Challenges and opportunities for renewable energy cooperatives through the lens of the social business model: Cases from India and the Netherland

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Master in Environmental and Energy Management [2018-2019]

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Keywords: Renewable energy cooperatives, business model, the Netherlands, India, social enterprises

ABSTRACT

In the context of the slowly progressing energy transition, several renewable energy initiatives have been emerging in India and The Netherlands. These initiatives are an alternative model of the global energy transition. This thesis work analyses an existing business models and the new business models that are leading to different multi-scale transitions towards low-energy societies. It examines several different cases from India and The Netherlands. The focus of the study is renewable energy cooperatives. The approach is to gather qualitative data from six different cases from India and The Netherlands. The theoretical framework of business model canvas coupled with elements of social entrepreneurship is used to analyse an existing and new business models. The comparative analysis is aimed for cross-learning opportunities.

ACKNOWLEDGEMENTS

While working on environmental documentaries in India I always missed important dimensions of climate change. In my quest of exploring more about citizen participation in energy transition, MEEM blessed me with this opportunity. It was a challenging and enriching journey.

Foremost, I would like to express my sincere gratitude to my supervisor Dr. Frans H.J.M. Coenen for his continuous support and motivation. Whenever I lost the track during this period his insights made me to focus on the most important factors. I would also like to thank my second supervisor Dr. Maarten J. Arentsen for suggestions.

I would like to extend my humble gratitude to all the cooperatives involved in this research. It was undoubtedly an inspiring to get to know about how citizen participation can accelerate the energy transition.

I would like to give special thanks to Dr. Suyash Jolly and Dr. Beau Warbroek who shared thoughts and remarks. I am highly obliged in taking the opportunity to thank my peers and professors from diverse backgrounds who boosted my lateral thinking ability. I also acknowledge with a deep sense of reverence, my gratitude towards my beloved parents for their continuous encouragement, understanding and endless faith in me. I would like to thank Sayali Shetye for her painstaking efforts to proofread the drafts. I am eagerly looking forward to work in renewable energy field and try to deviate from traditional consumption path into sustainable use of resources for the future.

TABLE OF CONTENTS

TABLES

FIGURES

LIST OF ABBRIVIETIONS

CE Community Energy
CSR Corporate Social Responsibility
ICA International Cooperative alliance
ICEF India Canada Environmental facility
IEA International Energy Agency
IWMI International Water Management Institute
LEDeG Ladakh Ecological Development Group
MNRE Ministry of renewable energy
PPA Power Purchase Agreement
REC Renewable Energy Cooperative
REDCO Renewable Energy Development Cooperative
SDE+ Stimulering Duurzame Energieproductie
SDG Sustainable Development Goal
SE Social Entrepreneurship
SPICE Solar Pump Irrigator's Cooperative Enterprise

1. INTRODUCTION

1.1. Background

'The Global-UN COP24 Climate Conference' was held in Katowice, Poland in December, 2018, where 196 countries and EU worked alongside on critical components of the Paris agreement. The main purpose of Katowice Conference was to envisage the Paris agreement in real. The climate change agreement has induced the development of an emerging energy system. It is a slow and challenging transition process paving ways for an opportunities and tough choices for governments, businesses, and citizens. The current lock-in energy system is the result of choices made by consumers, energy suppliers, and governments. The fundamental challenge is to provide energy to 1.1 billion people when there are 3 billion people who are still relying on solid fuels like firewood for heating and cooking. Sustainability incorporates society, economy and the environmental aspects of development. The sustainable growth model makes clear distinction from these three aspects. This compartmentalization has encouraged technical solutions that can be implemented easily but avoids the social aspect. There is a need for a fundamental examination of the relationship between businesses, society, and the environment. This makes sustainability as a dynamic concept.

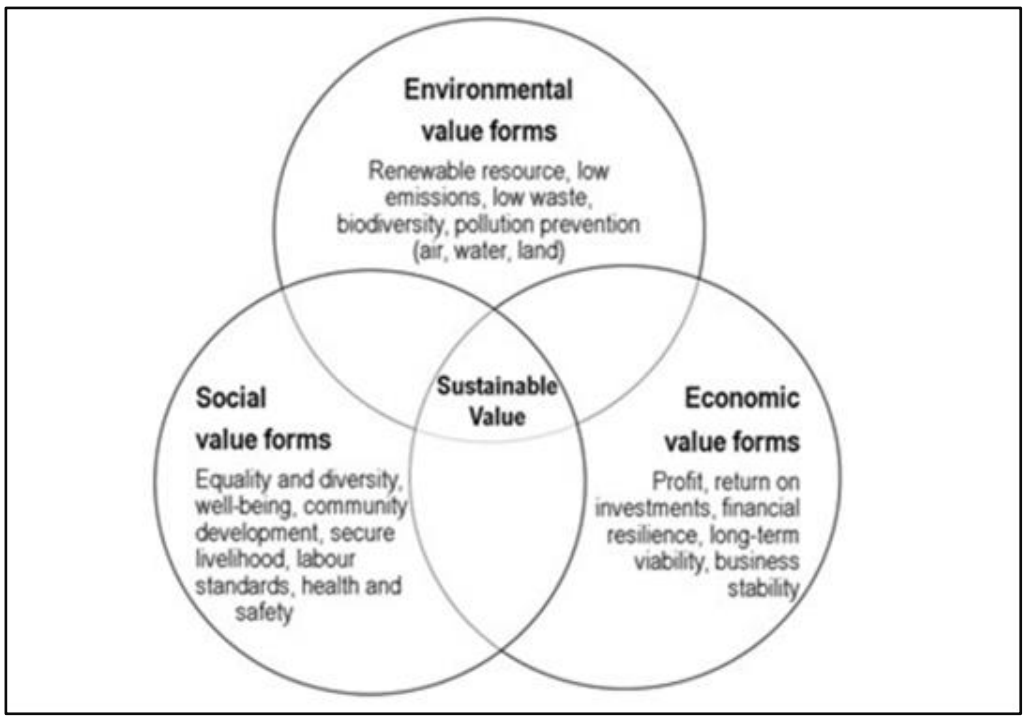

FIGURE 1: SUSTAINABLE VALUE INTERSECTION

An access to energy services is critical for advancing human development. In 2015, 193 countries developed and adopted 2030 agenda for sustainable development. The 17 Sustainable Development Goals (SDGs) aim at ending poverty, improving the health and gender equality, protecting the planet, and ensuring peace and prosperity for all. Linking the other SDGs to energy access, countries are facing the other challenges of poverty (SDG1), essential health care service for all (SDG 3), air pollution, quality education (SDG 4), economic growth and employment (SDG 8).

Emerging economies like Brazil, Russia, India, China and South Africa (BRICS) will be responsible for future economic growth. The correlation between economy and energy establishes that increase in energy demanded by multi-fold (Reilly, 2015). According to IRENA, energy demand by these emerging economies will increase by 50% by 2030 consequently these countries will contribute to higher level of emission. To limit the temperature below 1.5 degrees we need a collaborative global effort. With the advances of the internet of things and sharing economy, it is possible to experiment with business models that can be universal. Innovation diffusion is a lengthy process. It needs time to move from niche to mass market (Smith & Raven, 2012). There is a huge obstacle to existing infrastructure by utilities. As transition accelerates, incumbents and new players will have a conflict (Fattouh, Poudineh & West, 2018).

1.2. The problem of a centralized energy system

After the invention of electricity in the 1880s, the centralized structure of electricity systems has remained largely unchanged till now. New policies, new technologies have come into play, but the ownership structure of utilities remained the same. The customer has no active role in it. The aspect of energy transition needs to consider the value capture of energy service. The traditional utility business model is no longer useful to deploy and diffuse renewable energy technologies fast (Klose & Kofluk, 2012).

The traditional utility model has been challenged now by advanced renewable energy technology and public participation. The distributed small-scale generation, renewable cooperatives, peer to peer energy services, virtual power plants and prosumers are disrupting the traditional electricity value chain.

Main trends in electricity system which are working in a vicious circle and reinforcing each other. Electrification of large sectors such as transportation, decentralization of energy production by distributed energy resources, such as PV, Digitalization of the grid by smart meters, but also beyond. in areas of production and interaction with consumers (Rodríguez-Molina, Martínez-Núñez, Martínez & Pérez-Aguiar, 2014).

1.3. Energy transition in India and the Netherlands

With the growth of the global economy at an average rate of 3.4% per year, population growth is predicted to be more than 9 billion in 2040 from current 7.4 billion. India will be having the biggest share in global energy use by a rise of 11% in 2040 (IEA, 2017).

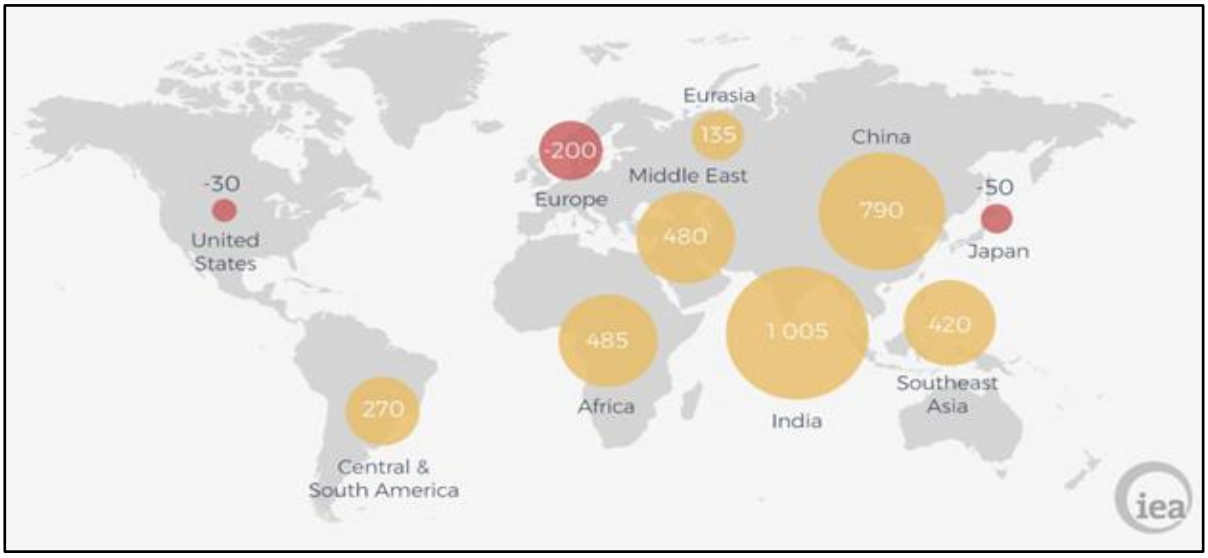

FIGURE 2: CHANGE IN GLOBAL ENERGY DEMAND, 2016-2040 IN MTOE (SOURCE: IEA, 2017)

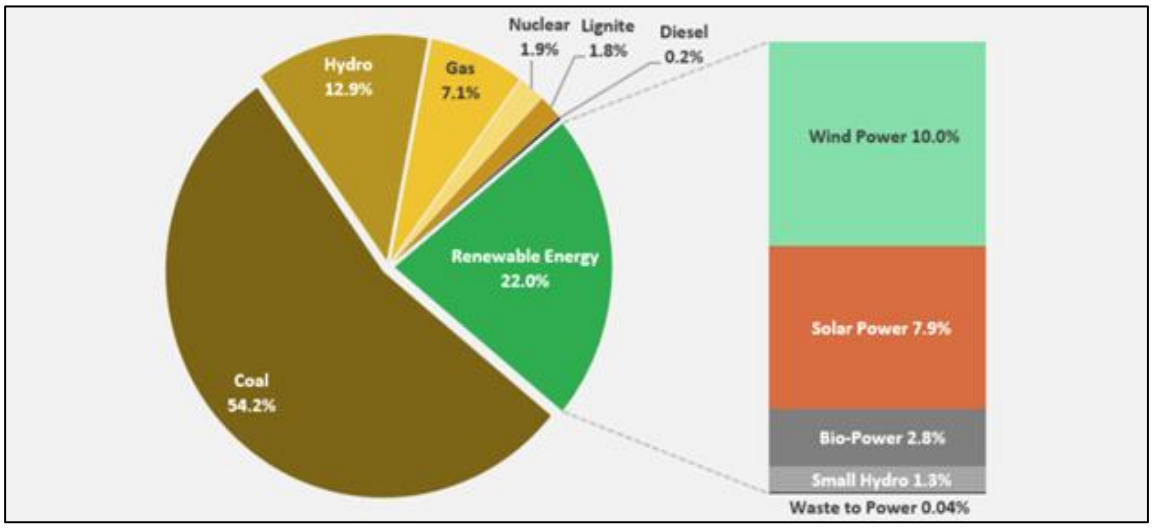

FIGURE 3: THE ENERGY MIX OF INDIA WITH RENEWABLES IN DETAIL (MARCOM, INDIA)

Total renewable's share in India's energy mix is 22%. The growth of renewable is inevitable as traditional coal assets are declared as stressed assets. Given its scale, circumstances, rapid growth and commitment to sustainable development (e.g. 175 GW RE capacity target), India's energy transitions present tremendous opportunities as well as challenges. The renewable sources like solar are now cheaper than coal in India, and potentially going beyond government objectives in the mid-term, with the National Electricity Plan 2018 considering 275 GW by 2027 (Buckley & Shah, IEEFA 2018). India has always been dependent on the traditional utility model for the supply of energy. Every state has its electricity utility. There is the failure of security of supply even if the grid is penetrated in remote parts of the country. Average rural India gets 6-8 hours per day of electricity supply. Additionally, these utilities are facing debts (Khurana, Mani, Banerjee & Sudeshna, 2015).

It is a tipping point to explore other business models and leapfrog the fossil fuel-based system. With the technological innovations, an appropriate model of commercialization for the diffusion of renewable is necessary. Business models as an actor can play a central role in market adoption and distribution. In that context, renewable energy cooperatives are less explored options in India (Jolly S., Raven R. & Romijn, 2012)

In Europe, with climate change, rising electricity costs and benefits of adopting renewable technologies are the trendsetters in the diffusion of renewable energy. Germany and Denmark have successfully created an energy ecosystem with the

collaboration of citizens. Customers are more willing to adopt energy-efficient appliances, electric vehicles. Customers want to participate in the value chain if policies are favourable. The Dutch energy environment was well organized with only a few large utility companies delivering energy to consumers in the past. In the energy transition, the market has become more dynamic and complex with increased competition and self-supplying consumers (Bosman et al. 2013). In this context, the decline in domestic gas production has become a concern, especially as the Groningen gas field has been cutting down its production every year since 2013, before finally shutting down in 2030.(Sintubin M., 2007). As a matter of energy security, the Netherlands has started to explore other options in the energy mix. Furthermore, the government has announced a plan to shut down all coal-fired plants. Therefore, the Netherlands needs to effectively balance its demand and power generation.

The **'Stimuleringsregeling Duurzame Energieproductie'** – SDE+ (Incentive Scheme for Sustainable Energy Production) initiates a new system of feed-in premium allocation subsidizing renewable energy in the electricity, heat and gas sectors (RVO, Netherlands, 2018)

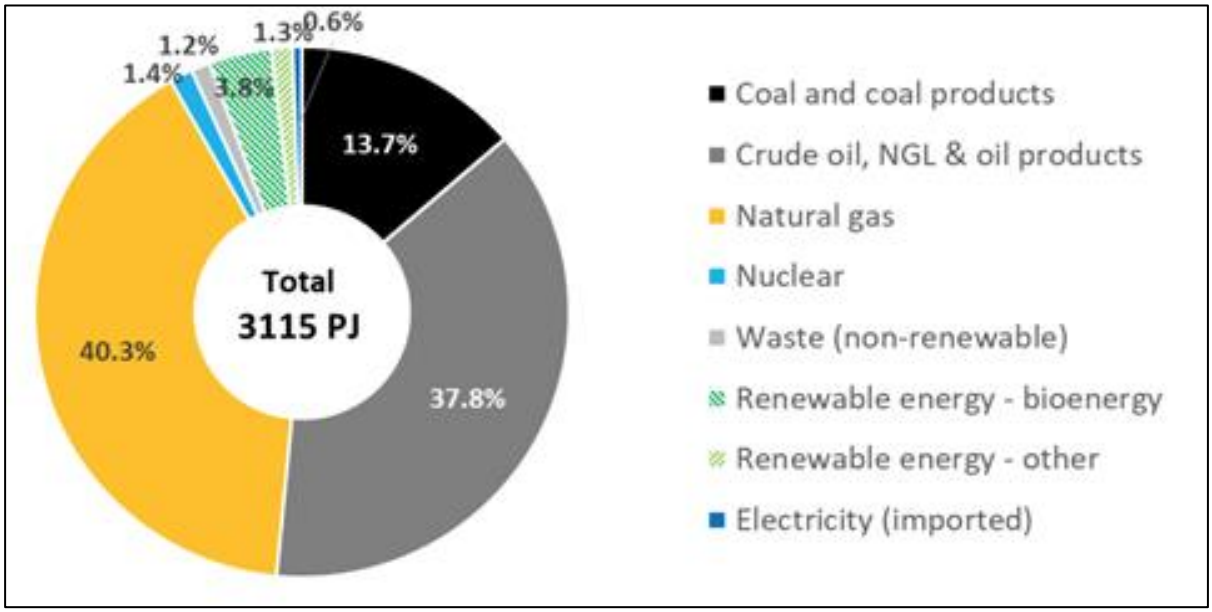

FIGURE 4: TOTAL ENERGY SUPPLY IN THE NETHERLANDS, 2016 (SOURCE: WORLD ENERGY BALANCES OECD/IEA 2018)

1.4. Problem Statement

In developing countries such as India decentralized energy is an option to expand the electric network to the remote locations which are inaccessible by the grid. Massive power outage in July 2012 left 670 million people without grid electricity questioning the centralized system. (Xue & Xiao, 2013). The high investment cost of transmission lines is also one of the barriers to diffuse renewable energy capacity. India has reached grid parity for solar power, but the right model of commercialization has not attracted. With technological innovation, Business model innovation is also equally important (Goel, 2016). In case of India and the Netherlands, there is a large difference in political, geographical, social conditions. However, in the context of the energy transition, both countries face similar problems as ambiguity in net metering regulations, the slow diffusion rate of renewable technologies (Kern & Smith, 2008). Emerging countries would highly benefit from leapfrog the traditional energy system. However, the development is restricted by various barriers, including economic, social and infrastructural barriers. We need to find various ways to overcome these barriers to be able to increase the deployment of renewable energy. India is one of these developing countries with very high solar, wind and biomass potential. Public participation in the process of deployment is very low. Renewable energy cooperatives adopted as a business model can be the right model of diffusion of technological innovations. India has a long history of the cooperative movement and successfully transformed the dairy and agricultural industry. The same approach can be beneficial to energy transition as energy demand is growing rapidly (Singh, Krishna M, et al 2012) Taking these views as a departure point, the objective of the study is to look at how innovative forms of business models can help overcome barriers and increase the deployment of renewable technologies, in the case of one developing country like India and the other is the high energy-consuming country the Netherlands.

1.5. Knowledge Gap

Renewable energy cooperatives adopt diverse business models to sustain in local conditions. There several cooperative business models studied in terms of governance and institutional framework. It is proposed that they are constantly developing with multiple factors like policy changes at the national level, technology diffusion. Many of

the research papers and articles have discussed the historical development of energy cooperatives focused on the USA, Canada, Germany, and Denmark. Developing countries literature is limited and focused on small scale community energy initiate, off grid distributed energy infrastructure and its management. (Yildiz, Rommel, Debor, Holstenkamp, Mey, Müller et al., 2015). Other studies emphasized on the role of intermediaries for REC is to break from the niche (Seyfang, & Smith, 2012; Warbroek, Coenen, & Hoppe, 2015).

Secondly, at present there is less literature available on cross country comparison with different local, geographical, economic and political conditions. Previous studies identified critical components of business models of renewable energy, the last decade's advancement in sharing economy, cooperative movement, the hybrid business model is a relatively young field of study (Mazzorol, 2011). The intersection of social enterprise and renewable energy cooperatives with the business model lens is not well studied in developing countries.

1.6. Research Objective

The co-op is a hybrid form of social enterprise that can move between social and economic purposes depending on the needs (Neck, 2018). The objective of the research is to study different types of cooperative business models in India and the Netherland.

The objective can be attained by:

- Defining renewable energy cooperatives in India and the Netherlands
- Collect information from existing REC and social enterprises and study various business models
- Conceptually understand the challenges and opportunities in front of REC in India and the Netherlands.

Based on this analysis, the ultimate result will be a mapping of key challenges developing the business model.

1.7. Research Questions

Main question:

RQ. What are the challenges and opportunities for REC business models in India and the Netherlands?

Sub questions are as follows:

RQ 1. How can we describe the REC business model in India and the Netherlands?
RQ 2. What are the differences and similarities in the business models of REC in India and the Netherlands?
RQ 3. What challenges in front of REC business models in India and the Netherlands?
RQ 4. What lessons can be drawn by cross-analysis?

The study is structured as follows:

In Chapter 1, the problem addressed in the study and the specific research question is presented against the background of the energy transition in India and the Netherlands.

Chapter 2 presents the concept of cooperatives and renewable energy cooperatives in the context of India and the Netherlands and further extracts key conditions from the literature review.

Chapter 3 presents the research design and methods.

Chapter 4 presents the case study and summarizes the challenges in business models for RECs in India and the Netherlands. And also the research sub-question number 3 is answered.

Chapter 5 presents the cross-analysis of the business model innovations from India and the Netherlands. Research sub-question 4 is answered.

In Chapter 6, a discussion is presented, the research question is answered based on the findings of the study and recommendations are presented.

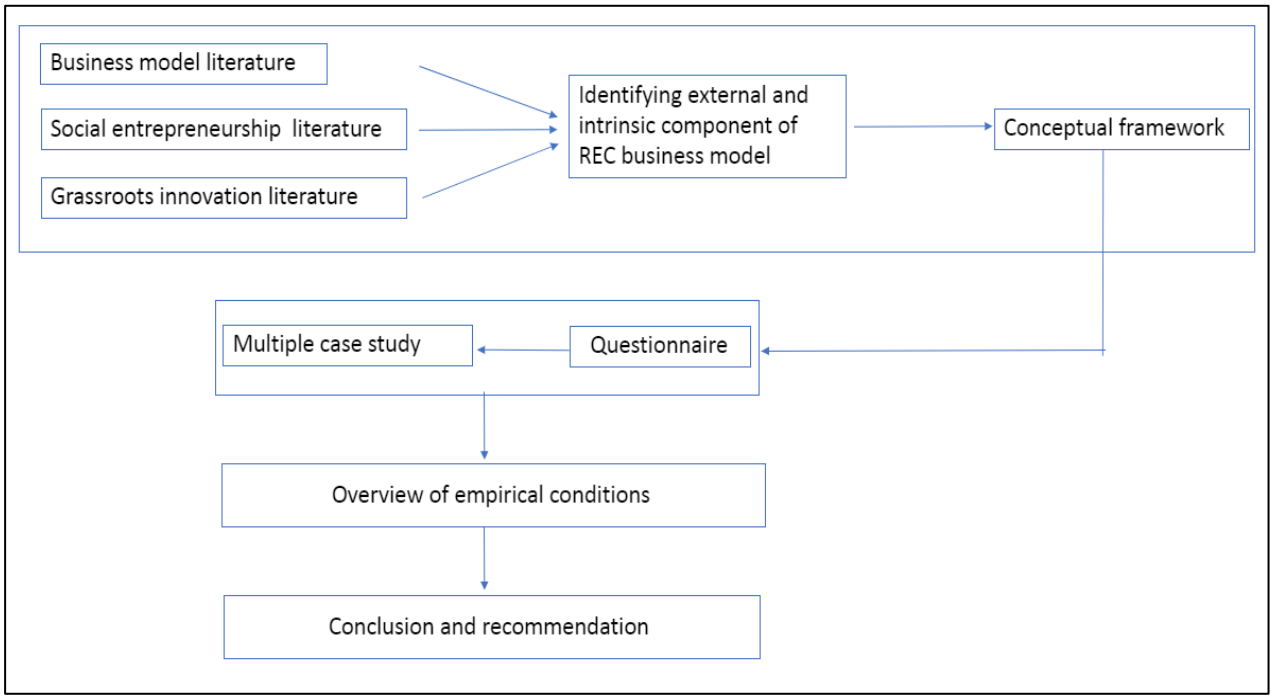

FIGURE 5: RESEARCH FRAMEWORK

2. THEORETICAL BUILDING BLOCKS

The second chapter explains the conceptual framework and answers the following two sub questions.

Research sub question 1: How can we describe the REC business model in India and the Netherlands?

Research sub question 2: What are the different business models of REC in India and the Netherlands?

2.1 What is a cooperative

"Cooperatives are people-centred enterprises, owned, controlled and run by and for their members to realize their common economic, social, and cultural needs and aspirations." (International cooperative alliance)

Democratic nature (one person one vote) is the core of cooperatives. At the same time, cooperatives are business-driven entities but at the heart of the cooperatives, the business model is the generation of social values, not profit. On the other hand, investor-owned firms (IOF) are solely focused on profit-making. International cooperative alliance identified seven cooperatives principles which are as follows:

1. Voluntary and Open Membership

There is no discrimination in participating by the like gender, social, political or religious

2. Democratic Member Control

One member one vote not one euro one vote

3. Member Economic Participation

Democratic control of investment and profit

4. Autonomy and Independence

Cooperatives are autonomous, self-help organizations controlled by their members.

5. Education, Training, and Information

Cooperatives play an important role in a capacity building especially in the developing world where initiatives face a lack of skilled workforce.

6. Cooperation among Cooperatives

Cooperative work together as a network of the organization.

7. Concern for Community

Cooperatives work for the sustainable development of their communities

2.2. Renewable Energy Cooperative (REC)

The establishment of renewable energy cooperatives has a long history. The first RECs founded in Germany in the 19th century. An inadequate infrastructure to provide energy access was the main concern at that time. After the second world war, energy demand increased drastically and government favoured policies to establish large scale centralized electricity system. Citizen participation in the electricity value chain was diminished. After realizing the challenge of climate change in recent years, countries like Denmark, Germany, USA, UK, Canada saw the surge of citizens lead initiatives for renewable energy deployment. REC is part of the broader field of "**c**ommunity energy" (CE).

Defining community is the first step in the research. Communities are defined in two ways:

1. **Communities of location -** Geographically bound communities
2. **communities of interest** - Individually assembled with the same interest

Most of the renewable cooperatives fall in the category of communities of the location where production and consumption of electricity/heat facilitate through citizen participation. RECs take an active part in addressing local environmental, social and economic needs (Tarhan, M. D. (2015). In Germany, Canada, UK, and Denmark many cooperatives have allowed individuals who fall in the category of a community of

interest. For example, DGRV or community power fund, Ontario (DGRV, 2018; CP fund, 2018)

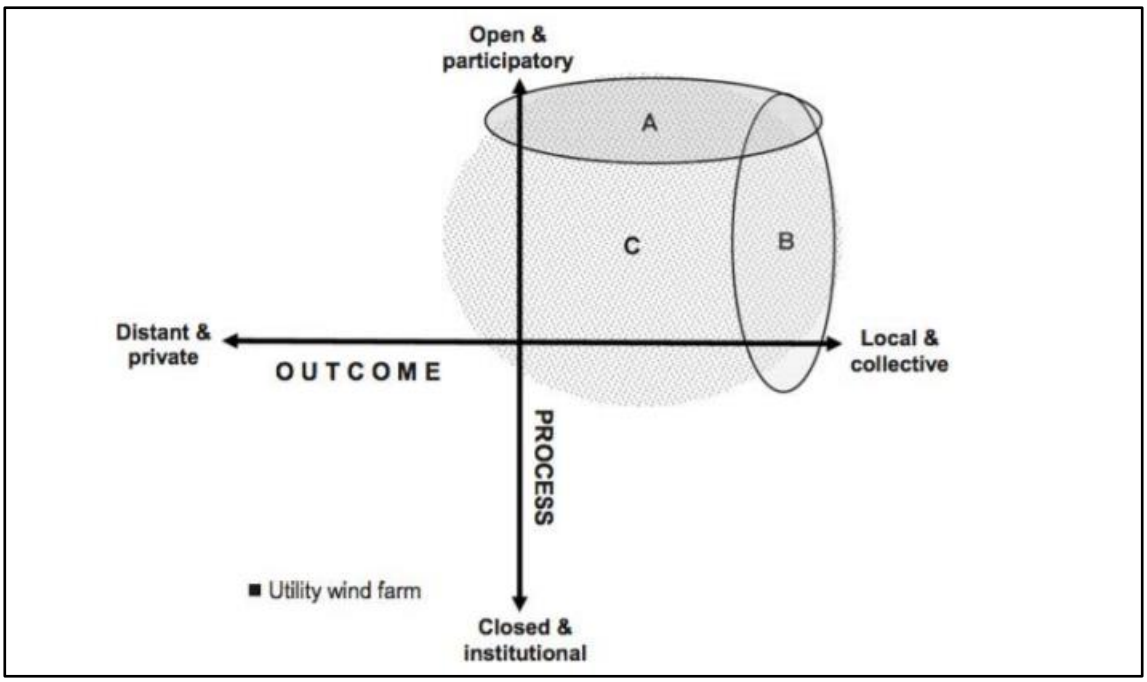

FIGURE 6 : TWO DIMENSIONS OF COMMUNITY ENERGY (SOURCE: WALKER & DEVINE-WRIGHT, 2008, P. 498 498)

Fig. 6 describes community energy with process outcome dimension. According to Walker and Wright, 2008 community project belongs to upper right corner of the graph. The open and participatory approach, citizen involvement is collective movement. Community projects are majorly localised projects where the profit is retained or invested in local community's development.

Stakeholders in RECs socio-technical system

• Local government • Regional government • National government • Large energy companies • Local SMEs • Local industry • Green-collar workers • Other RECs	• Local and individual citizens • Renewable energy antagonist groups • Disadvantaged and vulnerable groups • Young citizens • Future generations • Natural environment

• Umbrella REC organizations • R&D institutes	

TABLE 1: STAKEHOLDERS IN THE RENEWABLE ENERGY COOPERATIVE SYSTEM BASED ON SEYFANG, 2012; RESCOOP, 2012; HOPPE ET AL., 2015; WALKER ET AL., 2010

2.3. Renewable energy cooperatives in India

In India, the cooperative moment has a long history in the agricultural and dairy sector. For example, Amul model in the dairy sector developed an organic network of producers and consumers and now it's one of the biggest cooperative in India empowering 18700 village-level cooperatives leading to the white revolution (Chawla, H., 2007). There are growing examples of community energy projects utilizing solar, biomass and micro-hydro as sources of electricity access in India (Chauhan & Saini, 2015).

Renewable energy cooperatives in India can be classified as decentralized community energy projects, community microgrids, and renewable cooperatives and social enterprises. On the other hand, REScoop in Europe defines Energy communities as:

"An Energy Community is a legal entity where citizens, SMEs, and local authorities come together, as final users of energy, to cooperate in the generation, consumption distribution, storage, supply, aggregation of energy from renewable sources, or offer energy efficiency/demand-side management services" (REScoop, 2018).

Not all characteristics of the REScoop definition applies in the Indian context. According to Mazzarol (2011), the cooperative business model belongs to the fourth sector of "social economy" which is the intersection of cooperatives and social enterprises. Among diverse community energy models, the renewable cooperatives fit in the sense of ownership model where community-owned energy initiative's financial and technical responsibility is an integral part of beneficiary communities (Palit & Chaurey, 2011). Researchers also argue that the community's involvement during the design of initiatives and the installation of renewable technology empowers local stakeholders (Sovacool, 2012).

For example, the Indian state of West Bengal, in the remote area of Sundarbans islands has successfully developed community-owned microgrids. Another example is Chhattisgarh where 1400 solar microgrids are installed in the pilot phase (Palit, Sarangi, et al, 2014). The success rate of initiatives is mixed, many are a failure due to inherent challenges like community participation level, institutional barriers, contextual environment, different priorities (Chatterjee, Burmester, et al, 2019).

Currently, there are REC functioning in India but there is no data portal like REScoop. Most of the cooperatives are born because of the inaccessibility of the grid and individual ambitions to empower village communities as social enterprises. The GOI approach is establishing large scale solar parks that are not helping the local communities. It is against the sustainable development principles. It is a tragedy that villages which give up their land and the big solar, wind parks developed to supply energy to nearby metro cities. It is not uncommon to see a large power plant brilliantly illuminated in an island of darkness surrounding it.

2.4. Renewable energy cooperatives in the Netherlands

Community-based renewable energy cooperatives have reached a considerable number worldwide. Throughout Europe alone, more than 2,400 such cooperatives exist (REScoop.eu, 2015). Renewable energy cooperatives in Germany engaged 150,000 members, 90 percent of which were private citizens, and most of them participating with small amounts (Tarhan, M. D., 2015). Like many other European countries, the Netherlands has recently witnessed the emergence of renewable energy cooperatives that aim at integrating the production and consumption of renewable energy, heat, and energy efficiency initiatives.

According to Local Energy Monitor 2018 of Hier Opgewekt, the number of energy cooperatives rose by 20 percent from last year to 484. A large number of cooperatives are jointly generating solar energy on the roof of the sports hall, in the neighbourhood or roofs. Almost 70,000 Dutch people are members of a local energy cooperative. All in all, they now generate enough power for more than 140,000 households. (Hier Opgewekt, 2019)

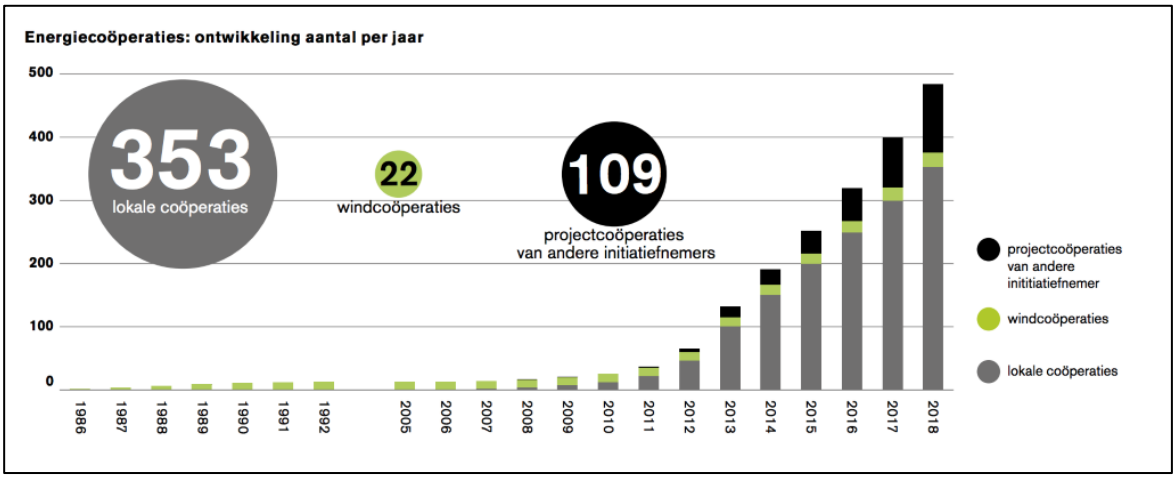

FIGURE 7 : ENERGY COOPERATIVES: DEVELOPMENT NUMBER PER YEAR

2.4.1. Postcode Scheme

New initiatives have been sponsored by the Postcoderoosregeling (Postcode rose regulation), a tax arrangement by the government which exempts participants in a cooperative project to generate renewable energy from having to pay energy tax. Participants of this scheme can invest in a renewable energy installation. The condition is that all participants are residents in a postal code area close to the energy installation. If excess energy produced can be sold to the energy supplier (Proka, Hisschemöller, & Loorbach, 2018).

The success factor in Dutch REC is analysed in the case of wind cooperatives. Determinants relating to collaboration, interaction with stakeholders and sharing knowledge and expertise proved to be the most important (Schipper, 2014). Further, it recommended that policy measure to participation guidelines and managing and sharing knowledge is key targets.

To elaborate on business model diversity in REC further, the theoretical concepts are considered to be relevant. Aligning research scope with research questions with the theory of business models, Social entrepreneurship, Grassroots innovation conceptual framework is developed. The social entrepreneurship literature is more focused on social businesses but was considered relevant because cooperatives are a type of social enterprise and in Indian context REC can be defined as social enterprises. The answers

of sub-questions 1 and 2 were explored with the help of literature. The literature study provides necessary background and insight into aspects that are relevant for the study.

The following three steps were taken to approach the theoretical aspects of research.

1. Literature search

2. Skimming papers and writing down keywords

3. Identifying overlapping conditions

A literature review will be performed in this research to gain knowledge and information that are important to this research. The literature review will consist of scientific articles from the previous works, books, websites, newspaper, and any other materials that are related to the research. The scientific articles and books are obtained from ScienceDirect, Scopus, Google Scholar and the University of Twente online library using specific keywords.

2.5. Business Model

Business models structure how business investments are to be designed, implemented, and managed. It contains financing, service, and monitoring features. This study uses following definition of business models: “the rationale of how an organization creates, delivers, and captures value'' (Osterwalder, 2004; Richter, 2012). The business model for a given project will be influenced by local conditions, the financial and regulatory environment, and the institutional framework and support mechanisms. Business models must be well defined, but they cannot be rigidly structured as they need to integrate with local conditions (Kühn & Louw, 2017). The regular model of utility businesses is linear and rigid where no competition is allowed in India. In the remote parts of developing countries small scale off-grid initiatives promoted by NGOs and world organizations, but they lack a sustainable business model (Aggarwal et al.,2014). In developed countries like Netherlands incumbent utilities either need to cooperate in energy transition or they will lose business. It led to the competition with other actors and started to disrupt the dominant regime (Burke & Stephens, 2018).

The work of (Wirtz, 2011) provides a comprehensive overview of the business model literature and its development over time. In his research on business model definitions,

two categories are distinguished. The first group of definitions comprises a theoretical, illustrative approach that describes how business is done. The second category is more in the context of the company's core logic and active management (Wirtz, 2011). From the technological perspective, it is argued that the business model can be a source of competitive advantage, but also that value creation is not limited to the boundaries of the firm (Zott & Amit 2008).

Osterwalder developed a visual structure to define any business models with different perspectives. The model is extensively applied to study the energy entrepreneurship field. The advantage of Osterwalder's business model canvas is an abstract information about the company which can be visualized in a sophisticated manner in a short time.

Pillar	**Building Block**	**Description**
Product	Value Proposition	A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer.
Customer interface	Target Customer	The Target Customer is a segment of customers a company wants to offer value to.
	Distribution channel	A Distribution Channel is a means of getting in touch with the customer.
	Relationship	The Relationship describes the kind of link a company establishes between itself and the customer.

Infrastructure management	Value configuration	The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer.
	Capability (sometimes referred to as core competency)	A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.
	Partnership or Partner Network	A Partnership is a voluntarily initiated cooperative Agreement between two or more companies in order to create value for the customer.
Financial aspect	Cost structure	The Cost Structure is the representation in the money of all the means employed in the business model.
	Revenue Model	The Revenue Model describes the way a company makes money through a variety of revenue flows.

TABLE 2: BUSINESS MODELS COMPONENTS (OSTERWALDER. 2007)

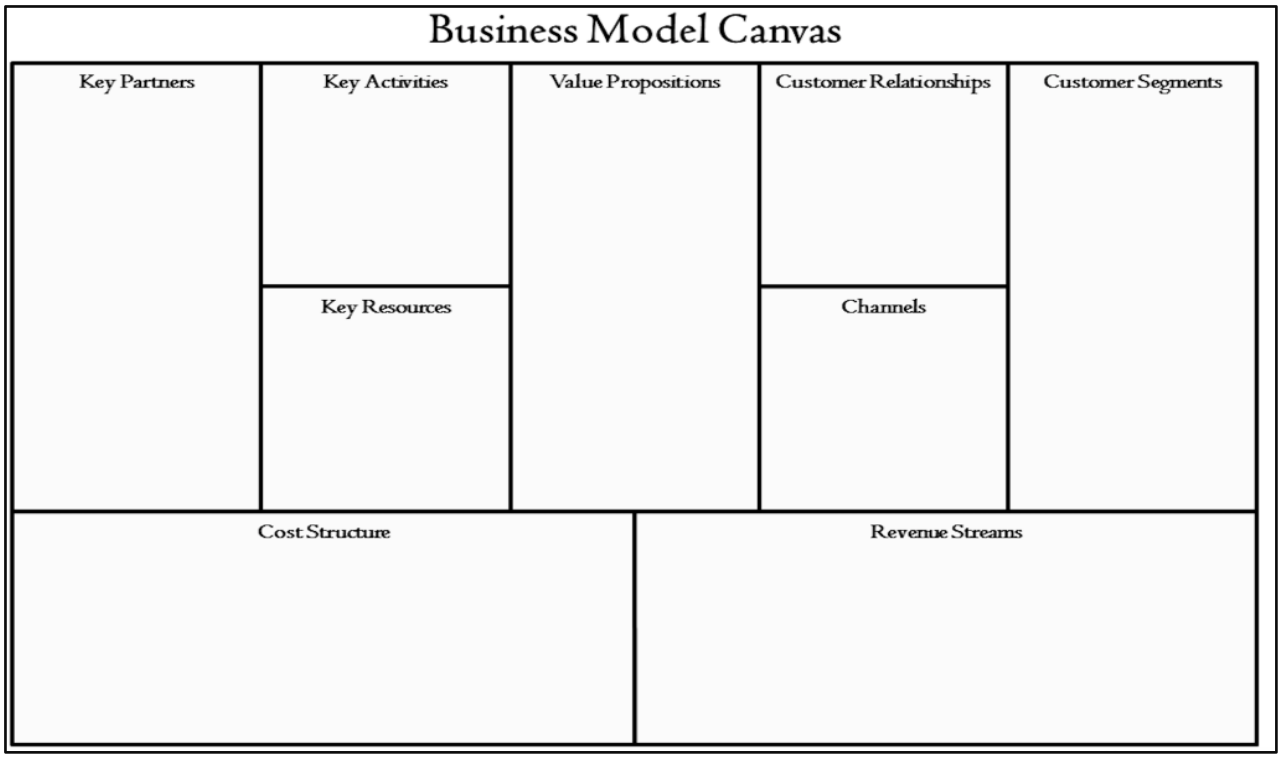

Figure 7: Visual representation of business model canvas (Osterwalder, Pigneur, 2010)

Third party ownership	Peer to peer
Under a TPO contract the energy system host typically makes payment to the third-party owner of the system. Evidences suggest that the total TPO contract payment made by customer can differ significant from payments in which the system host directly purchases system. TPO model can effectively address initial high investment problem of renewable technologies. Longer contract periods gives guarantee of stable energy price. TPO model is popular in Brazil and USA for solar PV. (Davidson C., Steinberg D. et al, 2015)	The direct trading in energy between consumers and prosumers is called Peer - to -Peer (P2P) energy trading, which is built on the concept of the "P2P economy "also known as sharing economy (Hamari, Sjöklint, & Ukkonen, 2016). Wind farm, solar PV owners sell excess electricity directly to other consumers through a digital platform. Although the regulation does not allow trades of electricity credits, it does allow trading of the PV assets. Accelerated trading of PV assets through secure. Online contracts could in effect lead to commercialization surplus energy (Zhang, Wu, Zhou, Cheng, & Long, 2018).
Renewable cooperatives	**Renewable energy Community initiatives**
A cooperative can be defined as a "user-owned and controlled business from which benefits are derived and distributed on the basis of use" (Dunn, 1988, p. 85) Cooperatives in India have been long established in the agricultural and dairy sectors. The user cooperation business model provides government or NGOs a mechanism to support local-level renewable energy. Cooperatives model is implemented successfully for rural electrification in developing countries and self-sustained energy systems in developed countries (Krithika P R Palit D ,2013)	Community energy is any combination of at least two of the following elements: • Local stakeholders own the majority or all of a renewable energy project. • Voting control rests with a community-based organization. • The majority of social and economic benefits are distributed locally (IRENA,2018) Community project identified by high levels of citizen participation with aims to retain profits within the local community, reinvesting the profit in energy projects and local facilities. Social capital is precondition for community initiatives (Berka & Creamer, 2017)

Table 3: Types of different business models

2.6. Social Entrepreneurship

The purpose of cooperatives is not profit-making, it is a sustainable business and social wellbeing of the community they are serving. With the current processes of environmental degradation and climate change, social enterprises that attempt to combat these problems have been emerging all over the word (Dees, Anderson, & Wei-

Skillern, 2004). A broader definition of SE was also given recently by the European Commission (2011), which considers the social enterprise to be

"an operator in the social economy whose main objective is to have a social impact rather than make a profit for their owners or shareholders. It operates by providing goods and services for the market in an entrepreneurial and innovative fashion and uses its profits primarily to achieve social objectives. It is managed responsibly and involves employees, consumers, and stakeholders affected by its commercial activities".

The European Commission uses the terms social enterprise and social business synonymously. According to (Jolly et al., 2012), social entrepreneurship is the key to change the existing unsustainable practices in the socio-technical system and being a key stakeholder in sustainability transition. A similar interpretation of social entrepreneurship is given by Yunus (2008,2010). He defines social business as a subset of social entrepreneurship that operates as an enterprise, selling products and services to customers. Any surplus revenue is reinvested in the benefit of the community. The social business is not profit-oriented, but it exclusively demands to generate social value.

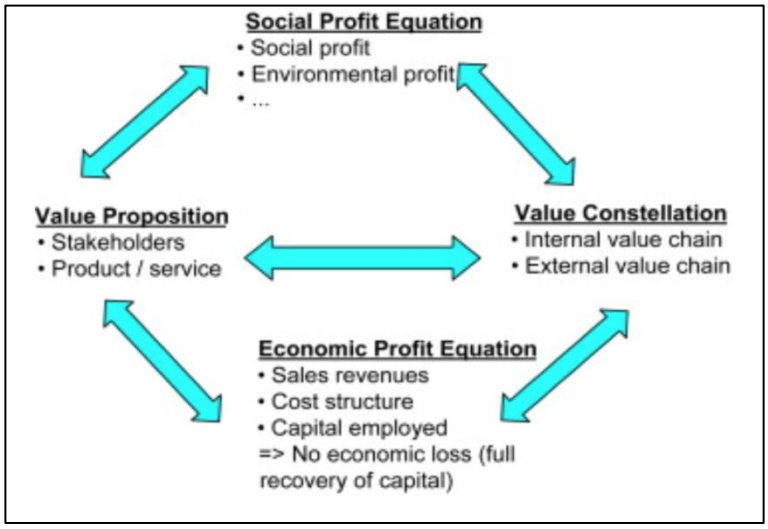

FIGURE 8: THE FOUR COMPONENTS OF A SOCIAL BUSINESS MODEL (SOURCE: YUNUS ET AL, 2010)

In above figure, the Conventional business models break away from the traditional structure and incorporate social value creation as an integral part of the business model. This social business model can also be applied to environmental issues. Problems ranging from climate change and water shortages to industrial pollution in developed and emerging countries.

To dive in depth of intrinsic conditions, social entrepreneurship literature from different countries analysed. The SCALERs model of Bloom & Smith (2010) gave insights into the success conditions of SE. SCALERS, which stands for: Staffing, Communications, Alliance building, Lobbying, Earnings generation, Replication, and Stimulating market forces. These are the key success conditions observed in social enterprises to overcome the internal challenges. Van der Horst (2008) assessed the role social entrepreneurs played to enhance the development of renewable energy in the Scottish context. The study in community energy charging station identified internal factors and challenges in dissemination of renewable energy in Africa. By examining community energy initiatives through a social entrepreneurship lens, Becker, Kunz et al, 2017 developed an integrated approach for the analysis of small-scale and bottom-up energy initiatives. Following is a summary of conditions extracted from SE literature relevant to business model elements

Component	**Sub components**
Mission/motivation	Shared vision Specific vision Motivation of member Responsibility of members Dedicated board
Organizational structure	Right people, right place Paid staff Own office Internal communication Gender of members Democratic principle
Purpose	Member value proposition (MVP) Accessibility Getting job done Design

	Price Usability convenience

Table 4: Intrinsic conditions identified in SE literature

2.7. Grassroots Innovation

Grassroots innovations are defined as "networks of activists and organizations generating novel bottom-up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved" (Seyfang & Smith, 2007, p. 585).

Social innovations "are new solutions (products, services, models, markets, processes, etc.) that simultaneously meet social needs (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society's capacity to act" (Caulier-Grice et al., 2012, p.18).

Caulier-Grice et al. (2012) found that 'social innovation' has been used to describe:

(1) societal transformation; (2) a model of organizational management; (3) social entrepreneurship; (4) the development of new products, services and programs; and; (5) a model of governance, empowerment and capacity building. Learning and Network in the community as stakeholders are identified as important elements relevant to the business model.

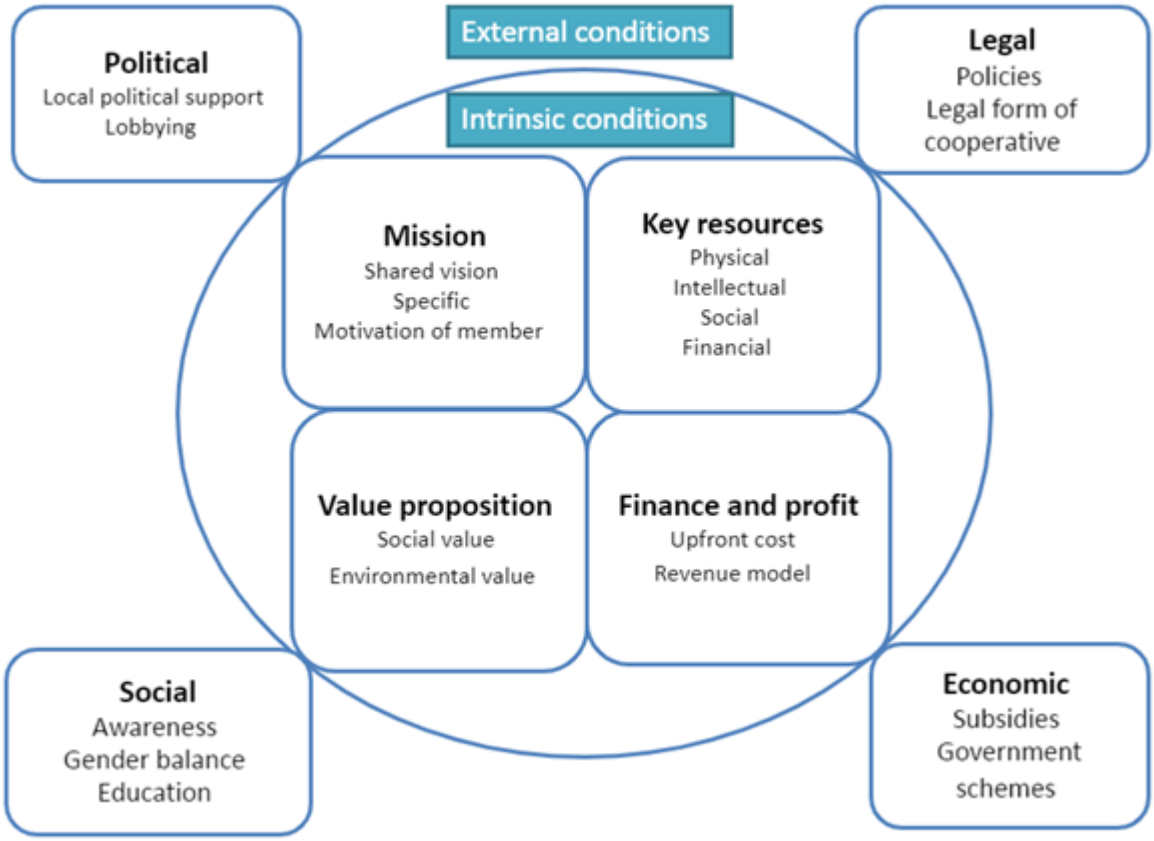

FIGURE 9 : CONCEPTUAL FRAMEWORK

3. RESEARCH DESIGN

3.1. Why exploratory qualitative research and case study?

"Research design is a logical plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions" (Yin, 2003). The strategy in this research will make use of some of the elements in the algorithm proposed by Yin (2003):

1. Research questions
2. Unit of research
3. The logic connecting the data to the research questions
4. Criteria for linking empirical work to the theory and interpreting the results

The author has chosen to perform an exploratory, qualitative case study due to the following reasons:

Preliminary desk research done by the author on the topic showed that cooperative's business model in renewable energy is a relatively less explored area; Because of this and because of the nature of the research question being a "what" question, the authors have chosen to perform an exploratory multiple-case research design (Yin, 2014). The study wants to explore the global nature of business model components and then link the logic to find out what are the main challenges.

This thesis will make use of desk research and interviews to gather and validate the data that will be presented. Since the interest of this research is to understand What are diverse business models of RECs and challenges in front of them. To do this, the research will be more focus on the case study's decisions regarding business models. Qualitative case study approach offers the benefit of being open-ended and allowing the use of rich data with the exploratory nature of the analysis; it also has a distinct advantage of interpreting motives and lived experiences of actors (Graebner, Martin & Roundy, 2012).

The following table represents the approach to connect the logic of data gathered and research questions.

Research Question	**Information Required**	**Research Material**	**Outcome**
RQ 1. How can we describe REC's business model in India and Netherlands?	Existing RECs business models in India and the Netherlands	Scientific publications, Government reports, Conference reports Interview of founders On public platform, REC websites, REScoop, Hier Opgewekt, Greenpeace distributed energy data	Construction of literature review and simultaneously developing a questionnaire
RQ 2. What are the different business models of REC in India and Netherlands?	Survey of diverse business models including social enterprises, community energy	Interviews conducted social entrepreneurs, Project managers scientific	Analysing how these businesses converted existing opportunity into a sustainable business. Track the

	and REC	publications, News articles, Conference reports Company website	evolution of business models over the time What are the intrinsic and external factors influenced current business model
RQ 3. What challenges in front of REC's business models in India and Netherlands?	Identifying key challenges	Interpreting the interviews and linking it with theory	Apply business model canvas to get more analytical outlook
RQ 4. What lessons can be drawn by cross analysis?	The conclusion formed by the application of the conceptual framework.	Result of interviews	Recommendation and opportunities tracing.

TABLE 5: RESEARCH APPROACH

3.2. Case Selection

According to Simons "Case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or

system in a ‘real-life' context." The case study must have two units one is practical, historical and other is theoretical, analytical unit (Thomas, 2015).

Case selection and planning

The case selection and planning were divided into three stages consisting of:

1. Online searches
2. Talking to industry experts in India and the Netherlands
3. Selection of cooperatives

Yildiz et al. (2015) proposed a classification of RECs based on technology, value chain, region and historical development. The proposed criteria used to define the cases. In case of technology, solar energy cooperatives in particular are selected. RECs classified by value chain in subcategories generation, distribution, trading and other as the value chain. Historical development cases have chosen which are new initiatives or in the business from the past 10 years. Constantly changing regulatory environment's effects on the development of the RECs business model can be closely observed in the last ten years. Regional development can provide a valid classification as the value creation and consumer segment for these organizations is most of the time geographically dependent. While in India nationwide operations for rural electrification achieved by some social enterprises like SELCO, MGP INDIA (Mera Gaon Power) etc.

Name	**Description/Motivation**	**Value Chain**	**Historical Development**	**Regional Development**
Haarse Zon	Haarse Zon originated from a dream: Making Haarzuilens energy neutral. With this aim in mind, some Haarse residents and Emmaus Haarzuilens set up a working group two years	Generation	2017	Localized

	ago.			
Cooperative DE Ramplaan	"Involving all neighbourhood residents of the neighbourhood was the first, and most important, step in the process."	Generation	2012	Localized
dEA, Apeldoorn	Residents and companies in the municipality of Apeldoorn can become a member of the cooperative and / or purchase energy from the energy company. By becoming a member, you are a co-owner and you participate. In addition, deA has its own energy company that supplies sustainable energy that is generated in the municipality of Apeldoorn and helps residents to generate and save energy themselves.	Generation		Localized

TABLE 6: SELECTED RECS IN NETHERLANDS

Name	**Description and motivation**	**Value chain**	**Historical Develop**	**Regional Development**

			ment	
Gram Oorja	Darewadi, a remote village in Sahyadri mountain range, Project executed by: Gram Oorja Solutions Private Limited, Technology and funding by: Bosch Solar Energy AG, Project operation and maintenance by: Vanadev Gramodyog Nyas (a local trust managed by villagers)	Generation And distribution	2012	Nationwide
Renewable Energy Development Cooperative (REDCO) Durbuk	The 250 KVA Diesel Generator at Tangtse in Durbuk block of Leh district supplied electricity to three villages for domestic lighting. Tangtse, which completely replaced the existing Diesel Generator set. The solar photovoltaic plant is now managed by the local people through a cooperative society known as	Generation Other solar technologies include; **(a)** Solar Fruit Dryers **(b)** Solar parabolic cookers (SK-10, SK-14 and Scheffler **(C)** Solar water heaters (evacuated type)	2005	Localized

	Renewable Energy Development Cooperative Limited or REDCO. Villages in Ladakh are isolated, houses are scattered, resources are inadequate and options for electrification are limited			
Dhundi Saur Urja Utpadak Sahakari Mandali	Six farmers of Dhundi village in Kheda district of Gujarat for a solar power cooperative society. The village did not have access to the agricultural grid. This meant that the farmers here used expensive, noisy, and polluting diesel pumps to pump water out of the ground to irrigate their crops. Diesel pumps were replaced with grid connected solar pumps,	Generation Solar water pump	2016	Localized

TABLE 7: SELECTED RECS IN INDIA

3.3. Protocol for Multiple Case Studies

For the case study following steps were followed:

1. **Contact interviewees**
2. **Conduct interview**
3. **Analysis of interview**

Contacting interviewer was done over email, few Indian cases did not have websites or contact points, therefore, contacted them via different modes like LinkedIn and Facebook page and from there obtained the official mail. The initial email with some basic information was sent to the mailing address of the cooperative with the question if the chairman wanted to participate in the research. In addition to these interviews, the author plans to take interviews of a researcher who has worked in both the countries. The interviewees chosen hold different positions in respective cooperatives.

Questionnaire Design:

Following are the broad themes which were considered to develop the specific questions.

1. Mission
2. Early-stage
3. Business model, choices made, and reason for this
4. Resources - physical, intellectual, social capital
5. External conditions - Political, social, legal and economic conditions
6. Challenges to the business model
7. Opportunities to make business model robust

While conducting the interviews, it is planned to adjust the way follows up questions are asked when subjects revealed something interesting.

3.4. Analysis

The generation of a lot of data should make sense in qualitative research. To make it more coherent and aligned to research question themes. Following steps established to analyse the data.

Transcription

- Mined theme transcription not the immediate and literal copy of the interview.
- Case by case as analysis
- While analysing interviews, the author mixed the use of predefined and emerging themes. The predefined themes were extracted from theory, while the emerging themes derived from reflecting upon the answers given by the interviewees.

Organization / Locality	Interviewee	Date
Gram Oorja, Darewadi	Mr. Kiran Auti (Project manager), Anshuman Lath (Director)	25 July 2019
The Dhundi Solar Pump Irrigator's Cooperative Enterprise (SPICE)	Ms. Neha Durga, Consultant (IWMI-TATA policy program)	25 July 2019
DEA Apeldoorn cooperative	Mr. Micheal Roemer (founding member)	29th August 2019
REDECO, Durbok	Mr. Thinlay Durojay (Consultant)	20 August 2019
DE Ramplaan	Mr. Jeroen Vijverberg ,Bestuurder (Director)	20 August 2019
Haarse Zon cooperative	Mr. Bert Nesselaar (Treasurer)	26 August 2019

TABLE 8: INTERVIEWEES NAME AND POSITION

3.5. Limitations and Scope

The study was conducted within the following limitations:

- The study was limited to the use of time and resources. As the study was conducted for the master thesis at the University of Twente, there were limitations regarding time availability.
- The study was limited to the investigation of cases in only two countries. Even though the social enterprise model is different, they still experience common problems arising at similar stages in their development. These problems can be related to different business model components, and they are characteristic of early-stage operations. The following are the early stage characteristics considered to classify the cases.
- The area of operations is mainly local. Workers and owners are in one community.
- Only solar cooperatives were chosen for the research study because of similar challenges about net metering , uncertain policies and socio technical system in both countries.

3.6. Ethical Consideration

The conduct of this research will comply with the principles laid down by the Ethics Committee, University of Twente, The Netherlands. The ethical responsibility will be respected.

The principle includes the avoidance of exploitation, distribution of benefits and burdens, respect for the interviewees, respect for human dignity, scientific validity, scientific, social and/or educative relevance, respect for the rights and the particular interests of research participants (specific groups of) and/or the community / society, and safeguarding confidence. The research process will adhere to the Dutch Code of Ethics for Research in the Social and Behavioural Sciences. Confidentiality will remain rigorously maintained throughout the research for the leaders of companies, officials and project managers and we will not proceed until full, voluntary and informed consent has been obtained. A consent form for local languages will be developed and will be translated. Key informants will be able to view and approve the transcripts of interviews.

4. EMPIRICAL RESEARCH

4.1. The Dhundi Solar Pump Irrigators' Cooperative Enterprise (SPICE)

Dhundi is a medium size village located in Thasra Taluka in Kheda, district of Gujarat state of India. with total 309 families residing. Dhundi village has a population of 1473 (Census 2011). It is situated near Anand town in Gujarat state which is known as the birthplace of dairy cooperative movement. Acquiring the land in Dhundi poses a special problem. The land there is owned by 30 people. If villagers want an electricity connection for irrigation, they need to affix the signatures of all those 30 people. It was nearly impossible task, hence farmers in Dhundi village gave up on electricity grid and started using Diesel pump which was costing them 15 times more than electricity per unit price. **SPICE** was formed in June 2015 with 6 farmer members who were supported financially by International Water Management Institute (IWMI) and Climate Change, Agriculture and Food Security (CCAFS) to acquire solar irrigation pumps with a total panel capacity of 56.4 kWh. These were formed into a micro-grid which the cooperative was created to manage on behalf of members.

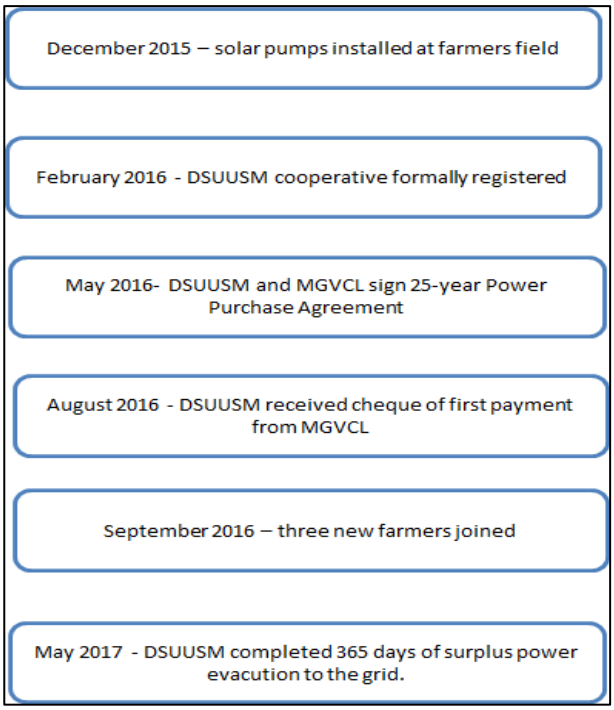

FIGURE 10: TIMELINE OF DEVELOPMENT OF DSUUSM

4.1.1. Mission

Until 2015, village did not have access to agriculture grid. This meant that the farmers here had to use an expensive, noisy and polluting diesel pumps to pump water out of the ground to irrigate their crops. With an intervention of International Water Management Institute (IWMI) and Sir Ratan Tata Trust through the IWMI-Tata Water Policy Research Program, solar irrigation cooperative was formed. The aim of this initiative was to replace noisy, polluting and expensive diesel generators with solar pumps. To avoid excess water pumping as depletion of groundwater is also a major concern in India, the local utility agreed on PPA with the farmers to purchase the excess energy after irrigation usage.

Rahul Rathod, a consultant with IWMI says "*Now, the farmers and their families have not only got rid of the noise, diesel fumes and spending on diesel, but are also selling solar energy worth thousands*"

4.1.2. Organizational Structure

Membership conditions summarized as below. (Source - Paranjothi & Mishra, 2017)

MALE	FEMALE
He should be a resident of Dhundi or	She should be a resident of Dhundi or

residing within 2.5 Km from the Society He must be a farmer He should have one gunta land (1 Gunta = 101.17 square meters) He must have a well The well should be at least within the minimum distance of 1 Km He should purchase at least 1 share and pay Rs.51/- as admission fee He should be abo0ve 18 years of age He should be free from criminal cases, liquor consumption and immoral activities	residing within 2.5 Km from the Society Her husband or son should be a farmer The farmer should be above 18 years of age and capable of executing Agreement Her husband/son should have well If women farmer does not have land, she can become member if her husband/son is eligible for membership not convicted on liquor laws or immoral activities If a women dis-continues membership she cannot join the society again unless the committee approves of her re-joining.

TABLE 9: MEMBER CRITERIA FOR DHUNDI COOPERATIVE

Initially 6 farmers of this Cooperative paid Rs.5,000 per KW. After seeing the benefits of other farmers, 3 new farmers showed an interest and joined the cooperative and even paid Rs.25,000 per KW. There is an election after every two years to elect the president and the chairman. All members participate in decision making process democratically. (Durga, N. Personal interview on 2019, July 25).

4.1.3. Key Resources

The availability of land and water well to connect with solar pumps is the major physical resource. Solar pumps were funded by IWRM and TATA. The non-physical resources were important as participation of local farmers and will to invest in installation and maintenance. The knowledge and capacity building program provided by research institute was also a key factor for successful functioning of cooperative.

4.1.4. Value Proposition

Irrigation using solar technology as opposed to earlier diesel engines is an example of leapfrogging. Between January and May 2016, Dhundi cooperative's member farmers could use solar energy generated either to meet own irrigation needs or to sell irrigation service to neighbouring farmers. Selling excess electricity to local utility MGVCL's grid at

₹7.13/unit. This attractive tariff is helping farmers to use less solar energy for irrigation. Farmers can grow crops like Tomato which have good demand in the market because of new method of irrigation. Less use of groundwater and selling surplus energy have the value proposition for utilities in debt. The local government saved amount to connect Dhundi with traditional grid. Social value proposition, empowerment of local farmers and capacity building by collaborating with research organizations. On broader level Dhundi cooperative succeeded in reducing Carbon Footprint of Tube well Irrigation.

4.1.5. Finance and Profit

Initially 6 farmers of this Cooperative were paying Rs.5,000 per KW. After seeing the benefits of other farmers, 3 new farmers were ready to join the cooperative and even paid Rs.25,000 per KW. Solar pumps of these 3 new farmers are yet to be connected to the Grid rest of the money to install solar pumps was come from research grant IWMI and TATA. The Society pays a rent of Rs.150/- every month where the meters are also fixed in the Office. The Secretary of the Society is paid Rs.1500/- and the President is an honorary worker.

Particulars	Quantity	Amount (₹)	Unit Cost (₹ per watt-peak)
SOLAR IRRIGATION PUMPS		**₹3,499,400**	**₹62.0**
Solar Panel Modules	*56.4 kWp*	*₹2,030,400*	*₹36.0*
Inverters	*6*	*₹510,000*	*₹9.0*
Pump + Variable Frequency Drive (VFD)	*6*	*₹420,000*	*₹7.4*
Mounting Structures	*6*	*₹315,000*	*₹5.6*
Switches, Panels, Meters, Wiring	*Lump sum*	*₹134,000*	*₹2.4*
Solar Pump Installation Cost	*6*	*₹90,000*	*₹1.6*
MICROGRID AND OTHER PERIPHERALS		**₹1,565,600**	**₹27.7**
Microgrid: Supplies	*2.8 km*	*₹1,142,600*	*₹20.3*
Microgrid: Installation Cost		*₹190,000*	*₹3.4*
BOS		*₹50,000*	*₹7.4*
Dedicated 100 kVa Transformer	*100 kVa*	*₹183,000*	*₹5.6*
TOTAL*		**₹5,065,000**	**₹89.8**
Farmers' Contribution		₹465,000	**₹8.2**
CCAFS Contribution		₹4,600,000	**₹81.6**

* Exclusive of transportation and taxes

TABLE 10: DETAIL COST SHEET FOR MICRO GRID AND SOLAR PUMP

Power Purchase Agreement

The Power Purchase Agreement was made on 2nd May 2016 between Madhya Gujarat Vij Company Limited (MGVCL), a Government Company registered under the Companies Act 1956 and carrying on the business of distribution and supply of electricity in the area of supply" and **Dhundi Saururja Utpadak Sahakari Mandali**. The Solar system of 100 KW was set up for the member farmer's own use in their agriculture land for irrigation, connected with MGVCL's grid at 415 Voltage level for injection of surplus energy into the MGVCL grid at interface point. The eligibility period of this Agreement will be Twenty-Five years from the date of commencement of commercial operation by the solar power generator or the lifespan of the plant, whichever is earlier.

Profit from PPA

Apart from using solar energy for irrigation purpose they were providing water to the farmers in the neighbouring fields and getting income of Rs.250 per bigha (120Sq ft). The farmers were supplying electricity to MGVCL and getting Rs.4.63 per unit. Apart from this they were also getting Rs.1.25 per unit as Green Energy Bonus and Rs.1.25 per unit as Water Conservation Bonus.

Liabilities		As on 31-May-2017	Assets		As on 31-May-2017
Equity		₹ 664,358.00	Fixed Assets		₹ 441,925.00
Capital Account	₹ 5,312.00		*Dedicated 100 kVa transformer#*	₹ 181,925.00	
Members' Contribution	₹ 659,046.00		*Micro-grid and peripherals*	₹260,000.00	
Current Liabilities		₹ 227,438.00	Current Assets		₹ 449,871.00
Excess of income over expenditure	₹ 227,438.00		*Fixed Deposit*	₹ 150,000.00	
			Bank Balance	₹ 299,871.00	
Total		₹ 891,796.00	Total		₹ 891,796.00

TABLE 11: BALANCE SHEET AS 31ST OCTOBER 2017

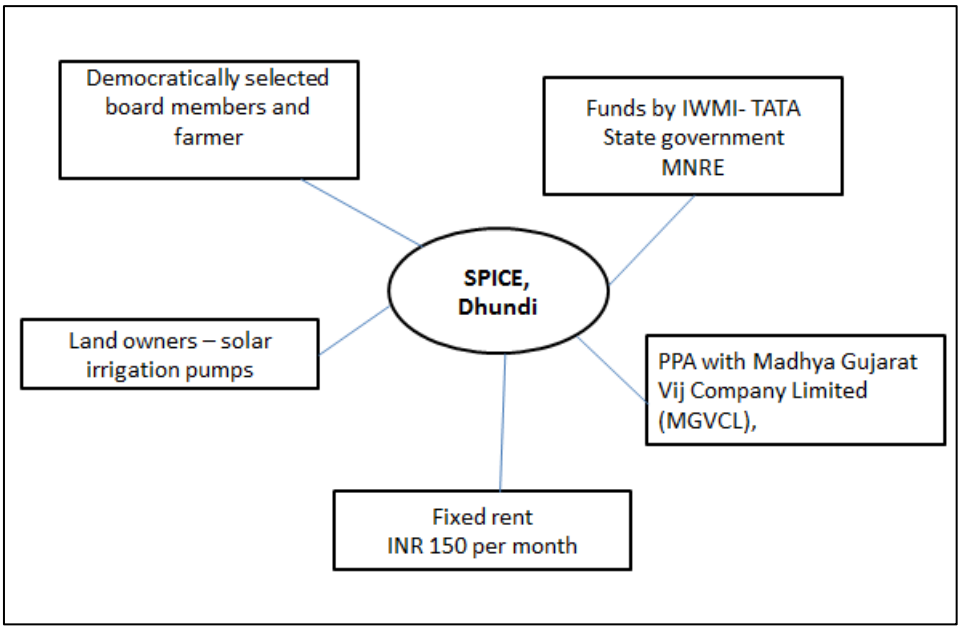

FIGURE 11: OVERVIEW OF SPICE, DHUNDI

External Conditions	Description
Political	There was no political support or hindrance for the Dhundi initiative. The research organization actively pursued the idea towards the bureaucrats and government.
Economic	The farmers with less than 1-acre land owning were hesitant to invest in solar pumps. The insecurity of financial sustainability in agriculture played a major part in convincing the farmers.
Social	Lack of education lead in the doubts about working capacity of solar pumps. No gender-specific role identified.

Legal	There is no framework of policy so cooperative needed to adjust in traditional cooperative's rules and regulations. The flexibility by local utility for PPA was also another factor that sustained Dhundi initiative. Dhundi Cooperative was registered under the Gujarat Cooperative Societies Act 1961 on 16/02/2016.

TABLE 12: EXTERNAL CONDITIONS FOR SPICE, DHUNDI

4.2. Gram Oorja, Darewadi

Gram Oorja Solutions Private Limited was established in year 2008 with the aim of providing energy solutions to rural communities in India. Having worked in more than 200 remote villages in India, it provides electricity, drinking water and cooking fuel to tribal communities. Basically, Gram Oorja acts as an implementing social enterprise which enables villagers to establish a cooperative community to govern renewable energy projects. (Auti, k. Personal interview 2019, July 25). A key feature of the work has been the sustainability of these projects, with local communities taking over the management, tariff collection duties and ownership of these projects. In the context of cooperative, the study will be focused on Darewadi, the hamlet nestled in Sahyadri mountains. The population of Darewadi is 200. Darewadi did not have access to the grid due to remote location. The community in Darewadi is dependent on agriculture, cultivating just one crop per year that is uncertain because of irregular pattern of monsoon.

4.2.1. Mission

Gram Oorja's mission is to provide electricity, clean cooking fuel and clean water to the remote communities and rural areas. However, the problem of power crisis is more

acute in rural areas due to their remote inaccessible locations. It is extremely difficult to transport grid power to distant villages as power wastage drastically increases with the length of the electric lines, due to transmission and distribution losses.

4.2.2. Key product / Service

Solar PV microgrid for off-grid villages, Solar Water Pumping, Biogas based cooking grid. Gram Oorja's philosophy is to provide sustainable energy to rural communities through paradigms and systems in a manner that will allow these to run for decades. They created a micro grid with hybrid power sources with funding from corporate charity funds. Bosch solar energy AG funded initial investment for the project. The enterprise wants to bridge the gap between energy and rural areas and commercialize on-the-ground viable renewable energy solutions for the rural sector and small-scale applications.

4.2.3. Organizational Structure

A village trust consisting of 7 members was created to take charge of assets. The locals are being trained and funded by the trust to do repair and maintenance of solar panels. Gram Oorja as an implementing agency gives emphasize on gender balance in village trust. The committee consists of three female members and four male members who are responsible for any major decision concerning the micro-grid. The committee members are elected democratically.

Gram Oorja Solutions Private Limited is an implementing agency which provides community interaction, partnership and strategy functions. The top management is aided by a team of engineers and social engagement experts.

4.2.4. Key Resources:

- Solar panels from the CSR activity of Bosch
- Local young person trained for the repair and maintaining solar panel system
- The knowledge and capacity building by Gram Oorja
- The battery backup system when the sun is not shining specially in heavy monsoon rains.
- The human capital act as an important factor in the case of Darewadi.

4.2.5. Value Proposition

At present villagers can now enjoy an uninterrupted supply of electricity 24*7. Each house is given a 2-3 lead bulbs, one plug point for mobile charging, computer, TV installation or other usage. The street lights in common area is also provided. Villagers can use electricity for commercial use like flour machine. There is no difference in tariffs of commercial load and residential use which encouraged local entrepreneurs. Environmental value is generated by not using diesel pumps for water pumping. Two water pumps are added so villagers now can grow two crops instead of one. There is coherence about decisions regarding electricity system in villagers that made community bond stronger. Exposure to media and TV is also added value which connected Darewadi to the outside world.

4.2.6. Finance and Profit

The finance for the purchase of solar panels was provided through Bosch CSR initiative. To withstand the heavy wind cement blocks were installed. Bosch has covered the upfront cost for micro-grid, but 15% of the total project cost is to be recovered from villagers

The tariff is fixed in a way to recover the cost of maintenance and replacement of battery after 4-5 years. Effective tariff was imposed for 20kWh with fixed charges of 90 rupees per month for street lights. It is not a viable business model if installing cost is taken into consideration. There is no default so far, and system is sustained. The purpose of tariff was not to earn profit but make initiative for the self-sustainability.

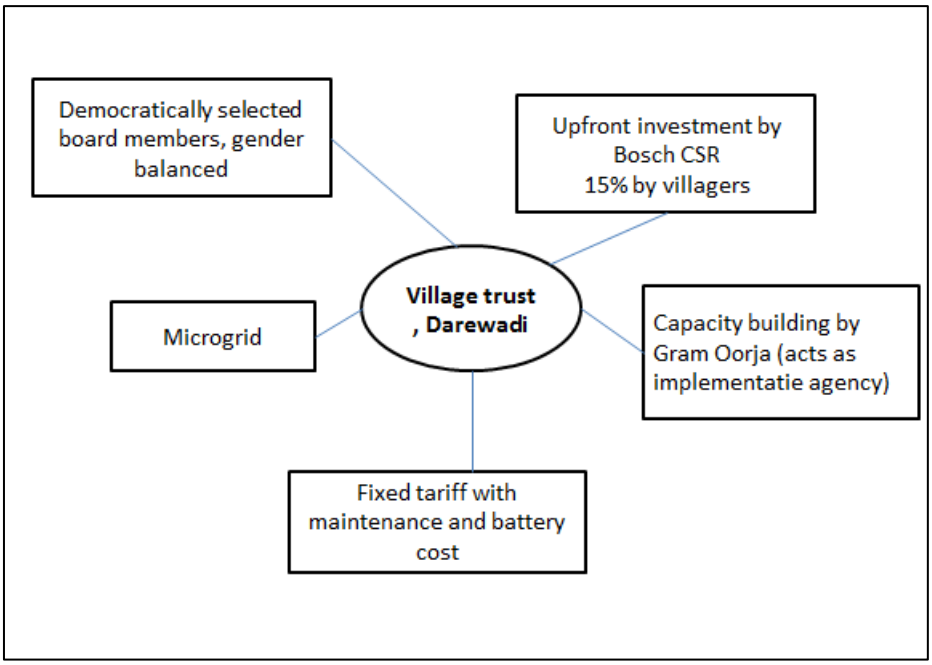

FIGURE 12: OVERVIEW OF GRAM OORJA, DAREWADI COOPERATIVE

External Conditions	Description
Political	No political support. The village trust needs to take "**Na Harkat**"(no objection) certificate from the Gram panchayat.
Economic	The land for installing solar panels is leased by the family. High cost of the solar panels is donated by CSR activities of Bosch.
Social	Lack of trust and lack of awareness was observed. Making organizational structure gender balanced was the key encourage participation. The high coherence about decision is observed in villagers.
Legal	Government has proposed micro grid policy but not implemented

	yet which can be a big step to facilitate similar type of initiatives

TABLE 13: EXTERNAL CONDITIONS FOR GRAM OORJA-DAREWADI COOPERATIVE

4.3. Renewable Energy Development Cooperative (REDCO), Durbok

Durbok is situated in the north-eastern part of district Leh, in the state of Jammu and Kashmir (J&K), India. Darbok is cold desert with highest altitude approximately 13,500 feet above sea level. In winter, the temperature fell as low as -30 °C at several places and the region is disconnected from the rest of the country. Population of Durbok is 852. An exponential increase in tourism has affected fragile ecology of Leh-Ladakh. Till 2005 the power requirement was fulfilled by state run diesel generators as it is not connected to the grid. In 2005, the **Ladakh ecological development group (LEDeG)** initiated solar project.

4.3.1. Mission

The aim of the cooperative is to increase the quality of life and capacity building of local institutions. The major challenges were no access to electricity, inadequate water supply, inefficient biomass burning, and harsh climatic conditions. To overcome these challenges potential of solar energy is assessed by local research institute. The goals of cooperative are as follows:

- Development and utilization of renewable energy sources,
- Ensure enhanced income to the community by identifying available natural resources, formation of SHGs, provision of training in income generation activities like handicrafts, eco-tourism, maintenance of solar technologies etc.

4.3.2. Organizational Structure

LEDeG, with technical assistance from one of the private developer TATA BP Solar India Ltd implemented the project. All the villagers were involved in the activities of the project. The power plant is now run and maintained by the REDCO; a cooperative society formed by local people in the village. REDCO comprised of general body members, the Power Management Committee (PMC) and the Board of Directors (BOD).

All the 392 households (up to May 2007) with electricity connection from the ten hamlets are members of the general body. Total fifteen BOD members are elected democratically. Eight of them are elected by the general members and seven members are Sarpanch (elected village head) of respective hamlets. PMC consists of seven members who were elected for three years and were involved in keeping a check on the misuse of electricity. The operator and maintenance are taken care of by salaried local youth. To become a member of the cooperative, a villager has to pay INR105 as membership fee.

4.3.3. Key Resources

The research done by LEDeG about sustainable energy sources in extreme climatic conditions acted as an intellectual capital to build up the REDCO. For the smooth operation and maintenance of the power plant in the initial years, the cooperative entered into a **'Comprehensive Maintenance Cost'** agreement with TATA BP for ten years. The comprehensive maintenance cost agreement included maintenance of the power plant by TATA BP, for which the cooperative had to pay 3 lakh per annum as fee. Local youth participated in capacity building program which now maintains and repair the solar PV system.

Funding Agencies:

- India Canada Environment Facility (ICEF), New Delhi
- Ministry of New and Renewable Energy (MNRE), Government of India, New Delhi
- Ladakh Autonomous Hill Development Council (LAHDC), Leh

4.3.4. Value Proposition

- Supply of electricity daily 4-5 hours
- Retrofitting of 135 solar houses using passive solar architecture or Trombe wall technology
- Distribution of 300 solar dish cookers
- Distribution of 500 solar box cookers
- Distribution of 630 improved smokeless Chullah (stove)
- Installation of five solar submersible pumps and five solar surface pumps
- Up-gradation and solarisation of 10 Community Health Centres

- Establishment of eight eco-tourism units at Durbok Laga, Mugleb, Spangmik, Tangtse.
- Formation and promotion of 12 women Self Help Groups for handicraft development.

4.3.5. Finance and Profit

The project got financial support from India–Canada Environment Facility (ICEF), Ministry of New and Renewable Energy—Government of India (MNRE) and Ladakh Autonomous Hill Development Council (LAHDC). The one-time membership fees for villagers is INR 105 and INR 50 per month for electricity consumption. The cooperative was able to generate revenue of about INR 0.34 million. The pricing of electricity was done in accordance to state government regulations as per MoU with PDD. The collection of payment was not an easy task as there is no fix income source for villagers.

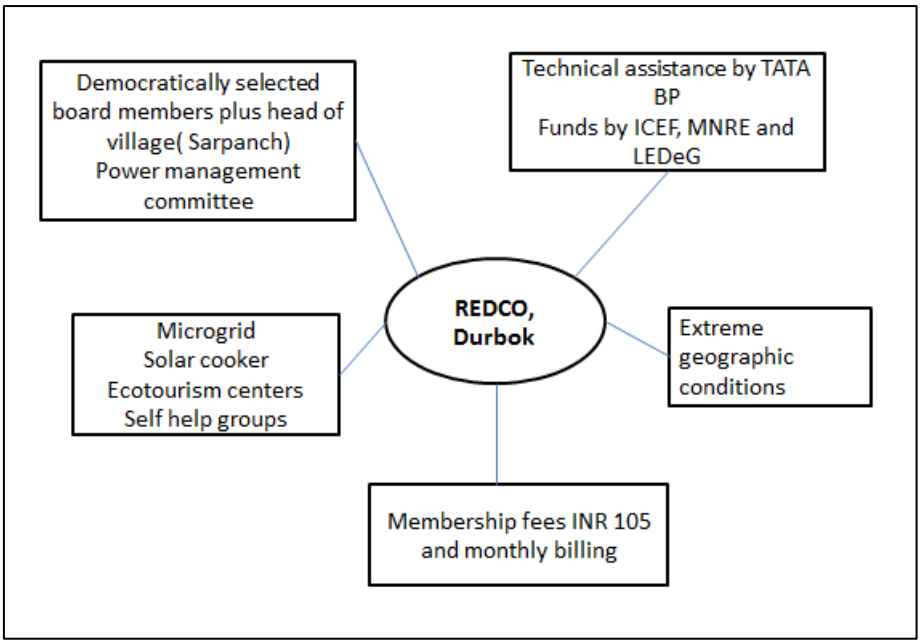

FIGURE 13:OVERVIEW OF REDCO

External Conditions	Description
Political	Collaboration of National and International and local agencies for

	natural resource management (MNRE, ICEF and LAHDC)
Economic	Low willingness to pay Diesel lobby in the area has influence on state utility
Social	High social acceptance observed but members lack knowledge and training in using electricity for socio- economic development. (Thinlay D., Personal interview on 2019, August 20). Awareness about not using heavy power consuming appliances and electricity theft
Legal	There is conflict observed between tariff charges by state government regulations and REDCO Subsidies did not consider extreme geographic and climate conditions The cooperative is registered under 'Jammu and Kashmir self-reliant cooperative act 1999'.

TABLE 14: EXTERNAL CONDITIONS REDECO, DURBOK

4.4. Sustainable Energy Cooperative Apeldoorn (dEA Apeldoorn)

Municipality of Apeldoorn is situated in the province of Gelderland, Netherlands. Small team of six people from Apeldoorn came up with an idea of sustainable generation of energy produced and consumed locally. The Municipality of Apeldoorn plans to become energy-neutral by 2020. This is a private initiative starting with the establishment of a foundation.

4.4.1. Mission

The objective was to set up a local sustainable energy company collaborating with the municipality and social partners.

“After' long deliberation, we gave that 'from and for' the form of a cooperative. With such an initiative you soon think of an association, with members and democratic decision-making. But from the outset we also wanted to operate in a business-like way and then a cooperative - an association that is at the same time a company and with members who are also owners - is the ideal legal form. " Michael Boddeke, director.

4.4.2. Organizational Structure

dEA is a cooperative, a non-profit organization. Anybody in the area of Apeldoorn can become a member. The organization consists of board, cooperative council members, implementation organization. Apart from regular members it has post of energy director appointed by municipality and voluntary energy coaches. The role of voluntary energy coaches is to discuss energy saving possibilities by visiting the members. It is democratically governed organization. DEA issue shares to stakeholders. Residents and companies in the municipality of Apeldoorn can become a member of the cooperative and / or purchase energy from the energy company. DEA developed a local energy company with 450 members and 800 energy customers in 2015.

4.4.3. Key Resource

The DEA Apeldoorn has Physical resources office space, solar panels, rooftop access to install solar, roof of schools. Primarily to facilitate smooth dialogue and optimum use of human resources co creation strategy is applied. To reach the consensus Delphi method was applied in group meetings. The method entails a group of experts who anonymously reply to questionnaires and subsequently receive feedback in the form of a statistical representation of the "group response," after which the process repeats itself. The goal is to reduce the range of responses and arrive at something closer to expert consensus. This led to the new idea generation from members. The Rabobank provided the office

space. Legal experts provided legal assistance for initial documentation to become legal entity.

Financial resources, On 1 July,2012 there were 163 members, who had undertaken to purchase participations to the tune of €455,000.

4.4.4. Value Proposition

- Supply of sustainable energy to neighbourhoods in Apeldoorn
- Crowdfunding from parents and families to install solar panels on primary schools and new housing projects.
- Car charging station
- A platform for the exchange of experiences, ideas and knowledge in the broad field of sustainability and energy

4.4.5. Finance and Profit

Initially there were 163 members, who had undertaken to purchase participations to the sum of €455,000. The aim is for at least 10% of all Apeldoorn households to become members of the cooperative. Members pay an annual contribution of € 25. In addition, each member purchases a minimum of 1 and a maximum of 100 participation certificate of € 50 each. The profit is reinvested in the projects by dEA. Dividend is not distributed . (Roamer M., Personal interview on 2019, August 29).

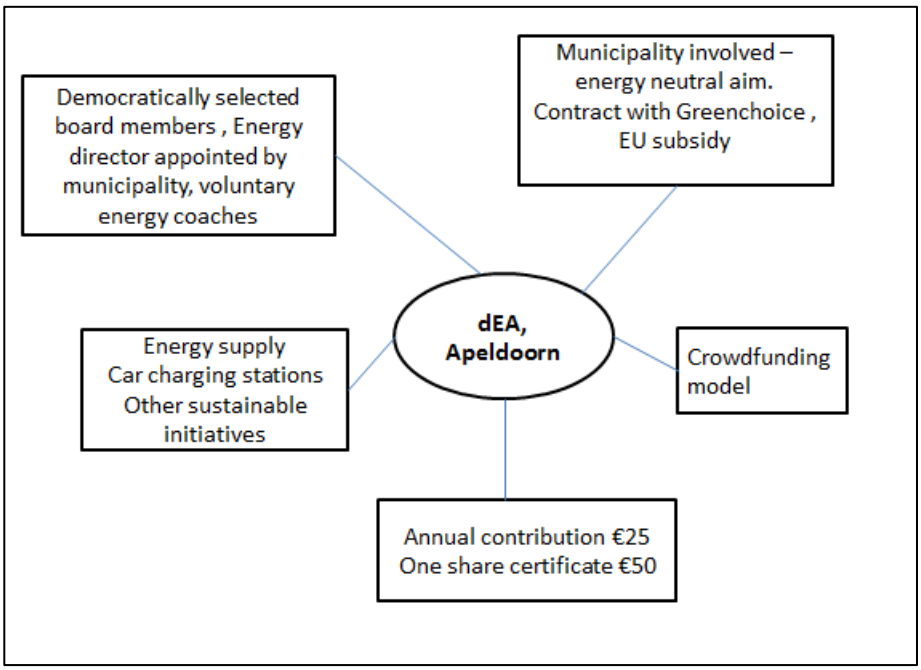

FIGURE 14:OVERVIEW OF DEA APELDOORN

External Conditions	Description
Political	Role of local municipality was important factor. The municipality has limitations on tendering renewable cooperatives. After a certain point RECs need to compete with commercial actors.
Economic	Partnership with Green choice as energy supplier. People want to become more sustainable, but are not often accepting that a higher price should be paid.
Social	Citizens showed a high level of awareness about sustainable energy and want to participate in energy transition efforts of municipality. The learning process played a crucial role in initial phases. Community bonding reinstalled with the “coming together” activities of DEA
Legal	From the European Union's ERDF program, a subsidy for this project “Robust and Co.” has been awarded for 2016-2018 by the EU and the province of Gelderland. DEA can receive a contribution up to a maximum of € 20,000 per year for improving the business cases. Regulations are still based on the classic model of permit, delivery and tax collection. Diederik Samsom said "Everyone can eat lettuce from their allotment garden, but generate their own sustainable energy, you suddenly have to pay all kinds of taxes on it!" Quoted by member of cooperative.

TABLE 15: EXTERNAL CONDITIONS – DE APELDOORN

4.5. DE Ramplaan

DE Ramplaan cooperative is situated in the city of Haarlem. Ramplaankwartier, a neighbourhood on the west side of Haarlem which - given its mix of pre-and post-war homes. DE Ramplaan is one of the first and largest project to use the new government policy for increasing local energy generation. Exact 1347 solar panels on the roof of the Fablo tennis hall in Haarlem provide power to more than 200 households in Haarlem.

4.5.1. Mission

A group of enthusiastic residents of the DE Ramplaankwartier in Haarlem decided in 2011 to work on making their neighbourhood more sustainable. Following objectives were set up. The idea of renewable energy cooperatives is spin off of Stichting (Dutch legal entity for foundation).

- Decreasing energy use by 12.5 % from 2012 onwards.
- Increasing the share of renewable energy technologies on private roofs.
- Improving the reuse/circularity of materials and products in the area.
- Researching the feasibility and applicability of sustainable techniques.
- Maximizing the percentage of engaged residents and local businesses.

4.5.2. Organizational Structure

The cooperative is led by a management board that consists of minimum three persons that are chosen by the member. The members can appoint a supervisory board that has the main task to supervise the work of the board and gives advice to both the board and the member. DE Ramplaan foundation conducts research regarding development of cooperative and, tries to raise awareness. The project was fully developed by a resident's initiative, united in the DE Ramplaan foundation. An intensive recruitment campaign was set up at the beginning of 2014. This consisted of residents' meetings, press communication, website, personalized letter to all neighbourhood residents. The

decisions taken in that meeting are decided based on the majority vote (50+1) with at least two third of the member presents. Then, the daily decision is taken by the board with certain cases which they must inform the supervisory board and the member Municipality of Haarlem, the network operator Allinder and legal specialists and residents of neighbourhood are the main stakeholders. Residents in the surrounding zip code area participate financially. Each member has equal voting rights in the cooperation regardless of the number of the share's ownership.

4.5.3. Key Resources

Firm Thoolen is the roof owner of the solar plant. He makes his roof available free of charge. Making the roof available free of charge is seen as an interpretation of the CSR (corporate social responsibility) policy. (Vijverberg J., Personal interview on 2019, August 20).

The Haarlem municipality supported this initiative through commissioning of a technical-economic feasibility study on alternative technology scenarios (High-Level Business Case Energiecoöoperatie DE Ramplaan). Coming together of motivated and experienced people who were already working in the environmental and energy sector is the intangible key resource. The cooperative finances the solar plant through the contribution of member capital as equity. The member capital was raised by issuing 1,600 certificates or participations, so-called Solar power parts.

4.5.4. Value Proposition

- Reduction in energy bill- energy saving
- Being climate neutral on the long term
- More people are shopping at the local grocery, or butcher, instead of shopping at a large national grocery store such as the Albert Heijn therefore money remains in the local community.

4.5.5. Finance and Profit

The solar park is 100% financed by private individuals. In the early phase (2012), the DE Ramplaan Foundation has received several thousand euros from Rabobank's sustainability fund to cover the costs of room rental and printing. Residents can possibly use a sustainability loan from the Municipality of Haarlem to finance the solar energy components.

- **Solar power parts**

  Members participate financially by purchasing 'Solar power parts'. A solar power part corresponds to the value of a solar panel: 325 euros. Members needs to purchase at least two solar power parts. Payback period with energy tax discount is 8-10 years.

- **Agreements with the energy supplier**

  Participants must switch to energy supplier Greenchoice (Vijverberg J., Personal interview on 2019, August 20). This supplies the solar power and the remaining part of the electricity with natural gas at favourable rates. The cooperative receives a small additional payment per customer. The combination of favourable rates and the annual remuneration to the cooperative contribute to the profitability of the project. The profit generated through favourable electricity rates and annual dividend.

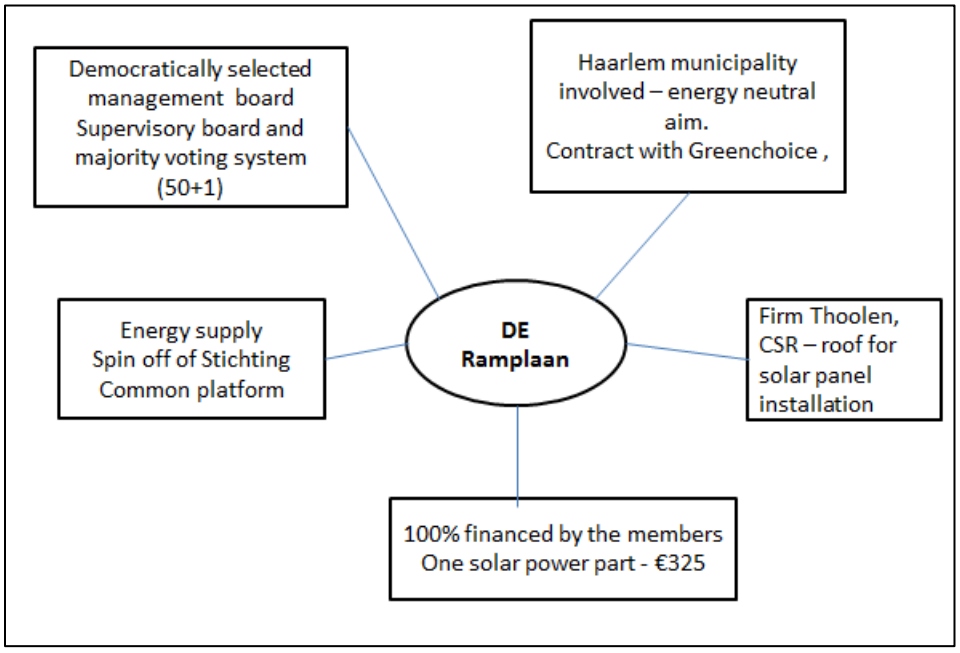

Figure 15:Overview of DE Ramplaan

External Conditions	Description
Political	Throughout the process the municipality of Haarlem was closely involved with both the Foundation and cooperative, both in funding and in expertise. Also, for member the solar panel investment could be refinanced by the government and paid back via a loan (Wattel 2016). The energy initiatives together lobbied for better regulations and discounted schemes for more than 5 years.
Economic	Higher middle class neighbourhood had no financial problem in investing initially in solar panels Contract with Greenchoice for competitive price
Social	The well-connected community already helping in forming organic cooperative garden. The people wanted to know from where their commodities are coming from including energy. Mouth publicity and meeting at public places to recruit member helped to enhance the participation
Legal	DE Ramlpaan is one of the first post code projects in Netherlands. The lobbying for better regulation resulted into the favourable post code scheme (Vijverberg J., Personal interview on 2019, August 20)

TABLE 16: EXTERNAL CONDITIONS – DE RAMPLAAN

4.6. Cooperative Haarse Sun UA

Haarzuilens has officially become a protected townscape on December 4, 2013, as a result of which many residents of the village are restricted in adapting their own house in the context of the townscape. Haarse Zon is a local initiative situated in Utrecht province. This protected landscape prevented residents from making major adjustments to their homes. The Haarse Zon energy cooperative decided collective installation of solar panels on roofs on the outskirts of the village.

4.6.1. Mission

The goal of Haarzuilens is Making village energy neutral. During a number of meetings in village hall people believed that 100% electricity needs can be met by sustainable energy. Protection of cultural heritage was aligned goal.

“We generate energy ourselves and organize meetings to stimulate sustainable energy and energy saving. This is possible because we have a group of enthusiastic and skilled volunteers”

4.6.2. Organizational Structure

The board is elected by members of cooperative democratically. The Board decides on the admission of new members. Only Members have voting rights in the General Assembly. Third parties who are not members of the cooperative, including those who financially support the Cooperative (sponsors) have no voting rights. Each member has a General Assembly one vote. Members are entitled to participate in person or by written proxy, to the General Assembly, to address the meeting and to exercise voting rights

4.6.3. Key Resources

The current solar panels are located on three roofs on the Thematerweg, including the country store De Haarse Gaard. Agreements have been made with the owners of these roofs to expand the number of panels. The intellectual capital of board members working in different fields like finance, communication and leadership had key role in an

initial stage. The coherence in decision as forty percent population of village participated in the Haarse Zon cooperative.

4.6.4. Value Proposition

- Sustainable energy supply without harming the cultural heritage
- Organizing meetings on energy saving.
- Informing members and residents to encourage, support and co-finance sustainable energy solutions
-

4.6.5. Finance and Profit

Haarse Zon issues 1000 certificates, so that each certificate is expected to yield around 212 kWh per year. Price per certificate. The price of a certificate is set at 220 euros. The Cooperative has no capital divided into shares You earn back the investment in two ways. Due to a lower energy bill: you receive a discount on the energy tax for your current share. This part is settled via your energy bill by your own energy supplier. For every kWh of 'own' solar energy you save 11.93euro cents 1, or approximately 25 euro per certificate per year (for 15 years).

FIGURE 16 :FINANCIAL FLOW OF HAARSE ZON

There are three financial flows: between the cooperative and the participant (one-time contribution, annual payment), between the cooperative and the energy supplier

(electricity sales) and between the participant and their own energy supplier (Source – Informatiebrochure Haarse Zon Fase 2 24 Mei 2019 944)

External Conditions	Description
Political	Agenda of being climate neutral by local governing body. Utrecht municipality supported Haarse Zon extensively
Economic	Contract with Greenchoice for competitive price
Social	Common consensus about making village energy neutral has great effect on establishing the cooperative
Legal	Uncertainty about post code scheme. The Expert Group's preference is a simple subsidy scheme with a subsidy per kWh or kWp, instead of the current energy tax exemption. The Expert Group will work out this preferred option together with EZK. More is probably known in the autumn of 2019

TABLE 17: EXTERNAL CONDITIONS – HAARSE ZON COOPERATIVE

5. CROSS ANALYSIS

In this section, the cross-case analysis of the six cases will be performed based on the findings of each of the individual case analysis. The comparison between cases will be done in the reference of intrinsic and external conditions discussed in conceptual framework.

The study acknowledges that there are major political, social, economic, cultural and size differences between India and the Netherlands, which make such a comparison both interesting and challenging. The aim of the research is to try to illustrate the opportunities and challenges for REC development. In order to find relevant patterns, key differences and key similarities idiographic case study method applied. The aim is to describe, explain, interpret, and/or understand a single case as an end rather than as a vehicle for developing broader theoretical generalizations (Levy J., 2008)

5.1. Intrinsic Conditions

5.1.1. Mission

In India the mission of cooperatives is to provide energy access and give minimum security of supply. Rural India is predominantly an agrarian based society. Improving living conditions, generating multiple supplementary businesses and thus opening new income avenues in rural areas are integrated aspects of the mission.

Netherlands REC are driven by the agenda of sustainable development, climate change and competitive prices. Consumption of energy domestically is another goal to be less dependent on a centralized system.

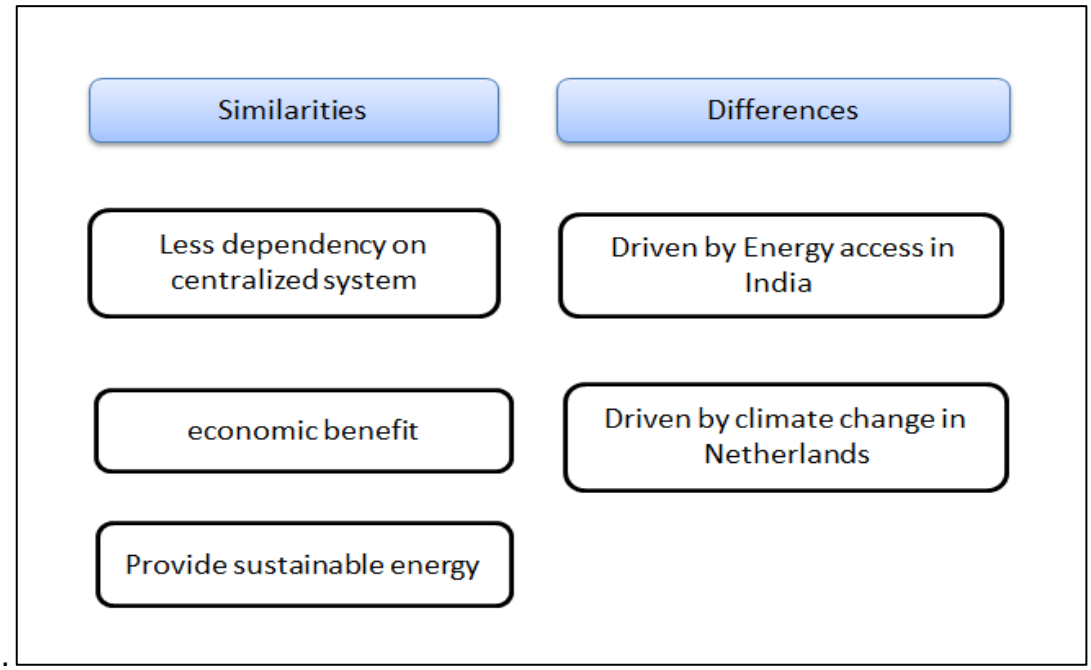

FIGURE 17: KEY SIMILARITIES AND DIFFERENCES IN THE MISSION

5.1.2. Organizational Structure

In case of India, it is commonly observed that only financial participation by members is not enough to invest in upfront cost, REC in India needs external financial assistance. The self-governance of REC in India has a distinct characteristic of local youth involvement. Board members can be the village heads but, in all cases, they are democratically elected. Collective decision making with the highlight of equal participation of woman members observed in one case. Sometimes there is need to appoint specific person to collect the payment.

In Netherlands the board is elected democratically. The amount of share does not affect the voting rights. Additional posts like energy coaches are created for energy saving strategies. Municipalities and energy supplier companies are closely involved in REC.

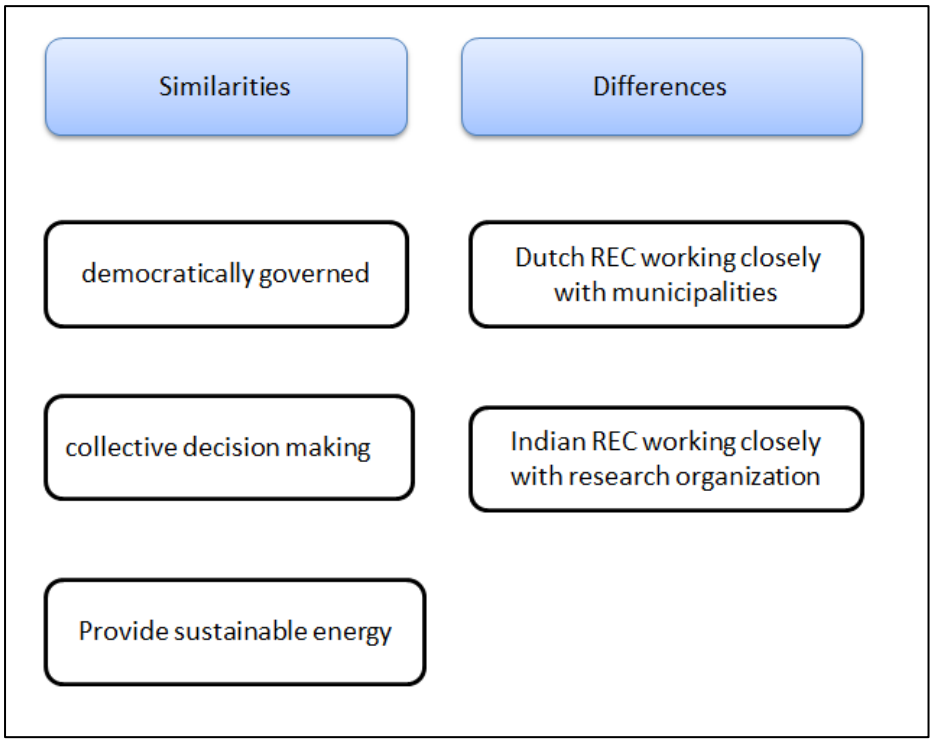

FIGURE 18: KEY SIMILARITIES AND DIFFERENCES IN THE ORGANIZATIONAL STRUCTURE

5.1.3. Key Resources

One of the important key resources in India is the availability of sunshine throughout the year. Well established cooperatives in agriculture and dairy sectors have helped to organize REC. MNRE, international funds, the CSR activities of private companies assisted financially. Demographic dividend of India helped for capacity building of local youth. Common platform of knowledge sharing and learning is not available in India.

In one of the cases of the Netherlands, mentioned earlier, a private company made a roof available for solar panels to boost positive image. The sustainability loan given by municipality, EU business case competition, subsidy and bank loans have eased the financial constraints on RECs.

The important difference between REC in India and Netherlands is intellectual capital. The members of REC in Netherlands are well educated and possess technical expertise. Umbrella organizations like Hier Opgewekt and REScoop have helped cooperatives for knowledge exchange and connecting with each other.

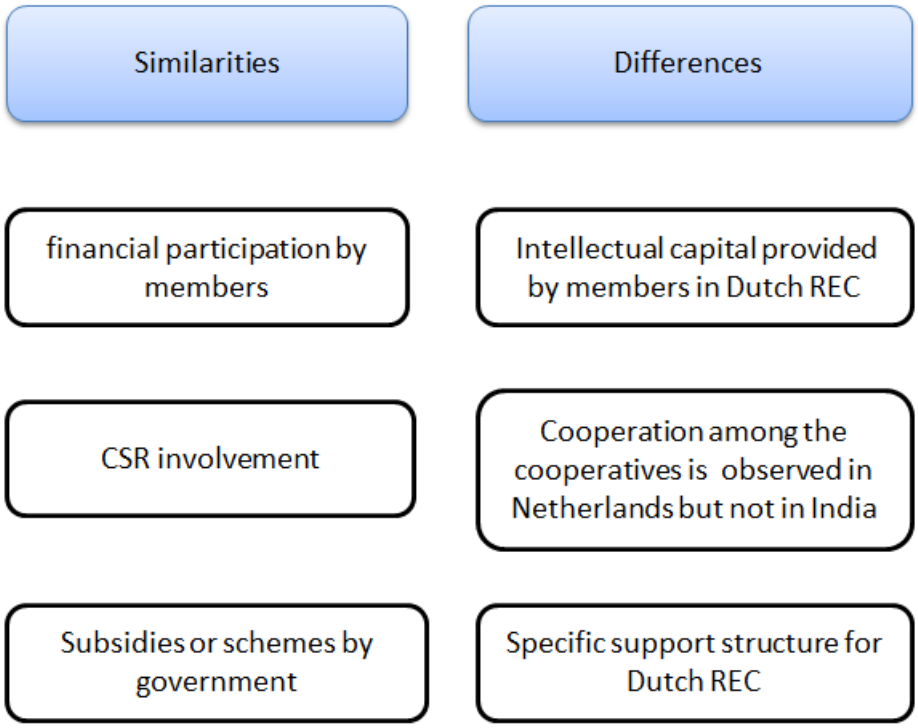

FIGURE 19: KEY SIMILARITIES AND DIFFERENCES IN THE KEY RESOURCES

5.1.4. Value Proposition

Fundamental difference between social structure in both countries has greatly impinged on value proposition offered by RECs. In both countries cooperative members benefited from attractive tariff rates. In Netherlands partnership with local utilities is prevalent.

Use of solar for different purposes like car charging, clean fuel, ecotourism centres is observed as an additional value proposition. The community spirit to organize REC and sustain by making positive business case is common factor in both of the countries.

5.1.5. Finance and Profit

In case of India, half of the capital is generated by citizens and other half need external assistance through MNRE, CSR or international organization who want to invest. PPA with local utilities are observed in India. Excess electricity is supplied to these local utilities and the cooperative member acts as a prosumer.

In the Netherlands the capital is generated by members of the cooperative. Although the Sustainability loan and other schemes have helped for upfront investment in infrastructure. Annual dividend is shared as a profit, except in one case no annual dividend policy is observed.

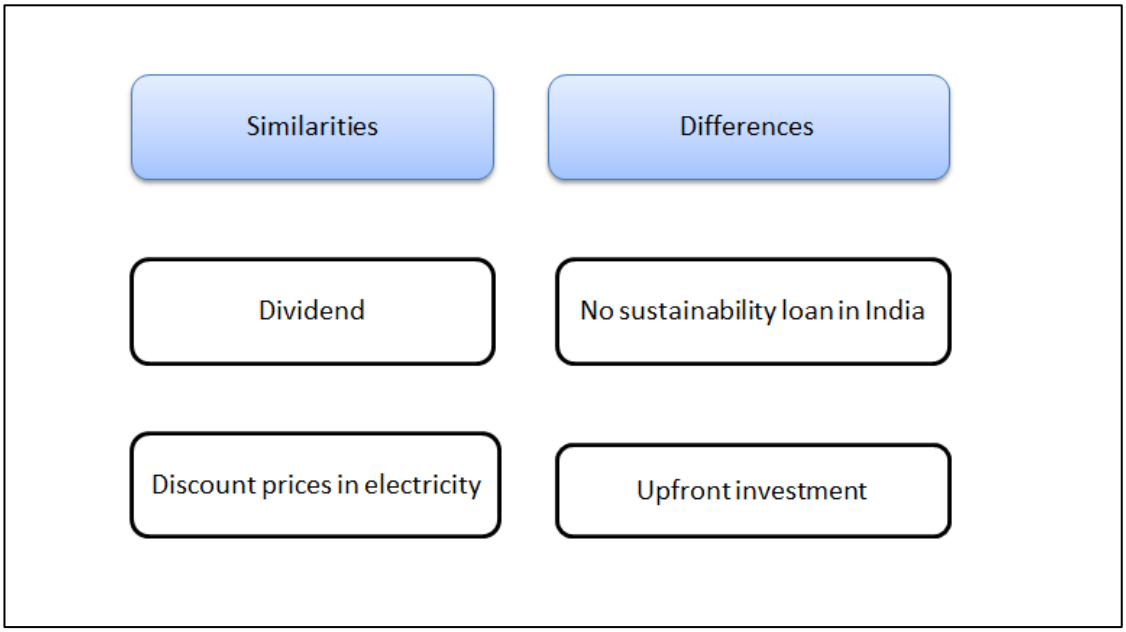

FIGURE 20: KEY SIMILARITIES AND DIFFERENCES IN THE FINANCE AND PROFIT

5.2. External Conditions

The external conditions played a significant role in the development of the business model in the initial stages. The business models of RECs in India and the Netherlands adopted themselves to adjust the external conditions. The high political will of municipalities in the Netherlands lead to cooperation between RECs, municipalities and energy suppliers. In India, municipalities or village authorities did not directly provide support nor the hindrance. The education and awareness level in members are an important factor for recruiting members. The Indian RECs struggled to gain recruiters because of less awareness about renewable energy technology. The Dutch RECs are primarily started by citizen who were aware of climate change and who knew how the technology works. The Indian RECs has extensive participation of youth due to India's demographic dividend. The capacity-building projects from research organizations helped local youth to gain knowledge about the maintenance and repair of renewable

energy systems. The Dutch RECs needed to invest in human capital. The members of REC dedicated a significant amount of time to establish the system at first. The maintenance is in the hand of energy suppliers.

Despite the differences listed above, the RECs in both countries adopted business models as per the policy changes on a national level. For example, the net metering policy in India and the Netherlands is ambiguous. not clear. Both the countries have high ambitions to deploy renewable energy and experimenting with different business models. RECs in both the countries led to the encouragement of local commercial activities. The local businesses and community spirit gathered like-minded people together for more sustainable initiatives.

The Fig 15. summarises key similarities and differences based on external conditions.

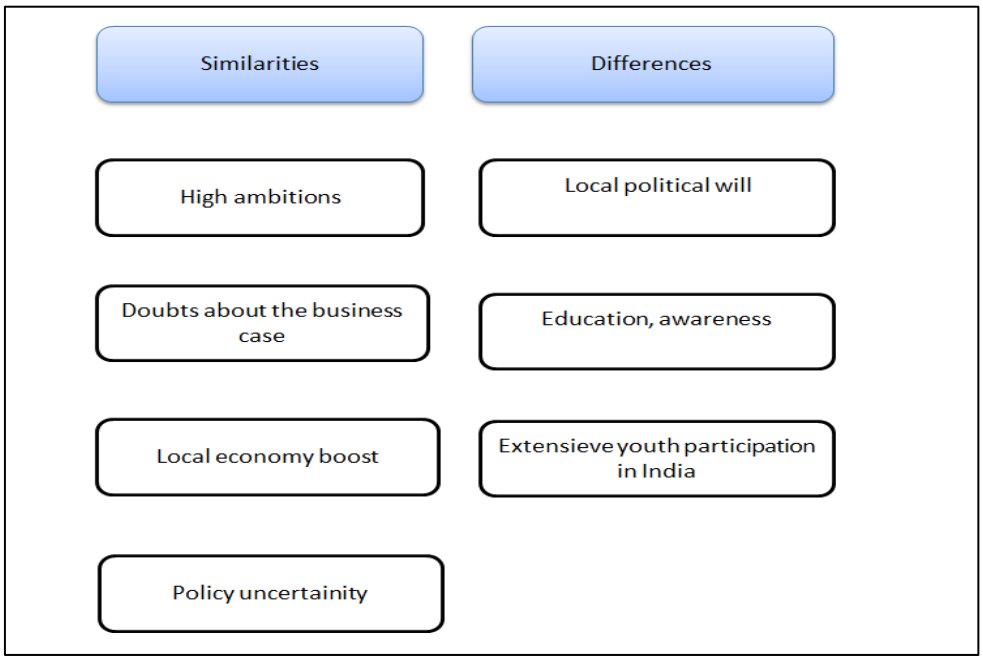

FIGURE 21: KEY SIMILARITIES AND DIFFERENCES IN THE EXTERNAL CONDITIONS

Intrinsic conditions	Dhundi Solar Pump Irrigators' Cooperative Enterprise (SPICE),	Gram Oorja, Darewadi village cooperative	Renewable Energy Development Cooperative (REDCO), Durbok	DEA Apeldoorn	DE Ramplaan	Cooperative Haarse Sun UA
Location	Dhundi, Gujrat, India	Pune, Maharashtra, India	Ladakh, Jammu and Kashmir	Apeldoorn, Gelderland, The Netherlands	Haarlem, North Holland, The Netherlands	Haarzuilens, Utrecht
Mission	Get rid of Diesel engines for water pumping Earn cash from selling excess energy to utility- cash crop	Access to energy in remote parts – off grid infrastructure Gender balance in decision making	Improve quality of life in remote part, harsh climatic conditions by using renewable energy source like solar	To establish 'from and for' the form of a cooperative Professional business-like operations	Make neighborhood sustainable Engage residents in local business	Climate neutral village without harming heritage landscape
Organizational structure	Extensively described members conditions Democratically selected committee One member one vote	Village trust of 7 members three females members compulsory Democratically decided Equal voting rights Should stay in village not someone who is working in city, commuting daily	Power management committee Board of directors Sarpanch, village heads are involved as board members Democratically governed	Anybody from Apeldoorn municipality area can become a member Extra posts of energy coaches and energy directors appointed by municipality	Board of directors elected democratically Members appoint supervisory board Decision are based on majority vote Intensive communication strategy	Board members elected democratically, Existing board of directors have control over new member participation
Key resources	Involvement of research organization Local youth Financial participation by members Funds from research organization	CSR activity of Bosch Local youth Coherence in decision Knowledge and capacity building by implementation agency Gram Oorja	Local youth Capacity building by Research organization National and international funding agencies Involvement of MNRE CSR activities	Financial ability of members to purchase participation certificate Smooth dialogue Time dedicated by expert volunteers	CSR motives of firm Thoolen made roof available for solar panels Educated and experience people in energy sector as members	Place outside village to install solar panels Private company involvement Common consensus

Value proposition	Leapfrog to solar pumping from diesel engine Income from surplus energy Less exploitation of ground water	Access to energy Security of supply Leapfrog from diesel to solar pumps Exposure to outside word through TV and cell phone	Energy access for 4-5 hours daily Good insulation methods Ecotourism centers Boost to local economy handicraft business Clean cooking fuel	Supply of sustainable energy Car charging infrastructure Open platform for citizens to discuss sustainable initiatives	Supply sustainable energy Revived local community business Energy savings Being climate neutral in long term	Sustainable energy supply Energy saving
Finance and profit	Financed by cooperative member and research organization fund PPA with local utility	Bosch invested upfront cost and recovered it from members Initiative is self-sustainable by current tariff but not viable business model to earn profit	MNRE, ICEF, local NGO and research organization funded the project Members pay monthly payment Not a viable business model in long term without any external funds	Financed by members Participations certificate by members Partnership with green choice as supplier in discounted rate Annual dividend	Financed by members Received Rabobank sustainability loan Partnership with Greenchoice Shares as solar power parts Annual dividend	Members raised money No capital divided into shares No dividend Nonprofit operations

TABLE 18: COMPARATIVE ANALYSIS OF CASES

6. CONCLUSION, DISCUSSION AND RECOMMENDATION

6.1 CONCLUSION

The energy transition needs to be accelerated. The bottom-up approach is getting attention in terms of effectiveness. Renewable energy cooperatives have proven to be an alternative to deploy renewable energy resources and meet the ambitious targets of respective countries. There is a need for considering social aspects in the business model of RECs. The research looks at the RECs business model from the point of view of intrinsic and external conditions. The research highlights the key challenges faced by REC in India and the Netherlands. With these statements, the main research question was posed as below

What are the challenges and opportunities for REC business models in India and the Netherlands?

The main research question was divided into several sub-questions that shapes the main question. These sub questions are answered below:

How can we describe the REC business model in India and the Netherlands?

India and Netherlands have significant difference between how RECs movements were developed. The defining RECs in both the countries needed some reference point. The study refers to international cooperative alliances' seven principles of cooperatives to assess the cases from India and the Netherlands. Indian RECs fulfil six principles. Cooperation among RECs is not observed in India which can have a significant effect proliferating REC movement. RECs in Netherlands fulfils all seven principles.

Cooperative Principles	India	The Netherlands
Voluntary and Open Membership	✓	✓
Democratic Member Control	✓	✓
Member's Economic Participation	✓	✓
Autonomy and Independence	✓	✓
Education, Training, and Information.	✓	✓
Cooperation Among Cooperatives	X	✓
Concern for Community	✓	✓

TABLE 19: ASSESSMENT WITH THE REFERENCE OF COOPERATIVES PRINCIPLES (ICA, 2018)

RECs in India is primarily the brainchild of local research organizations. Indian RECs are driven by personal motivation and mission to improve living conditions. Partnership with national and international agencies for financial support is a key financial resource for Indian RECs. The finance and revenue model of Indian RECs adopted as per the customer's needs. The customers are mainly consisting of people from rural or remote areas. The members involved in India RECs are unable to provide intellectual capital necessary to develop a viable business model. Indian RECs provide various services from being the supplier of sustainable energy to the clean fuel required for cooking. The diverse value proposition exploited efficiently in India RECs. The partnering with local government authority is not the striking character as it is observed frequently in Dutch RECs.

The REC cases in the Netherlands have partnered with municipalities. And also, the ambition of municipality to become climate neutral has aligned well with the mission of REC. The RECs in the Netherlands is founded in middle-class or upper-middle-class neighbourhoods. The key resources are intellectual capital from the members, financial capital in the form of shares and working hours dedicated to establishing a professional organization. RECs in the Netherlands made contracts with the energy suppliers that gave stability to the business model. The profit is shared among the members as a dividend.

What are the differences and similarities in the business models of REC in India and the Netherlands?

RECs are organizational, legal forms of cooperative business. The REC business models in India tend towards social enterprise with a profit or non-profit motives. The RECs in the Netherlands are aiming for professionally set businesses partnering with municipalities and utilities. The key activities and organization structure are same in both these countries, but the value proposition varies. RECs in India try to diversify the value proposition and needs of the customer. In India REC are mainly working on providing energy access to remote areas, in the Netherlands REC partnering with the municipality and local energy suppliers for economic and environmental benefits. The business models in both countries consider social value as of prime importance but at the same time cooperative are struggling to make robust business case.

To summarise the key differences and similarities generic business models of RECs in both countries visualized as below.

Generic business model canvas for India RECs

<table>
<tr>
<td rowspan="2">Key Partners

MNRE, national and international environmental agencies, NGO, regional research organization, social enterprises as implementation agencies</td>
<td>Key Activities

Supply of energy from sustainable energy source

Community development centers</td>
<td rowspan="2">Value Proposition

Reliable energy supply

Clean cooking fuel

Solar pumps for irrigation

Micro grid infrastructure

Supporting local commercial activities

Employment opportunities for youth</td>
<td>Customer Relationships

Energy community
Organized democratically</td>
<td rowspan="2">Customer Segments

Remote and rural parts of the country where grid is not reached

Bottom of pyramid customers</td>
</tr>
<tr>
<td>Key Resources

Human capital specially youth

Ample availability of sunshine all around the year

Land availability

Help from already established cooperatives from other sectors like dairy and agriculture</td>
<td>Channels

Maintenance of infrastructure by third party or by local people capacity building</td>
</tr>
<tr>
<td colspan="3">Cost Structure

The upfront cost is funded by mix of CSR activities or private companies, bank loans , MNRE funds, provincial funds and international agencies cooperation programs</td>
<td colspan="2">Revenue Streams

Monthly payment and one time fees for initial connection
Pay per use
Selling excess electricity to the local utility - prosumer model</td>
</tr>
</table>

Generic business model canvas for Dutch RECs

<table>
<tr>
<td rowspan="2">Key Partners

Municipalities
Energy suppliers like Green choice
Private companies</td>
<td>Key Activities

Supply of energy from sustainable energy source

Supply of heat</td>
<td rowspan="2">Value Proposition

Guaranteed sustainable energy supply

Achieving long term aim of climate neutral municipality/ village

Energy saving

Car charging stations

Community platform for sustainable initiates</td>
<td>Customer Relationships

Energy community
Organized democratically</td>
<td rowspan="2">Customer Segments

Middle class or upper middleclass neighborhoods

Participants aware about the climate change and want to do contribute in sustainable future</td>
</tr>
<tr>
<td>Key Resources

Financial capital by members

Intellectual capital by well-educated members

Common platform for cooperatives- learning process</td>
<td>Channels

cooperation with local energy supplier</td>
</tr>
<tr>
<td colspan="3">Cost Structure

The upfront cost is funded by the members. There is involvement of sustainability loan from municipality and other tax benefits</td>
<td colspan="2">Revenue Streams

Reduction in energy bill
Annual dividend shared</td>
</tr>
</table>

Dutch government promoted decentralized renewable energy generation. The political will, cooperation from local political authorities also play an important role in establishing REC. An extensive lobbying for favourable regulations had large impact on various policies. In India lobbying has negative connotations. The research organizations by different means convinced ministries and bureaucrats. In all cases there was no support, no hindrance from local politician.

India as a middle and low-income group country, cooperative members are unable to raise the capital. In the Netherlands it was not a big problem to raise the capital. Still in Netherlands the doubts about business cases of REC are raised frequently.

In the Netherlands a high level of awareness about sustainable energy technologies facilities pitching of REC. In India it took a time to make people trust of renewable energy technology. Community spirit revival is observed in both the countries. In both India and the Netherlands, an uncertainty in policies is observed. The ambitious target of renewable energy deployment affected because of such uncertainty. The various subsidy schemes played a crucial role in both countries. Netherlands REC tried to break away from subsidies and towards competing with commercial actors, but in India subsidy is necessary to thrive REC in Initial phases. The legal provision to establish a cooperative differs in every Indian state. In Netherlands the cooperatives are defined more clearly.

What challenges in front of REC business models in India and the Netherlands?

The empirical study identifies challenges for the business models of the RECs in India and the Netherland. The core challenge in both countries is sustaining the business case of REC. The policy uncertainty is another major external condition influencing the RECs business model. Following table summarises key challenges faced by the REC in India and the Netherlands

Key Challenges

INDIA	NETHERLANDS
• Policy uncertainty, high targets • Awareness among citizens • Extensive communication about renewable technologies • Linking energy with commercial activity of members to ensure reliable income source • Finance • Not self-sustaining the business model • Complex and bureaucratic regulations	• Policy uncertainty, high targets • Not in my backyard Aesthetic reasons • Availability of labour workforce • Sustaining the business model in long term • Recruiting new members • Competing with commercial enterprises • Complex and bureaucratic regulations

TABLE 20: KEY CHALLENGES IN FRONT OF INDIAN AND DUTCH RECS

6.2. RECOMMENDATION

The researcher wanted to explore the REC business models in India and the Netherlands specifically because of India and the Netherlands differs greatly in social, political, economic structure. The vast difference in external conditions stimulates business model innovation. The broader aim of RECs in both the countries is to provide energy from sustainable sources.

The cross-national dimension can give good insights about how RECs in respective countries can learn from each other.

- Organization and lobbying for better regulations - In India lobbying has negative connotations. The problem of corruption is another factor why lobbying is not looked with a positive outlook. In Netherlands founding members of REC has struggled to make regulations favourable for them.

- Collaborating with local energy producers' private companies/innovative start-ups - To break from niches, they need to compete with commercial players as like in Netherland. The partnership with start-ups and private companies can be a win-win situation for both parties.

- Well educated people can take this matter in their hands - It is frequently observed that the founding members of Dutch RECs are well educated. Most of them are working in environmental or energy related field professionally. It brings inherent intellectual capital. On the other hand, Indian RECs members are farmers with less literacy rate and awareness.

- The distinct feature of renewable energy cooperatives discovered during this research work, particularly in the case of India is optimum and efficient use of allocation of resources. As per the research study, Dutch RECs can learn this from India for their further productive functionality.

- The common challenges identified in both countries are about external conditions.
  Designing the favourable policy and eliminating uncertainty for longer time can be highly beneficial for becoming RECs mainstream.

- India lacks an umbrella organization like REScoop or Hier Opgewekt. The mutual learning process and common platform can give momentum to the Indian RECs growth.

In emerging economies like India an awareness about such technologies can be spread through education and training facilities. The use of demographic dividend is also another factor.

In Netherlands framework about partnership with municipalities and energy suppliers may give solid structure to business models.

6.3. DISCUSSION

Different types of methods were employed in order to construct the conceptual framework, empirical data was collected and results were analysed. In order to be as transparent as possible it is necessary to highlight certain issues that were encountered during the research. The most relevant constraints are discussed below.

Data Collection

In terms of limitations regarding the data collection, the sample size investigated was rather small. Netherlands has more than five hundred RECs. In India RECs are not defined exclusively but community energy as broader domain has more than a thousand initiatives. This had an influence on results. The research meant to first explore how RECs function in different parts of the world with different energy landscape. It cannot be stated for the whole population of cooperatives. The in-depth interviews provided new insights concerning business model.

The questionnaire based on conceptual model shared with both Indian and Dutch RECs. Due to vast differences some conditions did not make sense like gender role or trust. During the interview extra expansion would be given about the meaning of these conditions in the context of country.

The researcher studied three cases each from India and the Netherlands respectively. There is a significant difference in socio-economic conditions of both countries. In spite of great differences, the given framework can compare cross country analysis of business models, especially the social business models for deployment of renewable energy. The external conditions in Latin American countries like Brazil, Mexico and south east Asian countries like Indonesia, Vietnam are similar to that of India.

The Dutch REC movement is a part of larger European REC movement. It has a resemblance with the north western European countries like Denmark and Germany.

The comparative analysis between different countries can be done on the basis of economic structure, energy policies, intellectual capital of members and the way RECs are being financed. Different geographical conditions, remoteness of area have also contributed for an adoption of flexible business models.

6.4. Future Research

The contribution of this thesis has extended the academic knowledge in how RECs are working in underdeveloped and developed countries. Prior to this explorative study, no in-depth cross-national study was performed on the business models. Further research can explain biggest constraints in business models and why RECs are struggling to become mainstream. It could delve deeper into the external conditions policy making, institutional setting, role of social enterprises as implementation agency. The new initiatives related with peer to peer energy business model, smart meters the governance conditions coupled with technological advancement can give unique insights

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APPENDIX

Interview 1: Dhundi cooperative

Name and organization - Neha Durga, IWMI
Date – 25th July 2019
Time – 9:00 AM, CEST
Mode of contact – Skype

Interviewer: Can you tell the background of Dhundi cooperative?

Given a large number of workforces in India dependent on agriculture, the cropping system currently water-intensive. Plus, we don't use surface water, it is groundwater. All of these factors lead to energy-intensive irrigation.
Farming currently is not sustainable. There is no alternative income for farmers if farming fails. That's why the government is providing heavy subsidies in agriculture. It is not just in India, but it is the case all over the world.
The large portion of the subsidy goes for electricity in agriculture for irrigation so there has been a negative impact on groundwater which is well published. It is indicated that subsidies are detrimental to groundwater.
So now basically the idea was to leverage on the solarization Because anyway India is going to solarize very aggressively in Coming years both centralized and decentralized ways.
Rooftop is a very popular model in western countries, but it is not feasible in India due to different motivations, and I don't think rooftop is a good model for India because Utilities serve to subsidized customers and profitable customers. So basically, they cross-subsidize. They are in debt and again they will go into debt. Given that they are public utilities. There is a lot of inefficiency in the electricity sector because of state dependency. So that's why rooftop is not an attractive idea in India

So, we wanted to experiment and that is how we cooperate emerged. These farmers did not have an electricity connection, but they were planning to apply or the subsidized electricity connection.

Once you give subsidized connection to the farmer then it becomes a lifelong connection. It is attached to the land So till the time land is there in the name of some farmer the connection will be there and even if he sells the land the new owner can transfer the connection. The time till the land is agricultural there is no way to get rid of that subsidized connection Government somehow wanted to break this pattern.

Interviewer: So, was it the case of improper use of subsidies?

Yes. Government of India subsidized the solar pumps and has started promoting the solar pumps, so we thought why not to do it in a way they are connected to the grid and farmers can evacuate surplus electricity. So not just to give you farmers a solar pump but to solarize the existing connections. The broader idea on policy level was to solarize electricity connections in a way so the farmers use less electricity in pumping and the surplus can be sold to make additional income.

So, it's reverse psychology. Give them an opportunity if you had the connection then you have the entitlement to use subsidies to pump the groundwater but instead of using groundwater pumping you can sell that additional electricity to the government.

So, the farmers can use 1% of their land to install the solar panels and they sell excess electricity to the Government.

When they're getting paid the tariffs attached to the groundwater and act as an incentive for them to use less groundwater. and in return, they can get paid. Now the groundwater is priced but it is indirectly priced. It was expected that they will use less electricity they will cultivate less water-intensive crops. End of the day they will earn the additional income and, in the background, we can achieve our objective of solarization which is 175GW by 2022.

Dhundi is one of its kinds of case where first 6 farmers joined, later 3 more farmers joined and formed a co-operative. They started selling electricity by making a PPA agreement with the local utility. The farmers in cooperative have a small land portion (around one acre

each) so they use less electricity and sell more surplus electricity. When they saw an opportunity to earn additional income without going through the risk of traditional agriculture factors like rain, pest attacks, etc. they became more efficient.

So, this is a climate group kind of an opportunity for the Farmer. That was the idea and this is how farmers developed cooperatively with the help of IWMI and Tata. Several dignitaries visited this project and they found the potential in idea not only from farmers' point of view but utility point of view. Utility losses can be saved with this decentralized approach. With every farmer who is solarized, there is a lot of benefit to utilities that are the government. That's why it is a win-win situation.

Dhundi experiment worked well in the form of policy and now farmers are trying to establish bigger solar cooperatives.

Suryashakti Kisan Yojana by the Gujarat government adopted the Dhundi model and now upscaled it to the feeder level thing. Depending on the pump size there are 50-150 farmers, they can make cooperative on the feeder. Farmers can sell electricity individually also. We are experimenting where converting feeder level cooperative or individual farmer selling electricity which model works better. At the end of the day, all the farmers will sell excess electricity.

Interviewer: Who are the key stakeholders in the process?

The first thing is farmers, second is DISCOM owner of all the infrastructure like the grid and they will be buying from the farmers, contractors, and suppliers- they will be maintaining and installing the infra, state and central government, society and natural environment.

Interviewer: What is the Organizational structure of Dhundi cooperative?

There is secretory, chairman and general body. There is a design of a committee you need to follow. The executive body comes every two months there is meeting and specific meetings in the case of urgency.

Interviewer: Are the People elected democratically?

It's very small cooperatives only nine farmers, and nine more who don't have solar pumps, but they are part of the cooperative. Nine farmers they decided, after every two years there is an election for secretary and president. There are female members in the cooperative but none of them is the secretary. These women supported their husband's decision to participate in the cooperative.

Interviewer: What is the financial aspect and revenue model?

Read the revenue model in the Dhundi case it mentions in the brochure.

Interviewer: Was there any support from a local politician?

There was no support and no problem in local politics.
Interviewer - what are the key factors in the early stage? What you think are the key factors for upscaling such cases?
The local political support in the early stages will be helpful definitely. The research organizations presented their ideas to the bureaucrats and the government. I cannot call it lobbying, but they attract attention.

Interviewer - What are the challenges in the social dimension?

The lack of trust was a major challenge. Farmers did not see solar pumps before. They were reluctant if this technology will work or not.

Interviewer - How did you overcome it?

The small experiment is done by us on single farmers to see if the technology works. When other farmers saw it working then they started trusting it. Government using this experiment, prototype for education farmers. There was mutual learning between farmers.

Interviewer - What are the challenges you face in the economic dimension?

Initially, the project was funded by a research grant. Now there is a proper financial product that supports the farmers.

Interviewer - Did you face the problem of the skilled workforce?

We looked at it as an opportunity for capacity building in rural areas. Now farmers are trained to maintain and repair the solar pumps.
From the policy perspective do you think there is an inadequate legal framework for such.

Interviewer: What are the legal obstacles?

Legally there isn't anything much, no hindrance no support. It is still in the nascent stage, so they have not faced any legal requirement. They have formed a document. But I cannot call it a legal document. PPA with local utility is legal and an agreement was in place.

Interview 2: Gram Oorja, Darewadi

Name – Kiran Auti (Project manager), Anshuman Lath (Director)
[Text Wrapping Break]Date – 25th July 2019
Time – 1:00 CEST
Mode of contact – Skype

Interviewer: Can you tell the background of Gram Oorja, Darewadi?

Gram Oorja is a family-owned company, which operates without any institutional investment. It has associations with non-governmental organizations such as Pragati Pratishthan and the Sanjeevani Seva Trust. For its projects, Gram Oorja has partnered with Bosch Solar Energy AG, Sunlit Future, Smart Hydro Power, etc. and has received sponsorships from GIZ, Bank of America, the Prayas Energy Group, Shakti Foundation, ICICI Bank, etc.

Gram Oorja completed the Darewadi project in 2012. We chose Darewadi because the implementation process was easier as all the people in the village coherently cooperated. The billing is decided by estimating the annual expenses which includes battery expenses and other things.

Interviewer: What is the revenue model?

It is a different model for different projects. Every village has a village committee and every house has a meter installed. Every month the worker from committee measure the usage and they decided the fixed charge plus unit charge. Tariff and fixed charge are different. They are decided mutually between villagers.

Interviewer: The member of the village committee is elected democratically or Gramoorja appoints?

Gram Oorja doesn't interfere in the process. It is just insisted that the committee should be comprised of half of the female members. Villagers arrange meetings and decide who is going to be a member depending on multiple factors, for instance, someone is working outside the village then he is not an ideal candidate for the village committee. Sometimes local NGO guides the villagers. From the first meeting, we tell that there should be the participation of women in the process.

Interviewer: What are your key resources?

We have been trying to meet all the people who are interested in tribal development and remote energy access. it is a question of exposure to the project.

Interviewer: Is it profit-oriented?

So, as a business, we are profit-oriented. In our case, we generate profit only the case if we generate some impact.

Interviewer: Was there any local political support?

No. We just had no objection certificate from gram panchayat. They just took the support of gram panchayat to initiate the project.

Interviewer: How did you overcome the lack of trust?

There are two-three factors. In the case of Darewadi, they did not have light. They were reluctant to even after seeing the working solar panels. But when we installed poles like MSEB (Maharashtra state electricity board) a local utility, villagers started believing in us. Slowly villagers built up the confidence in the technology. One interesting case when there were cricket world cup match people from nearby villages also came to Darewadi to see the match. Exposure is a major factor in the success of Gram Oorja's projects.

Interviewer: Is there security of supply? 24*7?

We try to provide electricity for 24 hours. Not the commercial load but the domestic load is feasible. The committee monitors the connections and if someone is doing heavy usage then they warn that person. We have designed all the systems for commercial usage, there are flour mills active in Darewadi. There are fridge, TVs, agriculture pumps.

Interviewer: Was there a problem with the skilled workforce?

There was no problem with the workforce. Most people are socially minded like to do work in social enterprises.

Interviewer: What are the legal obstacles?

We do not use any subsidies. Regulatory wise India has mini-grid policy still in draft stage, but they acknowledge the project.

Interview 3: REDECO , Durbok

Name and organization – Mr Thinlay Dorjay
Date – 20th August 2019
Time – 1:20 PM, CEST
Mode of contact – Skype

Interviewer: Can you tell about the goal of the REDECO?

Mission was to completely power Durbok block by solar. Durbok consists of small hamlets. Before this, they were using diesel generators which had multiple problems like a shortage of diesel. During wintertime in extreme climate, it had limited capacity to support the system.

with this project, we aimed other complementary benefits in terms of livelihood, women self-help group, local product development. Ladies and youth were trained to new knitting techniques.

Interviewer: So, the aim was more than just supplying sustainable energy?

every member is provided a limited load connection. since people started using modern gadgets like a washing machine and freeze. we need to upgrade the system. but there was no upgrade.

Interviewer: What were the key resources?

It was private – private partnership everything was completely private, we have linemen from the government but everything else was a privately done.
During agreement time Tata maintained the system well even they managed to run the system with a full load. Once the agreement ended the system started having has some issues. After running for 10 years, the battery bank also came to the end of life. Ledeg kept some money for battery bank replacement. It was so expensive, we somehow succeeded to replace the battery bank. Infrastructure started crumbling. Now there is no scope from the government to upgrade the system. We invested in the capacity building of local people.

Initially, we had ideas to have some opportunity for youth and women, we can put some money in the system and upgrade but it did not work.

Interviewer: What are the flaws you observed in the business model?

Once the system was not completely able to provide the load the people started using the diesel engine again when back to the diesel. If we have planned to keep the future in mind the project would have been sustained. Another option was to sign the MOU with the government.
The increase in population and tourism requires a larger system. If we would have considered earlier picture would have different today.

Interviewer: Can you tell me about finance and profit?

Since its inception, REDECO never increased tariff. It is always INR 50 per month. The villagers were happy about it. The initial funding was provided by ICAF and the ministry of renewable energy.

Interviewer: What do you think about the external conditions? political factor?

Everybody supported the idea. The hill council supported some funds contributed by the local administration.
We observed low willingness to pay because villagers don't have a constant source of income. there are many points. The diesel generator has double the capacity of solar. People wanted to use all kinds of modern gadgets.

Interviewer: Was there a lack of awareness?

There was no incentive to organize this system, in the border parts of India people get many economic benefits because it is a politically sensitive border. Electricity is heavily subsidized.

Interviewer: Do you think the renewable cooperative in India cannot sustain because of the business model?

This kind of project needs huge funds to sustain. It was the biggest project in India when it started. I feel there are loopholes of not thinking ahead of the time. Planning for the next 20-30 years. Making a solid business case and then start the project. Currently, the Indian government's nodal agencies in Leh are focused on bigger projects like solar parks or wind parks.

Interview 4: DE Ramplaan

Name and organization – Mr. Jeroen Vijverberg, Bestuurder
Date – 20th August 2019
Time – 10:30 AM, CEST

Mode of contact – phone call

Interviewer: What was the goal when you started the coop?

The started coop with one goal only to get a solar panel installation and benefit from the postcode scheme. Before the coop, there was already a Stichting (foundation) in our neighbourhood It has a broader goal to promote renewable energy and energy saving. One of the ideas they developed about the solar panel roof, we thought that was realistic. they went out to look for the people e. They found five people initially. Our only mission was to get these solar panel installations in place.

Interviewer: Was there any specific aim?

The aim was to involve as much as people possible, we did not want to be a small project, we have around 1350 solar panels, we would not have been done the project if it was below 1000. The aim was to gather people and do something important together

Interviewer: What were the key resources? Financial?

We had nothing so there was a local government-sponsored feasibility study for Stichting. We did everything ourselves; we did not have any money at all. We had an agreement with Thoolen company and then we started collecting money by getting members. A lot of these people gave us money when many things were unclear
Interviewer: Do you have the concept of solar power parts to raise member capital? Can you elaborate on it?

Yes, we raised 1604 solar power parts. We specify one part to be equivalent to 250-kilowatt hours capacity. because in the beginning, we did not know what type of solar panels we will have so we decided this criterion.

Interviewer: Was there any limit on purchasing the solar power parts

Minimum was 2 but maximum has no limits but we advise people not to purchase more capacity than 80% of their usage, we have circulated on the website so people can use to get the optimum number of solar power parts.

Interviewer: Organization structure

We have five persons on board chairman, secretary, communication, technical and finance person. The management board was selected initially through a selection procedure now we have a program of withdrawal and we tried to find new people to replace. Supervisory board, we asked some people because they had long-standing merit in the energy business,
Small decisions are made by the management board, once a year we have a member meeting in which we explain financial results, this is also where decisions are taken. As we only have a small project, to be honest, there is not much conflict.
There are always few people who want to do more, put extra money try to find a new roof make extra solar panel installation but then democratically we agree that this is not the main purpose of our coop. once we start adding installation the process gets complicated.

Interviewer: Is it solely financed by the members?

Yes. We did not receive any funds, Stichting receives funds from Rabobank.
Only in the very beginning, the municipality did a feasibility study when the coop did not exist, the very early phase of the coop I think they paid for liability assurance.

Interviewer: Do you have an agreement with an energy supplier?

We had three agreements with them then we agreed with Greenchoice now. Now we are selling electricity to green choice. Before Greenchoice we had a contract with Quarrent but now Greenchoice acquired Quarrent so the thing is the same for us.

Interviewer: Was there any value proposition apart from supplying sustainable energy?

Like I said before stitching was already there so it kept starting new initiatives, insulate houses, repair broken things, drives electric cars shared by the community. But it originates from Stichting. Coop was a spin-off of Stichting. Coop has a function in the sense that people are proud to have more contact they know each other from the coop.

Interviewer: Can you tell me how you think about external conditions Was there political support or hindrance?

In the beginning, we were the first large postcode project so many things were unclear simply because it has never been done It was politicians' first time too so we have to lobby hard to make things clear and make this work. Because if there is no financial benefit from a project like this then people won't participate

Interviewer: On the national policy not in favour maybe but the municipality was closely involved?

The municipality was very positive about the project. They did not have a lot of money because Harlem is not a rich municipality so they won't do help.
We are surprised that we expected a lot of younger parents would be extra motivated to do something about the environment to live children in a clean world. But most of the members are older people who have a lot of money in the bank, low-interest rate. I don’t have any percentages but I think the majority of our participants are older.

I judge this based on people come to the yearly meeting. From the 216 members are 65 attend the meeting. elderly people have plenty of free time they attend the meeting.

Interviewer: Recruiting new members was difficult? did you face some awareness problem?

It was not easy in the beginning first 50% was easy. people who had knowledge about the project and thought it was great. First 50% joined quickly. but then it stopped. We did a lot of publicity we had information stalls in the supermarket. It happened slowly. we went around the surrounding neighbourhood. We had a goal not to do less than a thousand. it was not easy to get the last 20% of people.

Interviewer: In Legal section what do you think about regulations right now?

Lots of things hare clear now, there some fixed procure when you want to start a coop. there are some organizations like Hier opgewekt and REScoop. I don't see any hindrance there.
The biggest issue now is to find communities the motivation to organize the cooperatives is strong enough because a lot of people ask us to start a coop. Many times, they are idealistic people. Together with a sustainable world. But I| think that's not enough motivation. We had people who looked at it as a business case and developed the project. They recruited more business minded people to run it I think that has been a success factor.

Interviewer: How do you distribute profit?

We give a dividend. The board does not take any money.

Interviewer: What was the biggest challenge you think?

The recruiting member was an important part. The biggest obstacle was getting a business case. This has a relationship with the recruiting if you have an unclear business case then

it’s not possible to recruit people. If you say payback is 8 years but can be 12 years too then you can't convince people.

The other obstacle was the good relationship with the owner of the roof such a good relationship as they give a roof to use free. Benefit for them is that they did something back for the community in which they operate. They made a strong relationship with the community and municipal.

Interview 5: Cooperative Haarse Zon

Name and organization – Mr. Bert Nesselaar (Treasurer)
Date – 26th August 2019
Time – 15:00, CEST
Mode of contact – a phone call

Interviewer: What is the goal of Haarse Zon?

We have a project, we produce energy by the sun, people can take part in our project that means they need to pay for shares in the cooperative. that’s the way we finance our business. It's for and from.

Interviewer: What was the mission?

For green energy there are few options, you can start the project with subsidy, but you can also do what we do. The tax ministry has the rule of tax reduction scheme for sustainable energy producers, which means we can produce energy and people who take a share in our project can take revenue and there is the contribution of our partner Greenchoice.

Interviewer: Do you offer dividend to the members?

We have the meeting once in a year with members, then they see this financial picture. Then we decided what we can give to our members.t

Interviewer: Can you describe the organizational structure?

The counsel of members is the highest level in our cooperative and they decide everything. We as leader of the corporation makes an offer what is best to do and normally the members agree with that and that's the part of revenues for the member s and because of our model ruling with tax ministry that means people pay their bills of electricity and taxes on it. a part of taxes they get it back from the Greenchoice out partner because that's the agreement. That's also a kind of contribution from the government. If you want to know what it is in total, then members get a few cents from the profit payment and this moment they get

Interviewer: Does this project come under the postcode scheme?

Yes. that means we have different areas. all the surrounding areas can join the project. It's very much localized our mission was to be localized production and consumption of energy.

Interviewer: How do you make the decisions? is it a democratic process?

If you are a member it doesn't matter how much shares you own so every member has one vote. If you take part you have a right to vote, even if you take part. It doesn't matter how many shares you bought either its 250 euros or 12000 euros there is no difference.

Interviewer: Is there an upper limit to invest in shares?

You can buy a lot of shares but if you buy more shares than a certain limit then you won't get back energy taxes. The highest has 45 shares 250 euros each.

Interviewer: Can you tell me about the value proposition of the cooperative?

We have a plan to make the village energy neutral. We produce the same amount as we

consume. That's our most important reason we started the cooperative. We try to make more things in kind of saving energy in We are thinking about battery storage systems. This moment we only have installation running that's the first phase of the project because of some technical problems. After this solves, we can build the second installation in the second phase. The villagers have a platform to share their ideas.

Interviewer: What are the key resources?

Our village is historic. We can't install solar panels on our roofs. We have partnered with the companies just outside the village where the solar panels are installed. We use their roof and they get a little amount to rent the roof. we have an agreement for 25 years.
If you are going to start a project like this, you do with volunteers and it cost a lot of hours. Especially in the first phase of the project. It is impossible to start this kind of project without intellectual capital. In our group, we have people who are judge, people are good at talking with other people, financial man, communication man, etc.

Interviewer: Do the roof owners have shares in the cooperative?

They also take part in the project, but they are in the same position as other members

Interviewer: Was there any political support?

We are part of Gemeente Utrecht. Gemeente Utrecht is very enthusiastic about this kind of initiative. So we had great cooperation. We got money for the first phase of the project. They don't support the installation itself. You have to acquire the members and arrange everything.

Interviewer: What are the economic factors?

There was no conflict in villagers. We are in a little village and we know a lot of people. Normally in this kind of project, you get 1-2% of people from your area. But in our village, we got some 40% of total villagers as a member. That's a very high rate

Interviewer: Were there any legal conditions that affected your business model?

We get revenue from the energy tax reductions. The government every year changing the taxes and if the tax reduction is going to be zero then our members don't have a lot of revenues. If the government doubles the energy tax reduction, then our members earn something. There is discussion in Dutch politics to decrease the energy tax reductions and increase for gas. We will see next year. Then initiatives like us can get another kind of support so that we can maintain the same level of revenues. The government is always first that's the uncertainty for this kind of project.

Interviewer: Are you part of larger organizations like Hier Opgwekt?

No. we know the organization. We have been to the meeting every year.

Interview 5: dEA Apeldoorn

Name and organization – Micheal Roemer, Project manager
Date – 29th August 2019
Time – 13:300 PM, CEST
Mode of contact – face to face

Interviewer: Can you tell me the mission of Apeldoorn?

It was established by the former municipality member person who was not elected. According to him the energy transition plan on paper looked good but not practical. When he was not anymore in the municipality then he and some other people established dEA. The aim of dEA was to provide sustainable energy to 10% of Apeldoorn's population. Apeldoorn's population is around 158000.

We have two tracks one is Greenchoice supply energy and we have 4-5 different systems and we offer service. It started with solar panels. We have established collective solar farms also tried to establish a wind farm.

Interviewer: Are you registered as a cooperative or private company?

The dEA is corporation owned and governed by members. You pay each year 25 euros and share 50 euros and you are part of the family. Twice a year there is a meeting. In this meeting we discuss agenda and internal matters. Of course, there is governing body

Interviewer: Can you describe organizations structure?

Board is elected each year; people can opt for the second term. The energy director is appointed, and we appoint another member. The energy director is indirectly democratically elected.

Interviewer: Are the volunteer coaches being salaried people?

Our income is by selling energy and doing some projects. Sometimes we get an assignment by the municipality. My salary is paid on a contract basis. There are retired people who are sympathetic about the idea of dEA so they volunteer.

Interviewer: What are your key resources?

At the start, we have a lot of free time from people. Some resources from groups who are willing to participate. Rabobank liked this idea, so they offered a place for meeting
We got legal advice from the legal experts to process legal documents. We needed a few documents to become the legal entity. So, they said we would like to give our assistance for free. After you establish, we will charge something. We needed the money badly when we were started, we did not give payback guaranty so most of the shareholder it was term investment

Interviewer: Are there any limitations on how many shares you can buy?

Minimum you must buy 1, there are few people 20-25 shares. The average is 4-5 shares. The number of shares doesn't mean you have to say in decision making. One vote one person.

Interviewer: Can you tell more about Value proposition?

We exchange ideas with each other. we have a platform in the province of Gelderland. 5-6 times in a year in Arnhem we come together and discuss together different aspects of renewable energy. what do we do with solar panels? There are people with experience. It is provincial initiatives. Now the province decided to withdraw the funding which is quite shame.
We have heat network initiatives and we are actively engaged in improving insulations.

Interviewer: Do you distribute a dividend to the members?

No dividend. If we make a profit it's up to the annual meeting. We invest in infrastructure. Nothing goes to the shareholders. We don’t do it for money.

Interviewer: How do you see the external factors? politics?

We try to establish a good relationship with the municipality. We are now an official partner with the municipality. If you compare other cities there is a huge variation in collaboration.
First 5-6 years there was a lot of resistance to help us. Initially, there was scarce financial support then we got EU grant that was very helpful.

Interviewer: Local politicians were involved?

We have good connections with the municipality representative. Director is affiliated with a political party. Municipality bought shares in the solar farm as a gesture of goodwill to encourage other people.

Interviewer: What are the Economic factors affected dEA?

It is fair to say that the cooperative is made up of the upper class and the middle class. We have construction we give them a discount to lower-income class people. We offer them shares with discounted prices. They need to pay back in ten years. For some people its tool long, so most people don't buy. The economic factor is always an important factor. I want to support but what do I get. 2% of efficiency I want 4 %. If it's not profitable they don't buy it. Economic factors prevail before the climate change. For many people, climate change is a trigger, but everything boils down at economic factors.

Interviewer: What is a population sample?

The young people are underrepresented. They don't have the money to invest so many people in the 50s and 60s has majority shares. Some people are too old to invest some people are eighty years old.

Interviewer: How was the awareness level?

Well, I think it was not so much about awareness. Most people know something about climate change. But of course, they also know the windmill is high, noisy and there is a shadow. So, they resist. We try to explain to them how it works but I think people don't trust the municipality because in past municipality did promises but they never fulfilled so people are reluctant about top to bottom approach. When you present the project, you need to realize the people that they can have a part in decision making.

Interviewer: What do you think about Legal factors?

We have the benefit of the postcode scheme. The participants get a tax reduction. Our income comes from selling energy to Green choice. We have a contract for postal code project and normal electricity projects. It is long term contract. Each year we discuss are we satisfied with the Green choice?
Sometimes that happens legal development is lagging with policy development. once you decide to develop large solar then you also need a connection. It is different in timing in fixing the network for the future and people are already starting to develop solar farms. It should be entirely matched up.

Interviewer: Is there any plan to be a prosumer?

Now, we discussed with the municipality to get involved in with virtual power plant project. We are thinking of what we can do. We need people who can spend time working on it. Many people are hesitant about it. Energy for them is simple. You just receive the bill and pay it. The concept of selling energy to neighbors is complicated for them. Maybe I am skeptical about that. Next year we know chance of success.

Interview Questionnaire

- Can you please give us a brief description of the cooperative?
- Who initiated the foundation of the company?
- When was the company founded?
- What is the goal of the cooperative?
- What were the key resources?
- How did you recruit the member?
- Can you elaborate on organizational structure of cooperative?
- How did you raise the initial capital?
- Who are your partners?
- Is there involvement of CSR initiative by private company?
- What is member value proposition?
- What challenges did you face in the early stage of you cooperative?
- What do you see as the main challenges?
- How did these challenges affect your business model?
- What were the expertise/skills of the original and added people?
- Did you find skilled workers?
- Did you have to train workers?
- How did the national policies affect the cooperative?
- What are the social factors did you think were important to consider?
- Was there a political support for such initiative?
- Did you lobby for favorable regulations?