charging stations (SCS) micro-solar enterprise. Solar lights may be charged concurrently using the SCS, which has PV modules and electrical connections with multiple ports. Residents may rent solar lights from local businesses for a modest cost to improve night vision. Using solar PV modules, the SCS charges the lighting battery. To prepare Shubha for his rental business, local businesses charge lanterns after dark. Business owners manage the micro-solar enterprise, while households pay to a pooled fund to maintain the SCS and solar lights. TERI trained entrepreneurs to manage and run the SCS long-term. The client and service provider win with this Campaign.

TERI University and partners provide training. Flagbearers may build energy entrepreneur training courses. In these classes, students learn how to use technology to launch a side business and generate money. This shot shows numerous women spinning silk at night using solar lights. Just a regular power plant. LaBL employees often visit RETs to assess their well-being and treatment. Women utilize these lamps to cook, aid their husbands with grame panchayat paperwork, and help their children with academics when they're not working.After investigating several homes, TERI discovered that some had many solar RETs and recognized their purpose.

5.10.3 SUPPORT FOR SOLAR-BASED ENTREPRENEURSHIP: A THEORETICAL ANALYSIS

Table 5.4: The TERI data analysis framework

Patterns and effects of interaction	CODES	THEMES
In collaboration with the Minnesota Department of Natural Resources and neighborhood organizations	1. Joint efforts with public organizations at regional and national levels 2. Incorporating an Energy Entrepreneur	Partnership between public and private members
By partnering with banks and supporting clients after purchases	1. Collaborating with Banking Organizations 2. Accessible financing right at the front door for startup owners 3. Getting people out of poverty and onto a path to success 4. Developing Multi-Scale Knowledge Partnerships 5. Faster after-sale service and continued connection with customers	**Loans for solar-related start-ups, plus partnering with experts in the field**
Involving energy entrepreneurs in the process of creating new	1. Collaboration with thought leaders in academia and business to	**Collaboration at multiple levels, and keeping tabs on how well businesses**

energy-based small businesses.	advance education and knowledge transfer 2. Keeping an eye on how RETs are being put to use so that their original intent isn't compromised	**are doing**

(Source: Author's compilation)

a) The public-private partnership, or PPP, In addition to collaborating with the MNRE and other government agencies, the findings in Table displaying themes from data analysis suggest that TERI works with corporate RE manufacturers and local community-based groups.

b) Different tiers of the partnership structure are in use. By using the aforementioned local connections and expertise, working with local groups helps a target rural area thrive. A development intervention is thereafter carried out by the RETs in collaboration with TERI.

c) Establishing knowledge partnerships and providing seed funding to solar firms, An innovative and practical concept, the torchbearer was born out of the LaBL project. These pioneers go out to the target locations, recruiting people from research organizations, college students, and local youths who are eager to volunteer in order to gather information from the businesses, which will then be sent to the TERI headquarters. Additionally, it is not uncommon for the flagbearers to support energy entrepreneurs in a certain area. While TERI did have partnerships with RRBs and NABARD in the past, they now run their own finance firm. A business owner receives cash compensation when they promote the use of a RET to launch a microbusiness. You may also take advantage of a door-to-door financing service. The TERI provides all of the aforementioned support to entrepreneurs. To further assist the businesses, local VOs and NGOs are always gathering data and consulting with experts in the field.In addition, they provide details on the ventures' operations and activities to TERI, which maintains a distant watch.

d) Business owners' performance reviews and multi-level partnerships, The TERI model has the potential to assist business owners in becoming more financially literate, starting

and growing a microenterprise, providing necessary door-to-door financing, and monitoring their progress with the support of LaBL trailblazers and community-based groups. There are a number of private and governmental sector partners that make this possible, especially for rural region energy business owners. All those different types of individuals working together make the unique delivery method work.

5.11 INTERPRETATION

Three organizations—SELCO, AIWC, and TERI—adopted three institutional frameworks to promote RE-based entrepreneurship in India. The IAD component of this study studied actors, interaction patterns, and outcomes as the theoretical model's three pillars. A topic analysis using inductive and deductive reasoning examined India's solar business strengths. The chapter concludes with several tips for solar entrepreneurs and shows that different organizational styles provide similar results. SELCO's private model has only private enterprises as partners, unlike AIWC and TERI's public-private and public-private-people models. The three things we looked at illuminated three organizational structures that support RE-based business and create a positive atmosphere.

In the table below, we compare and contrast the three organizations' institutional systems.

The institutional approach	**SELCO**	**AIWC**	**TERI**	**SIMILARITIES**	**DIFFERENCES**
Nature of collaboration	Building trust in networks, collaborating with local communities, and identifying unmet needs	Training and education through participation; simulation possibilities	Partnership between public and commercial sectors	YES	SELCO does not collaborate with the government.
A mechanism for funding	Access to start-up	Available funding for	Offering RE-based start-up	YES	While SELCO and

	capital for RETs and growing banking practices.	start-ups, business situation variables, and determining the right firm and geography.	finance and building knowledge partnerships.		AIWC do not offer institutional finance, they can assist you find one.
Development of business acumen	Quicker responses to customer complaints and increased rates of product innovation	Women restoring RETs, long-term assistance for female entrepreneurs	Collaboration at multiple levels, and keeping tabs on how well businesses are doing	*Yes*	*None*
Knowledge management	Facilitating communication between SELCO and its customers and receiving their comments to better meet their lighting needs	Entrepreneurs gaining self-sufficiency through education and information dissemination	Months of community education and preparation before introducing innovations and working with local partners and businesses.	YES	*NONE*

Table: Institutional arrangements of three organizations: similarities and differences
Source: Author compilation

In general, solar entrepreneurial ventures are encouraged by the good outcomes that come from multinested actor collaboration and engagement. It's worth noting that numerous organizations often need the same components, even though they produce similar (or, in most cases, identical) outcomes: companies that produce and distribute renewable technology, funding sources, regional partners, and public participation in project design. Partnerships and exchanges across sectors don't necessarily have the same fundamental

features, however. As an example, SELCO collaborates with the government and MNRE, in contrast to AIWC and TERI, who do not (see table above).

Solar business owners can get loans from AIWC and TERI through MNRE funding, but SELCO falls short of the mark; it merely connects business owners to regional nationalized and regional banks, rather than being a part of the financing model. It bears repeating that the three of them use identical overarching tactics. The process begins with cultivating and disseminating consciousness in the designated areas before moving on to the installation of solar panels, and it concludes with supporting and growing the solar business owners when their micro-enterprises are up and running. It would be beneficial for future and ongoing study to include both similarities and differences. Reason being, it would be fascinating to find out which configuration works best in certain locations over the long run, in addition to looking at the components of different configurations. To do this, it is necessary to compare and contrast the various institutional configurations shown in the table above.

CHAPTER-6

CONCLUSION

CHAPTER-6

CONCLUSION

6.1 INTRODUCTION

The objectives of this research were twofold: first, to identify the institutional mechanisms that foster an environment conducive to solar-based entrepreneurial endeavors that substantially contribute to rural development; and second, to examine the main possibilities and obstacles that agricultural entrepreneurs face when trying to implement solar technology. Part of this study's examination also included looking into how entrepreneurship contributes to progress in rural areas.

Key results and conclusions generated from this thesis, organized by objective measures, are presented in the following section.

6.2 FINDINGS FOR THE OBJECTIVES

Research Objective-1

The purpose of this study was to identify and analyze the factors that influence entrepreneurs' decisions to use solar energy in their businesses, specifically looking at the agricultural sector. Ten factors were chosen at random to achieve this goal. (1) Conciousness/Awareness; (2) Government policies(3) Solar Market Supplies; (4) Locals' Involvement; (5) Prior Knowledge; (6) Trust from Stakeholders; (7) User-Friendliness; (8)Easy to maintain;(9) Standard of Life; and (10) Other Businesses . The entrepreneur's openness to incorporating solar technology into their firm was determined by comparing these discovered factors among the respondents. According to the findings, solar technology adoption among entrepreneurs is significantly influenced by factors such as awareness, government directives, solar market suppliers, local residents' participation, experience, stakeholder trust, and the use of solar technology in daily life. Entrepreneurs' decisions to use solar technology are unaffected by trivial aspects such as living conditions, the influence of other business activities, and the comfort of maintenance options.

Research objectives-2

Examining the Performance of Entrepreneurial Firms was the primary emphasis under this aim. In this respect, the aforementioned literature informed the examination of these nine Key Performance Indicators (KPIs). First, revenue; second, net income; third, company expansion; fourth, service quality; fifth, customer satisfaction; sixth, staff satisfaction; seventh, the state of product innovation; eighth, the state of process innovation; and ninth, product quality,out of all the factors mentioned earlier, factors like sales, profits, service quality, customer satisfaction, product innovation, and product quality were determined to have a significant impact on the entrepreneurial firm's performance in the solar technology case. On the other hand, factors like business growth, employee satisfaction, and process innovation were determined to have no impact.

Research objectives-3

The purpose of this study was to examine the potential benefits and drawbacks of solar energy for business owners in the agricultural industry. Listed below are the difficulties that were discovered:- Advertising is nonexistent; Mini-grid policies at the federal or state level are necessary; Local levels of workforce are inadequate; Awareness is the most significant deficiency; Product Marketing to Specific Audiences; Expensive Initial Investment.

Listed below are some of the possibilities that emerged as a result of recognizing these challenges:-Creating Jobs; Smart Business Decisions; Sharing Information and Transferring Technology; Assisting Local Businesses in Making and Selling High- Quality Goods at Affordable Prices; Solar equipment as a means of subsistence and cost savings in residences, hotels, restaurants, dhabas, and other commercial establishments; heightened public interest leading to more sales; higher quality of life.

Research objectives-4

We set out to discover more about the institutional frameworks that might help solar-powered enterprises thrive, which in turn can help revitalize rural areas. In their efforts to encourage RE-based entrepreneurship in India, SELCO, AIWC, and TERI all took rather different tacks. We have compiled a list of factors that appeal to solar entrepreneurs, and the results provided by the different institutional frameworks are equivalent (refer to the table below). AIWC is a public-private collaboration, whereas TERI is a public-private partnership that includes individuals, and SELCO is a private model that solely includes private firms as partners. Last but not least, we learn from the institutions we looked at three different institutional configurations that contribute to an environment that is good for business and encourages entrepreneurship based on renewable energy.

Table 5.1: Table below shows institutional configurations for three organizations.

The institutional approach	SELCO	AIWC	TERI	Similarities	Differences
Nature of	Building trust in	Training and	Partnership between	*Yes*	SELCO does not

collaboration	networks, collaborating with local communities, and identifying unmet needs	education through participation; simulation possibilities	public and commercial sectors		collaborate with the government.
The funding mechanism	Developing banking practise, and the availability of startup capital for RETs businesses	Start-up capital, business context, firm selection, and regional particulars	Offering seed money for real estate-based businesses and connecting entrepreneurs with experts	*Yes*	*Neither SELCO nor AIWC has its own institutional financing options, but they can help you find one.*
Development of business acumen	Quicker responses to customer complaints and increased rates of product innovation	Women restoring RETs, long-term assistance for female entrepreneurs	Collaboration at multiple levels, and keeping tabs on how well businesses are doing	*Yes*	*None*
Knowledge management	Facilitating communication between SELCO and its customers and receiving their comments to better meet their lighting needs	Entrepreneurs gaining self-sufficiency through education and information dissemination	Months of community education and preparation before presenting technologies and collaborating with local partners; eventually, direct collaboration with businesses.	*Yes*	*None*

6.3 HYPOTHESIS TEST RESULTS AND CONCLUSION

The findings showed that entrepreneurs' solar knowledge strongly impacts solar product and technology uptake. Additionally, the statistical value (p =.017) supports it. This supports earlier findings by Snape and Rynikiewicz, who found that agents' adoption of photovoltaic systems predicted subsequent adoption rates and that there was a concentric pattern of higher adoption in areas with higher solar awareness and lower adoption in areas with lower solar awareness. Fischer and Sauter observed that friends and neighbours' awareness of solar technology is critical for investing in solar panels, showing that solar technology knowledge influences RE technology adoption. The opinions of loved ones influence a person's thoughts on regional replenishable energy projects. Another study interviewed hotel industry experts to determine what criteria influence EU SMEs' adoption of replenishable energy systems. Hotel Energy Solutions was the study. The research found that hotel SMEs are hesitant to employ RES technology due to two main issues: a lack of information about its benefits and a lack of awareness among local communities and regional authorities.Thus, this study and others show that awareness of solar technology's benefits greatly impacts its adoption. We concur H1a: Awareness of solar-powered goods and services' benefits helps expand solar power.

We then considered government directions. According to the study (p =.028), government regulations significantly effect solar energy use. Previous research have demonstrated that government policy strongly influences renewable energy use. Public opinion, poorly thought-out regulations, the NIMBY effect, and a lack of data on RETs' environmental and landscape implications may hinder renewable energy use. Policy can boost or slow RET growth. [59] This study and others support Hypothesis H1b: Governmental directions and regulations for solar energy equipment manufacture and consumer protection greatly effect solar technology uptake. The.005-significant factor supports this finding.

[59]Klick H, Smith E, US public knowledge and support for wind power, Replenishable energy, 35 (7), 1585–1591. 10.1016/j.renene.2009.11.028

Next was Solar Market Suppliers, whose statistical findings (p =.012) validated their influence on solar power's spread. In this regard, Mattes et al.[60]According to a 2012 European Manufacturing Survey report, solar market supply considerably affected German companies' adoption of replenishable energy solutions. This study's findings support earlier research' findings that solar energy suppliers have a considerable impact on solar power's spread (factor significant at.005). We agree with Hypothesis H1c that solar energy industry vendors impact solar technology adoption owing to accessories.

The next component, ―Participation of Residents of Local Area,‖ has a significant effect on solar energy intake (.005 levels, p =.010). According to past studies, Haslip et al.[61]Studies in Ireland and Denmark found that residents' involvement in community energy project conception and implementation influenced their support. Reinsberger and Posch found several reasons why Austrians use solar systems. Financial incentives and local community meetings are examples. This study confirms Hypothesis H1d: Local people' involvement in solar energy technology planning and implementation strongly affects solar technology adoption.

Founder experience was also significant (p =.011). This implies that entrepreneurs' experience substantially influences solar technology uptake. Feng previously discovered what factors most affect Taiwanese consumers' renewable energy aspirations. We polled 273 individuals on renewable energy. Rogers' Diffusion of Innovations, Technology Acceptance Model, and Theory of Reasoned Action supported the study. The study considered perceived usefulness (how much better the system is than what was previously used, the economic benefit to be gained, the accessibility and fulfilment for using it), subjective norm (friends and family influence), compatibility (the individual's past experiences and current demand), and perceived ease of use. Technology costs, risks,

[60]Mattes K, Müller S, Jäger A, Weidner N, Weißfloch U, The policy mix affects replenishable energy technology adoption and diffusion in manufacturing, Fraunhofer ISI, Karlsruhe, Working Paper Sustainability and Innovation, No. S6/2014. http://nbn-resolving.de/urn:nbn:de:0011-n-2942282 Accessed 15 September 2021

[61] P. Devine-Wright, editor. Critical review of public views and adoption of replenishable energy technology. Manchester University School of Environment and Development, Oxford Road, Manchester M13 9PL, UK, 2007. Beyond Nimbyism http://geography.exeter.ac.uk/deliverables/bn_wp1_4.pdf Accessed June 15, 2021

andrewards affect customer choices.We accept Hypothesis H1e: Entrepreneurs' prior experience with replenishable energy technology significantly affects their adoption of solar technology because our results are consistent with these earlier studies and our statistical findings imply that entrepreneurs' experiences do influence their decision.

Trust amongst stakeholders was also assessed and was statistically significant (p-value.003). This research shows that entrepreneurs choose solar power based on stakeholder trust. According to previous studies (Huijts et al.), trust among stakeholders is very essential in influencing people's intentions to support new sustainable energy technologies, along with attitude, societal norms, perceived behavioral control, and personal norm. The idea is that trust, procedural justice, distributive fairness, and the technology's costs, risks, and benefits affect people's opinions. Hypothesis H1f is accepted. We found that stakeholder trust greatly influences solar technology uptake, consistent with previous research.

Another factor examined was the statistical significance of solar technology in daily life/easiness to use (p =.011). This strongly suggests that entrepreneur's life-use of solar technology influences their solar power adoption. Chinese scientists concluded that clean fuel and stove adoption depends on ease of use and maintenance. Dincer (2011), who found that the ease of use of solar technology is a key determinant of adoption, especially in less technically sophisticated settings like rural and agricultural sectors. Balachandra et al. (2010) also highlighted that for solar technology to be widely adopted in developing regions, it must be user-friendly and adaptable to local needs. Hypothesis H1g accepted. Since this research confirms earlier studies and the statistical results support it, solar technology adoption is heavily influenced by its ease of use.

We then examined easy tomaintain, which was not significant (p =.940). Comfortable Maintenance does not influence entrepreneur's solar technology choices, according to this research. Shen et al. examined secondary sources.[62]researched what was needed to overcome obstacles and what might be done to encourage the use of clean cooking fuel

[62]Factors impacting the adoption and sustainable use of clean fuels and cookstoves in China: a Chinese literature analysis, Renewable and Sustainable Energy Reviews: 51 (2015):741-750. https://doi.org/10.1016/j.rser.2015.06.049

andstoves in China. A home's maintenance ease has a substantial impact on cooking stoves and clean fuels.Thus, these findings go counter to what Shen et al. found. Hansen et al. (2015), which suggested that low maintenance requirements of solar technology are a key benefit that encourages adoption. However, Nygaard and Hansen (2015) found that in some contexts, especially where maintenance services are unreliable or expensive, the ease of maintenance may not be enough to drive adoption We reject the null hypothesis (H1h) that the ease of maintenance of solar energy equipment has a substantial effect on the adoption of solar technology since our findings contradict those of prior studiesand because of the statistical results. Next, we have living standards, which did not have a statistically significant effect on solar energy adoption (factor insignificant at.005 levels), suggesting that solar power does not have a major influence on people's living standards.Kaundinya et al. (2009) noted that the perceived improvement in living conditions might vary depending on local economic conditions and the extent to which solar technology meets the specific needs of a community Adopting solar power does not lower people's living standards, according to Verbruggen et al.As a consequence, we can reject Hypothesis H1i: The contribution of solar energy sources to enhance living standards considerably influences the adoption of solar technology as our findings are consistent with those of earlier studies.

The impact of other businesses in the area does not seem to have a significant effect on the entrepreneurs' decision to use solar technology, as indicated by the results of the Impact of other commercial activity factor, which was also statistically insignificant (p =.675).Painuly (2009) suggested that this influence may be more pronounced in urban or industrial contexts, where competition and business interdependence are stronger, while in rural or agricultural settings, this effect may be weaker.Ng'eno[63]ran a study amongst homeowners to find out why they don't use solar power in their homes. Residential solar energy adoption is unaffected by the existence of nearby enterprises, the research found. Since the results of this study are in line with those of previous research, we may conclude that entrepreneurs are not much encouraged to embrace solar technology due to the impact of other local businesses.

[63]Factors affecting domestic solar power uptake in Kajiado County, Kenya. MA Research Thesis in Project Planning and Management, University of Nairobi, Kenya, 2014.

Research Objectives-2:

Examining the Performance of Entrepreneurial Firms was the primary emphasis under this aim. Using the aforementioned literature as a guide, we looked at the following 9 KPIs in this context.

1. Revenue

2. The Total Amount Made / Overall Profitability

3. Expansion of the Firm

4. Service Quality

5. Customer Satisfaction Level

6. Employee Satisfaction Level

7. Product innovation Status

8. Process innovation Status

9. Product Quality

The regression analysis revealed the following factors as the most critical determinants of solar technology company success.

Revenues (p =.016)

These results indicate that the company's sales performance was positively impacted by its collaboration with solar technology-based goods and processes. (at the.005 level, the factor is significant) hence, H2a: Solar technology-based product adoption significantly affects sales growth is acknowledged.

Earnings (p =.000)

Businesses that invest in solar energy probably enjoy a growth in profits, which boosts their overall performance (factor significant at the.05 level). It is well acknowledged that

the adoption of items based on solar technology significantly affects profit growth. **Quality of Service (p =.025)**

Based on these results, it seems that solar-powered businesses have significantly improved their product quality and, therefore, their bottom line. (substantial at the.005 level), we agree H2d: Products based on solar technology have a considerable influence on service quality.

Satisfaction of Customers (p =.000)

The results show that the businesses have done a good job of raising customer happiness in this area generally. H2e: Products based on solar technology significantly affect consumer satisfaction (factor significant at.005 levels).

New Product Development (p =.000)

This suggests that solar technology companies have considerably improved their product development procedures, leading to better business success. (at.005), therefore H2g: Solar technology-based product adoption greatly affects product innovation is accepted.

The quality of the product (p =.000)

Companies in the solar technology sector have seen an uptick in performance as a result of higher-quality products, the research shows. Since the factor is substantial at the.005 level, we accept H2i: Products based on solar technology have a considerable influence on product quality.

Things that don't really matter for solar tech companies' bottom lines are these. **Company Expansion (p =.980)**

There was determined to be no discernible impact on the features of company growth in this sector. (at the.005 level, the component is not significant), so, we reject H2c: Products based on solar technology have a major influence on company growth. **Employee Satisfaction (p =.057)**

Companies in this sector shouldn't stress too much about employee satisfaction, if the numbers are to be believed. (at the.005 level, the factor is not significant). hence, we reject H2f: Products based on solar technology have a major influence on employee satisfaction.

Processes Innovation (p = 508.)

It seems from the results that process innovation is hit hard. This leads us to reject H2h: There is no substantial influence of solar technology adoption on process innovation (factor not significant at.005 levels).

6.4 Solar-based entrepreneurship performance factors

All three groups prioritize entrepreneurs evaluating and interacting at multiple levels. Energy entrepreneurs receive complete support from SELCO through stakeholder participation and institutional mechanisms. SELCO works with NGOs, social entrepreneurs, regional banks, and others. All stakeholders contribute to the firm's flawless operation and service to consumers and rural company owners. Thus, they are indirect and direct stakeholders. Each segment is responsible for a different set of deliverables, yet they all work together to create the client-facing product. Thus, these arrangements may show that actors can cooperate to achieve a goal even when they have distinct situations and make different judgments.

Along with one emergency call per year, SELCO guarantees system checks to ensure proper use. This information could revolutionize how we track and evaluate technologies and quantify solar RET efficiency. Remember that no SELCO local branch is more than 30 kilometers from a customer's home or office. Instead than visiting people's homes, they should figure out the problem and find a solution. This group is notable for solving 80% of issues and 65% of client inquiries in 24 hours. While functioning, effectiveness is high. These components' presence determines Companies that lease solar lights, lanterns, or home lighting systems operate daily and have a cash flow problem, thus RE entrepreneurs are urged to develop their own enterprises. The Entrepreneurship Research Institute (TERI) tracks and evaluates local company growth with community organizations. TERI receives monitoring reports and takes action if needed. TERI's

LaBL team visits the office to teach owners and personnel about business incubation. AIWC stays in touch with female business owners year-round, whether they're just starting out or have a team. The AIWC selects a few young women to pilot new technology. These ladies learn business and technology to start their own microbusiness. The initiative will have long-term academic and social effects. It empowers local entrepreneurs and helps women and youth start microbusinesses. Stable, long-term ties with local suppliers allow SELCO to customize product designs and manufacturing and develop new product ideas. Local organizations pick SELCO for repairs and technical assistance due to its highly qualified, educated, and business-savvy team. Staff usually handle issues quickly. Less risk, shorter wait periods, and lower operation costs are possible benefits. Second, research institutes and new solar energy enterprises should have ties. Whether they lease or buy solar RETs, solar energy startups need finance. Due to its preference not to pay clients directly, SELCO has strong partnerships with rural regional banks, credit cooperatives, and microfinance institutions. If SELCO's business owners need a loan or unique technology, they may rest assured that the firm has solid contacts with local banks and credit cooperative societies. If they have good relationships with banks, micro-businesses who use SELCO's solar solutions to grow may enhance their creditworthiness and get better treatment. This will help in personal and professional interactions throughout travel. With SELCO's weekly or daily payback programs, business owners can learn good money and credit habits. The MNRE allows banks and microfinance institutions to contact TERI for startup capital. Solar RETs cost 30% less after MNRE subsidies, leaving 70% for entrepreneurs to pay or borrow. Funding comes from TERI. To contrast, AIWC offers two finance streams. IREDA funds RETs for enterprise delivery or project demonstrations. Microfinance institutions (MFIs) provide entrepreneurs with startup funds and ongoing financial monitoring. These microfinance organizations offer various repayment choices and money management courses with AIWC. Entrepreneurs in the real estate industry need this knowledge. As shown by the fieldwork earlier in the chapter, opportunities to share information and build capacity are second. To expand into new markets, AIWC and TERI work closely with vocation groups and NGOs. AIWC prioritizes semi-urban areas, while TERI prioritizes rural ones. Both groups have collaborated with local NGOs, financial institutions, and professionals

to provide training, money, and oversight for new solar-based businesses. Their efforts have saved rural entrepreneurs' knowledge, financing, and people to start their firms. NGOs and nonprofits have helped rural areas understand AIWC technology and its benefits. Non-governmental organizations (NGOs) have assessed each household's needs, shown people how to use the techniques at the local level, gotten society's thoughts on the technologies' pros and cons (which could make development more urgent), and taught people how to maintain and repair the technologies with the AIWC's communities. All of these issues affect business owners' stability and assurance. A major loan source for SELCO is Gujarat's self-employed women's organization (SEWA), which helps the cooperative serve rural customers. Knowledge exchange, regular feedback loops, and strong user-provider integration increase SELCO's relationships with firm owners whose livelihoods depend on the technology. In addition to these practical benefits, entrepreneurs provide SELCO with trust as stakeholders and information providers.

Consider local circumstances and situational business factors—they're crucial. Partners' expertise exchange improves aid initiatives. AIWC case studies suggest that high technical standards may hinder program efficacy. Government plans to create gobar gas plants failed due to lack of training and participation. Research shows that technology from one field can be used in another. Solar cookers and battery chargers were among the AIWC-funded projects to help women and adolescents run their own enterprises without government intrusion. Giving unemployed women and youth solar design training could help them start a service division, find work, and help their communities with electricity. Local partners and regional NGOs helped these adolescents and women acquire specialized training. These community members have been competent associates for the training programs of a social firm that provides solar energy solutions and services to boost rural economic and job prospects.

Solar cooking demonstrations and renewable technology installation, maintenance, and servicing have long been part of AIWC's technical exposition. Participants and their communities benefited from the programs. They moved from consumers to champions. In these programs, women discussed how to use government services to help their daily

struggles. After starting their businesses, these women can mend and maintain solar RETs. The AIWC's training sessions and technical plan evaluated their knowledge and understanding, giving them confidence. Technical expertise and consumer trust are essential to running a solar-powered microbusiness, and TERI provides this environment. The second factor is public-private collaborative structures like TERI and AIWC. AIWC and TERI work closely with governments, particularly MNRE, as nodal and knowledge partner institutions, respectively, but SELCO India's Principal Analyst believes the government should keep out of our business.

To receive the 30% government subsidy, SELCO must cooperate with village authorities and panchayats. However, by dealing with the industry in their own way and saving time on paperwork and administrative costs, the firm gains efficiency. In addition to policymaking, TERI conceptualizes the MNRE's subsidy-driven strategy. However, AIWC's experience and role as the Ministry's lead agency for RET distribution to women give it the largest reach. Instead of focusing on growth, SELCO aims to set up regional SELCOs in line with the needs of the specified regions with the help of a local organization (such as Onergy in West Bengal, which is SELCO-modeled). TERI and AIWC collaborate with people they aim to serve, companies they support, and other public and private sector partners. Public-private partnerships involve government agencies, commercial RETs producers and distributors, neighborhood groups, philanthropic organizations, and ambitious individuals. Sharing information, strengthening skills, and building institutions are stressed. This partnership approach may impact entrepreneurship since enterprises can establish a regular communication and feedback loop for development with their institutions and suppliers, RETs. This study examines what led to so many rural entrepreneurs and their profound intellectual and social effects, not the three schools.

6.5 Impact of solar-based entrepreneurship on rural development

Solar firms' success and impact on rural development in India are the subject of this section. Starting with the OECD/EUROSTAT framework, researchers may assess entrepreneurs' performance in rural development. We use a systematic topic analysis to analyze how solar energy entrepreneurs have affected rural lifestyles and community

development. Each group was evaluated based on solar-powered business owners' effectiveness and a theme analysis of how these firms promoted rural growth. This study seeks to evaluate several renewable energy entrepreneurial initiatives in India. The conceptual framework (diagram below) for this study draws on the OECD/EUROSTAT framework and another framework to better comprehend the research challenges. The exploratory research design was informed by this study's conceptual framework and qualitative approach, which used key informants, observational methods, and interviews. Since my research was qualitative, the theoretical model (Figure below) helped me choose early codes to develop themes following analysis.

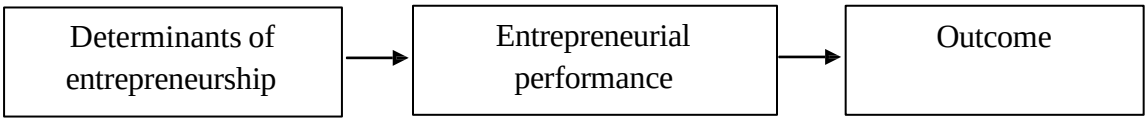


Figure: The conceptual framework

6.6 SOLAR BASED ENTREPRENEURIAL PERFORMANCE

My initial interest in TERI's energy entrepreneur idea sprang from a desire to expand my knowledge beyond solar system maintenance to include the acquisition and distribution of solar goods to end users. TERI-LaBL, a businessman in the solar industry Considering everything that has been mentioned, it is evident that our entrepreneurial friend took full advantage of the opportunity presented to him by LaBL. He successfully advertised his products within the neighborhood, created a workable business strategy, and was ready to handle the societal and intellectual fallout of his decisions. These initiatives, however, did not happen by accident; rather, TERI had to roll out long-term public education campaigns to present the concept that solar firms may provide revenue for people and communities. The community and prospective businesses were first exposed to solar RETs when TERI and VOs worked together to raise awareness. When interacting with the communities on a daily basis, the natives running these NGOs have an advantage. They discuss the changes that occur after making the transition to solar RETs at frequent, informal gatherings. Once the community has a basic grasp of RETs and circumstances are favorable, TERI starts engaging with the targeted entrepreneurs and arrives on the ground with the proper equipment, including solar

lanterns, lamps, and home lighting systems. Even if this is still background, the comment indicates how an entrepreneur thinks and behaves after their firm has established a solid place in the market.

Gaining a contract to install solar street lights via UP-NEDA is just one of many new opportunities that have arisen since becoming an energy business. I am grateful to TERI for their help in this matter, and my team has been diligently working to install 400 lights since January 2018. I make 600 rupees for every light that is sold. I have twelve people working for me under my domain right now since my company is booming, and I really think it's helping me build and light up more homes. I have made one hundred thousand rupees as an energy entrepreneur since I joined TERI. Not only am I able to assist other people out, but I am also able to provide for my own family. Solar entrepreneur TERI-LaBL

The fact that this respondent ordered and installed so many units so quickly shows that a rural micro company might be anything from a few to several hundreds. His yearly return is really large, particularly given his location; this shows that micro-companies using solar RETs don't always need to be little or limited to one area to be lucrative. Here, we look at models that are large and cover a lot of ground. With institutional support, this is considered less of a challenge, as certain projects wouldn't even be considered without it. We can provide entrepreneurs with more than simply assistance by teaming up with other groups to open doors to new markets. This gives them hope for the future of their enterprises and increases the potential of their ventures.

The company owner has helped many community members become financially independent in addition to his marketing skills. The thesis's literature review explains how energy entrepreneurship can affect individuals and society. As indicated in the research study, formal institutions often overlook rural word-of-mouth marketing. This thesis proves SELCO and TERI know. Most places have used this technology successfully without spending money on other marketing methods. At this level, local knowledge and advice are quite effective. However, this businessman took the chance and the community supported him. In addition to promoting the local solar power industry, he has hired locals. Employees and consumers share a market, which is

intriguing. The neighborhood has benefited from the entrepreneur's marketing, business modeling, concept generation, local recruitment, and community revenue generating. People have participated, and their consistency bodes well for the business's future. This and other studies suggest that women are more likely to work in groups in community-based vocational programs. Along with others, solar RETs can enable women to spread entrepreneurial spirit in a community. This may benefit a rural town in the long run. Second, Kanika, the businesswoman, claimed that the entrepreneurs are more confident and sharing their information with other women in their community to assist them succeed. The research in Chapter 2 of this thesis suggests describing rural development through a community development lens. The solar lamp helmetboosts women's confidence. Kerosene reduction has reduced health issues. According to the energy entrepreneur from AIWC in Noida, these innovations provide rural families a new source of income and health benefits. Solar alternatives considerably reduce the health risks of cooking with kerosene, as addressed in the thesis. Importantly, these business owners are well-informed about the benefits of these technologies and regard them as a benefit, not an extra.

Hofstede's cultural dimensions (2007) and women's attributes show that women prefer working together for society's good. Working in a team encourages women to launch their own enterprises, which benefits everyone in the long term. The fact that most female entrepreneurs worked in teams, unlike most male entrepreneurs, may support this notion. AIWC's female entrepreneurs' data strengthened the case. This case study shows a small and medium-sized firm (SME) run by a man and a woman with similar household assets. The woman lacked the man's economic skills at first, but her goals were more important eventually. Encourage youngsters to finish school to help a family leave an underdeveloped location. She wanted her children to go to school, unlike the men who expected their children to work in factories or at home. Women stay in suburban or rural areas where they feel safer and can get help. Looking at the bottom line, the male counterpart may win in the short term. The case study shows that women are better managers, especially in supervisory jobs. Second, unlike men, women are more likely to recruit other women in the area to help them operate their businesses or maintain their property's cropping pattern. They also lease the property instead of managing it.

By engaging youngsters, I've helped over 20 houses survive. TERI's selection of Sonitpur's successful LaBL businesses makes me proud. I brighten the community with my solar charging station. Doing so meets residents' domestic lighting needs and illuminates important community events, cultural celebrations, and weddings in my town and nearby locations. Female TERI-LaBL entrepreneur from New Delhi Energy entrepreneurs employ innovative technologies to make money for their home or business and improve society. Encourages social interaction and civic consciousness. In rural communities, cultural and social events bring families together and encourage consolidation. This case study from the businesswoman's interview shows replenishable energy's benefits. Readers must grasp this concept. The issue centers on the fact that these activities teach people about solar technology's benefits. These trips help people bond, leading to the term ―social capital.‖ As said, word-of-mouth advertising is powerful; research shows that households gradually adopt solar systems after hearing about their many benefits from current users. Since I distribute lamps to forty homes, my monthly income has increased by Rs. 1600. Even for a low rent, I'd do the work. We can easily explain why. Last summer, my fellow villagers and I trained to safeguard crops from wild animals and extend the harvest window until sundown. Solar entrepreneur from LaBL-TERI, New Delhi A fresh and exciting technical use unconnected to business or home is found here. Each of the 20–40 homes served by solar-powered firms likely uses solar energy for personal or professional purposes. Micro-firms give businesses a stable base to establish their name and money, and receivers enjoy the various benefits of solar light. Innovative farmers utilize solar lights to deter animals from entering crops. This article describes the different uses of this technology and how entrepreneurs' ideas help the supplier and proponent produce new products. I made 5,000 rupees more without crop protection. My revenue has increased enough for me to produce cashews and turmeric on the same area, expanding my agricultural. The village development commitment gathering was lit only by the solar lantern because the kerosene lamp is inaccessible at night. Even though Solar Charging station rental revenue is small, the solar lighting have helped enhance my income. The lights helped myself and other inhabitants adopt new lifestyles. Solar entrepreneur, LaBL-TERI, New Delhi This conversation covered technology management, microbusiness management, and

solar power's practical and intangible benefits in lessening people's fear of wild animals. The survey also revealed that solar technology keeps wild animals away from nocturnal communities and markets. It is noteworthy that all of these solar technologies are employed to create energy or power small businesses, as proved by experiments. The cooperative nature of these activities suggests that the villagers' cultural adoption of this technology will increase their social capital. Despite their educational value, these features are typically neglected. Based on the previous section's focus on the solar lantern's versatility, this application may be a profitable endeavor. After 6 or 7 p.m., solar light prevents animals from damaging crops. while the area is dark. The entrepreneur also found new ways to diversify his farming business, which considerably improved his financial prospects. Finally, an entrepreneur who acknowledges the solar business's relevance for his livelihood's success and recuperation is a good sign. The research and case studies described above occasionally overlook these solar company elements; the thesis makes another essential addition.

Almost everyone who has used a lantern likes its light. I used to struggle with patients with kerosene candles, but now I feel comfortable doing it, remarked a local doctor who runs a small clinic. I observed a group of solar-lit fishermen on my nightly town promenade. They appreciated the ease of life. Living on boats makes night fishing easier. LaBL-TERI, New Delhi, solar entrepreneur, Fish are hard to catch due to their slow fall rate and sun light intensity. However, they solve this difficulty by covering the light with a towel while reeling in fish. Their cheerful outlook and RET knowledge are clear. According to case studies in interviews and secondary information from AIWC, women lead and operate replenishable energy (RE) startups that have emerged from public- private partnerships (PPPs) in addition to producing, maintaining, and selling solar energy technologies.

At community haats and local expos in my town, I may make and sell finished products to other women and clients instead of buying them from AIWC or an NGO. During AIWC's RE Awareness week, a training team taught me how to make them with the right materials and methods. (New Delhi's AIWC Women Entrepreneurs) This appears to demonstrate their self-confidence in extending their business knowledge and operations.

It also shows rural women's undervalued absorbing potential. This shows that AIWC's training teams with university and scientific organization academic and technical groups are beneficial. Most organizational models, like SELCO and AIWC, feature incubation centers and information exchange, but no strategies to scale up functional expansion. SELCO and AIWC have had great success with them.

Before concluding, let's remind the reader how well the results above match the OECD/EUROSTAT model. This graphic shows the relationship and connection, demonstrating two points: first, the results' character and theoretical validity, and second, the theoretical framework's relevance to social enterprises and for-profit firms.

Recommendations and Implications of the Study:

1. Government Incentives and Policy Support:

Provide Financial Incentives: Financial schemes, subsidies, and low-interest loans can help reduce initial costs for entrepreneurs adopting solar technology. The government should also consider providing tax breaks or accelerated depreciation to encourage adoption.

Streamline Regulatory Processes: Simplifying the approval processes for setting up solar installations can help entrepreneurs avoid bureaucratic delays and reduce uncertainty.

2. Capacity Building and Training:

Skills Development: Invest in training programs to equip entrepreneurs with the technical know-how to install, maintain, and optimize solar systems. This will help improve adoption and reduce dependency on external expertise.

Awareness Programs: Promote awareness regarding the long-term benefits of solar energy, including cost savings, environmental impact, and energy independence, through workshops, media, and industry events.

3. Improved Financing Mechanisms:

Facilitate Access to Credit: Many entrepreneurs face difficulties accessing capital for adopting solar technology. Creating dedicated funding channels, such as venture capital or green bonds, can help them finance their solar investments.

Pay-As-You-Go (PAYG) Models: Encourage innovative financing models, such as PAYG, where entrepreneurs can pay for solar installations in installments. This reduces upfront costs and makes it easier for small businesses to adopt solar solutions.

4. Collaboration with Private Sector and Startups:

Partnerships with Solar Startups: Collaborate with solar technology startups to develop customized solutions for small and medium-sized enterprises (SMEs) that address their specific energy needs.

Research and Development (R&D) Support: Encourage innovation in solar technology that focuses on cost-effective and efficient solutions tailored for small-scale businesses in rural and urban areas.

5. Infrastructure and Grid Support:

Strengthen Grid Connectivity: Improve grid infrastructure in rural areas to support the integration of solar power systems. This can ensure a reliable backup for solar power generation and promote hybrid energy systems.

Energy Storage Solutions: Encourage the development and adoption of affordable energy storage systems that can help entrepreneurs store solar power during the day and use it during the night or during periods of high demand.

6. Market Development and Demand Creation:

Develop Solar Ecosystems: Encourage businesses to create solar-powered value chains, such as solar-powered cold storage for agriculture or solar-run factories, which can benefit from cost savings and contribute to environmental sustainability.

.Public Procurement for Solar: The government can lead by example by adopting solar

technologies in its public sector operations and providing bulk procurement to lower costs and incentivize entrepreneurs.

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Implications:

1.Economic Growth and Job Creation: Adoption of solar technology by entrepreneurs can lead to job creation in solar manufacturing, installation, maintenance, and support services. It can also stimulate local economies, particularly in rural areas, by providing a stable, renewable source of energy.

2.Energy Security and Independence: Widespread solar adoption can reduce India's dependency on fossil fuel imports, leading to greater energy security and long-term cost savings. Entrepreneurs, especially in remote areas, can become energy self-sufficient, which can stabilize their operations and reduce energy costs.

3.Environmental Sustainability: Solar technology adoption contributes significantly to reducing greenhouse gas emissions. If a large number of entrepreneurs adopt solar energy, it can play a key role in meeting India's climate targets under international agreements like the Paris Accord.

4.Technological Innovation and Scaling: The entrepreneurial adoption of solar technology can drive innovation and scaling in renewable energy solutions. By integrating solar technology into their operations, entrepreneurs can create new business models, such as solar-powered products or services, that disrupt traditional industries.

5.Inclusivity and Socio-Economic Benefits: The adoption of solar technology by entrepreneurs, particularly in underserved rural areas, can help bridge the energy access gap, enhance livelihoods, and improve the quality of life. Entrepreneurs who adopt solar can also serve as role models for their communities, encouraging wider adoption.

6.Challenges of Adoption: Despite the potential benefits, the study may reveal challenges such as high upfront costs, lack of awareness, inadequate financing options, and technical

barriers. Entrepreneurs may also face difficulties in educating and convincing customers about the advantages of solar energy, which could limit the scalability of solar adoption.

6.7 LIMITATIONS AND FUTURE RESEARCH

Institutional structures in different regions of India may differ in structure, substance, and impact on solar firms; however, I was unable to investigate these variations because of the study's narrow focus and time limitations. Three groups have been studied thoroughly to find out more about how current laws were made and how solar RE-based enterprises have been helped.

If we want to know which institutional framework is best for boosting solar businesses, we need compare and contrast the ones that were the subject of this research. Ignoring the possibility of scientific advancements, this would have consequences for policy. By keeping tabs on several businesses and talking to their owners, researchers might learn more about the ripple effects of solar-powered entrepreneurship. This would be helpful in understanding the interaction between several factors that affect entrepreneurship and in identifying the circumstances in which each factor is most important. More research is required to investigate the gaps shown by this study, taking into consideration the results of the quantitative and thematic analyses as well as the enhanced conceptual framework. In order to examine micro-scale solar firms, this thesis's theoretical underpinnings may be expanded to include the qualities described and described above. To further our knowledge of the structure and composition of diverse players working together toward a common objective, future research should delve more deeply into the nature of partnerships. A thorough examination of the initiatives and activities carried out by entrepreneurs and the results generated by various institutional structures is essential.

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APPENDIX

APPENDIX

APPENDIX-1: QUESTIONNAIREEXAMINING DETERMINANTS OF ENTREPRENEURSHIP

Do you agree that determinants of entrepreneurship in the context of solar technology significantly impact its adoption in the agriculture sector?

Strongly agree – SA; Agree – A; Neutral – N; Disagree – D; Strongly Disagree - SD

A-1: CONSCIOUSNESS ABOUT REPLENISHABLE ENERGY TECHNOLOGY

	SD (1)	D (2)	N (3)	A (4)	SA (5)
Do you agree that promotional initiatives or programs by the government in relation to solar technology adoption benefits made you aware about its benefits?					
Did the training programs which you attended before adopting solar technology made you aware about its benefits?					
Did the prior knowledge/experience which you had of solar technology made you aware about solar technology?					

A-2: PROPER GOVERNMENTAL DIRECTIVES AND STANDARDS FOR SOLAR ENERGY EQUIPMENT PRODUCTION AND CONSUMER PROTECTION

	SD (1)	D (2)	N (3)	A (4)	SA (5)
Do you agree that the Governmental directives and schemes in relation to solar technology help in providing financial stability to its adopters?					
Do you agree that the Governmental directives and schemes in relation to solar technology help in reducing illiteracy amongst its adopters?					
Do you agree that the Governmental directives and schemes in relation to solar technology help in reducing					

social vulnerability amongst its adopters?					

A-3: Developing a solar energy market with the necessary accessories

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that solar energy market suppliers are **Easily Available** at your location?					
Do you agree that solar energy market suppliers provide materials at a reasonable **Price**?					
Do you agree that solar energy market suppliers provide materials of a decent **Quality**?					

A-4: Local residents' participation in solar energy technology planning and implementation

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that Participation of residents of local area in solar energy technologies improves **Economic Growth** of the region?					
Do you agree that Participation of residents of local area in solar energy technologies improves **Social Growth** of the region?					
Do you agree that Participation of residents of local area in solar energy technologies improves **Educational Growth** of the region?					

A-5: PREVIOUS EXPERIENCE OF USING SOLAR ENERGY TECHNOLOGY

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that having experience in solar energy helps in identifying its **EnvironmentalBenefits**?					
Do you agree that having experience in					

solar energy helps in promoting its **Sales**?					
Do you agree that having experience in solar energy usage helps in promoting **Business Profitability**?					

A-6: Regulators and owners of solar energy technology are trusted by stakeholders.

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree Stakeholders Trust improves **Sales**?					
Do you agree Stakeholders Trust improves **Business Growth**?					
Do you agree Stakeholders Trust improves **Overall Growth**?					

A-7: IF IT MAKES LIFE EASIER FOR ME

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that solar powered products are **Easy To Use**?					
Do you agree that solar powered products have made day-to-day life **Easier**?					
Do you agree that solar powered products have made world more **Accessible**?					

A-8: If it's easy to use and maintain

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree solar energy equipments have reasonable **Running Cost?**					
Do you agree solar energy equipments have reasonable **Repair Cost?**					
Do you agree solar energy equipments have reasonable overall **Maintenance**					

Cost?					

A-9: IF IT IMPROVES JOB QUALITY AND LIVING STANDARDS

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that adoption of solar energy sources reduces energy bill?					
Do you agree that solar energy sources are Applicable Everywhere?					
Do you agree that adoption of solar energy sources helps in job creation?					

A-10: Other local commercial activity will encourage my business to adopt renewable energy technologies.

	SD (1)	**D (2)**	**N (3)**	**A (4)**	**SA (5)**
Do you agree that the presence of other business units in your area help in reducing operational cost?					
Do you agree that the presence of other business units in your area helps in ensuring better infrastructural facilities?					
Do you agree that the presence of other business units in your area helps in improving overall competitiveness of the business?					

APPENDIX-2:QUESTIONNAIRE-2: INVESTIGATING ENTREPRENEURIAL FIRM PERFORMANCE

Do you agree that the adoption of solar technology based products in the enterprise significantly impacts the firm performance determined through key performance indicators (KPIs) in the agriculture sector?

Following are some questions about the relative performance of your organization. Please compare your organization with your industry average to rate your organization on following parameters					
Does your company's solar technology-based product uptake increase sales?	**SD**	**D**	**N**	**A**	**SA**
Does using solar technology-based items in your business increase profits?					
Do you think your business grew quickly after adopting solar technology-based products?					
Do you think solar technology-based items have enhanced your company's service quality?					
Do you think solar technology-based goods have improved customer satisfaction in your company?					
Does solar technology-based product uptake boost employee satisfaction in your company?					
Do you think solar technology-based goods have increased product innovation in your company?					
Do you think solar technology-based goods have improved process innovation in your business?					
Do you think solar technology-based products have improved product quality in your business?					

Appendix-3

QUESTIONNNAIRE-3: ASSESS SOLAR TECHNOLOGY ADOPTION OPPORTUNITIES AND CHALLENGES AND UNDERSTAND INSTITUTIONAL ARRANGEMENTS

1. What is your opinion and understanding of the MNRE's current SET segment priorities, the involvement of various outside players in the sustainable market, and the numerous benefits it offers to entrepreneurs who utilize the RETs to create microbusinesses that generate revenue?

2. What kinds of institutional support are offered to entrepreneurs based in SETs?

3. How do these systems operate (feel free to express criticism of these models)?

4. Would you kindly use any case, example, or case study references?

5. When do you consider a SETs intervention in a given area to have been successful?

6. What does success mean to you?

7. What long-term effects do these interventions have on rural development?

8. Do you believe that these programs and supports are cost-effective and can be sustained for the same reason, considering the various cost layers involved?

9. To what extent does research help India's Solar Renewable Energy Application Planning?

10. Do universities work with SREDA, the MNRE, or other renewable energy companies?

11. Considering that the MNRE is at the top of the renewable energy market, what are the elements that encourage the creation of public-private partnerships?