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Renewable energy and social entrepreneurship: a sustainable future for morocco

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Abstract. This research explores the potential to combine economic profitability and social benefits through social entrepreneurship in Morocco's renewable energy sector in a manner that fulfills energy needs with the generation of sustainable development. The qualitative method underpinning the data gathering from ten semi-structured interviews of renewable energy firms is utilized in a drive to pursue social, environmental, and economic objectives. The findings indicate that social entrepreneurship in the industry is not merely a question of a mere economic opportunity, but is more a powerful tool to build a more just, sustainable and more resilient energy future for Morocco.

The socio-economic effects witnessed are extensive and multi-faced, ranging from enhancing the level of living for populations to maintaining the environment as well as inducing the economic progress of the respective areas. The study provides actionable facts to renewable energy companies' managers in a position to harmonize social and environmental objectives with economic objectives, making clean and reliable energy accessible, Household electrification, economic activity development and accessibility of health and education services. Despite this, the study comes with some shortcomings such as sample size and the qualitative nature which could be augmented with a quantitative study. Conclusions from an extremely small sample of ten companies are followed by guidance for further research on a representative sample and in other developing economies, with replication over time and setting.

Keywords: Renewable energy, social entrepreneurship, sustainable development, social impact, Morocco.

1. Introduction

Morocco, like many other countries, faces an ever-increasing energy demand, estimated at more than 25% by 2040 according to the International Energy Agency (IEA), which makes the transition to renewable energy more urgent in order to meet this need while reducing greenhouse gas emissions [1]. In this context, Morocco considers renewable energy as a national priority. The country has abundant natural resources, including strong sunshine, areas suitable for wind energy and significant hydroelectric potential ("IRENA - Renewable Energy Prospects: Morocco"). In this context, Morocco has launched ambitious projects such as the Noor Solar Plan, aimed at producing a significant part of its electricity from solar [2].

The present article is an exploration about the interface of social entrepreneurship and the renewable energy field in Morocco. The primary aim is to demonstrate the potential of social entrepreneurship to generate dynamic social inclusion, economic viability, and enabling national

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energy transition policy. It outlines the opportunities and barriers found in the positioning of a social business to mobilize in this important sector. The article then demonstrates an analysis of social entrepreneurship as a potential response to these opportunities and challenges by analysing the strategies that Moroccan actors are using to achieve this dual goal: social inclusion and economic viability. The article is divided into three main sections: the first section analyses the energy context in Morocco, the second section analyses the potential of social entrepreneurship in this sector and the third section outlines recommendations to develop the potential of social entrepreneurship in renewable energy.

It should be noted that, unlike existing studies dealing separately with renewable energies or social entrepreneurship, this research proposes a cross-sectional and systemic analysis in Morocco, based on an exploratory approach. It evaluates the impact at micro (households, rural communities) and meso (territorial ecosystems) levels.

2. Literature review

In a world where the transition to sustainable practices has become an unavoidable priority, the association of renewable energies with social entrepreneurship is emerging as an essential vector towards a sustainable future for Morocco. We will try to examine in a first point, the importance of renewable energy in sustainable development, in a second point, Emergence of social entrepreneurship in the context of renewable energies and its impact

2.1. The importance of renewable energy in sustainable development:

The importance of renewable energy in sustainable development cannot be underestimated, as it is the central pivot to a greener, more resilient and prosperous future. We will first try to examine the current state of energy consumption in Morocco as well as government and policy initiatives [3].

Indeed, at present, understanding the current state of energy consumption in Morocco and the government and policy initiatives in place is crucial to understand the issues and advances in the renewable energy sector.

- Current state of energy consumption in Morocco

Morocco's population and economy are expanding steadily, which has raised the country's energy consumption considerably. Over the past 20 years, Morocco's energy consumption has increased by more than 50%, according to data from the International Energy Agency (IEA) [1]. The main factor driving this growth was the rising demand for power in the commercial, residential, and industrial sectors.

- Government and policy initiatives.

The Moroccan government has embraced a bold plan to expand the proportion of renewable energy sources and diversify its energy mix [4]. One of the main initiatives, the Noor Solar Plan, intends to establish a number of massive solar power plants throughout the nation. Morocco is increasing its ability to produce power from renewable sources by investing in wind energy in addition to solar energy, including significant wind farms like the Tarfaya wind farm ("IRENA - Renewable Energy

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Prospects: Morocco"). In addition, the regulatory framework has been adapted to encourage investment in renewable energy. Financial incentives and support mechanisms, such as guaranteed feed-in tariffs for electricity produced from renewable sources, have been put in place to attract investors ("The World Bank - Scaling Solar Morocco".

2.2. The rise of social entrepreneurship and its effects in relation to renewable energy

Due to its revolutionary potential, social entrepreneurship is becoming more and more popular in the dynamic renewable energy sector [5]. New insights are provided by this convergence of social entrepreneurship and renewable energy, which also poses important queries regarding its effects on social and environmental sustainability.

2.2.1. Social entrepreneurship concept within the context of renewable energies:

Social enterprises in this industry adopt innovative business models that combine financial sustainability with a strong social purpose: to deliver clean, affordable energy to poor communities [6]. The businesses aim to fight energy poverty while advancing local development and environmental stewardship.

In Morocco, some of the most important initiatives are Dreampower Maroc, which offers clean and low-cost energy solutions to remote rural communities through solar and wind technologies [7]. Similarly, Argan Energies a cooperative in the Essaouira region employs local resources such as argan trees to generate renewable energy, while generating jobs and environmental protection ("Moroccan Ministry of Energy - Argan Energies").

2.2.2. Environmental and local community effects of social entrepreneurship

Social enterprise in the renewable energy industry has substantial environmental and social contributions:

-Access to Energy: They enhance energy access in rural areas significantly, contributing to better education, health, and economic activity [8].

-Community Empowerment: System maintenance and project management training boosts local capacity and autonomy [9].

-Environmental Impact: By replacing dirty fuels, such projects reduce the emissions of greenhouse gases and conserve ecosystems [10].

-Economic Development: The establishment of clean energy generates job opportunities and favors local businesses [11].

2.3. Sustainable business models:

To create both impact and sustainability, social enterprises are beginning to develop innovative and flexible business models that integrate social missions with financial sustainability [12].

2.3.1. Revenue Based Sales Models (Pay-As-You-Go)

A few social entrepreneurs have devised solutions where users pay for the energy they use instead of purchasing expensive systems of infrastructure. These forms of payment schemes, referred to as “pay-as-you-go” make renewable energy more accessible to lower income groups [13].

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Social impact: Increases access to numerous communities who are usually left out of the green energy market.

2.3.2. Social Crowdfunding:

Social enterprises collect funds from the local population or socially minded investors through crowdfunding. This helps in collecting the required financial amounts while involving the locally within the given projects directly.

Social impact: Gives ownership of energy initiatives to the local community, hence driving further community participation [14].

2.3.3. Public-private partnerships:

The collaboration with government and other public entities enables access to financing, tax funding or amortization of preexisting infrastructure for the purpose of developing projects in renewable energy [15].

Social impact: These cooperatives lead to meaningful impacts on a larger scale.

2.3.4. Network or Franchise models:

A certain group of social entrepreneurs build franchise or network models of business by associating with local entrepreneurs in regions to provide energy solutions in different regions [16].

Social impact: This creates local economic opportunities and promotes the diffusion of renewable energy solutions throughout the country.

2.3.4. Franchise or Network Models:

Some social entrepreneurs create franchise or network models, contracting local entrepreneurs to implement energy solutions in various territories [16]. Social Impact: This franchise model provides opportunities for economic development at the local level and accelerates the adoption of renewable energy solutions in the region.

2.3.5. Value-Added Services:

Some companies not only sell electricity, but also offer some value added services like providing training, maintaining the facility, or supplying energy-efficient appliances [17]. Social Impact: These initiatives increase the skills of the people in the area and the quality of life of the beneficiaries.

2.4. Towards an integrated entrepreneurial ecosystem

Although the renewable energy sector offers big potential for sustainable development, social entrepreneurs working in this field typically experience unique challenges which inhibit their potential to scale impact and sustain long-term viability.

2.4.1. Strengthening the ecosystem: adaptation of the Isenberg model

Given the importance of entrepreneurship to economic development, it is important to understand the components of the entrepreneurial ecosystem to better understand its dynamics. The application of Isenberg's model in this context is therefore a relevant lens to examine the structure and strengthening of the entrepreneurial ecosystem for Renewable Energy (RE).

Table 1: Ecosystem of Energy Social Entrepreneurship in Morocc

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Pillar	Content Adapted to the Moroccan Contex
Policy	Subsidies, tax incentives, regulatory simplification
Financing	Impact funds, green microcredit, partnerships
Culture	Promotion of social innovation, valorization of local initiatives
Support	Incubators, support networks, university partnerships
Human Capital	Technical training, development of entrepreneurial skills
Markets	Opportunities through public tenders, international cooperation

2.4.2. Challenges for social entrepreneurs in the renewable energy sector:

Social entrepreneurs in the renewable energy sector face a series of particular challenges on their transition toward a more sustainable future that simply cannot be swept aside [18]. These challenges are presented in the following table:

Table 2: Key Challenges and Strategic Solutions for Advancing Social Entrepreneurship in Renewable Energy in Morocco

Challenge	Proposed solution
Access to financing	Development of impact investment funds, public loan guarantees
Regulatory Complexity	Simplification of licensing procedures, clear legal framework for energy cooperatives
Social Acceptance	Awareness campaigns, involvement of community leaders, demonstration of tangible benefits.
Technical Training	Certified training programs, partnerships with local institutions

2.5. Summary of previous research on social entrepreneurship and renewable energies

Despite this increasing interest in social entrepreneurship and renewable energies, the interaction of the two areas has resulted in a small number of empirical and theoretical studies in the last few years. However, it is the authors' belief that both fields are actually becoming hybrids that can reconcile social inclusion, environmental impact and economic viability.

2.5.1. International studies

Several international studies have pointed to the role of social enterprises in fostering equity in access to clean energy, particularly in marginalized areas. For example, [19] examined how social enterprises have changed energy market standards by designing inclusive and participatory models. They demonstrate that hybrid governance modes consistently allow for the more nuanced contextual adaptation of renewable energy projects and programs while balancing social and market-driven

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activities. [20], similarly, in their study on rural electrification projects in India, show that social enterprises are providing contextually-informed solutions, which included flexible pricing models, community participation, and low-cost technology innovations based on local specificities.

2.5.2. Research in the African

Context [21] study in sub-Saharan Africa, studies examined numerous initiatives to gain energy access through social structures. The findings indicate that these initiatives provide not only access to electricity, but living improvements (education, health, safety) and strengthen local economic self-sufficiency. Yet, it also exposes challenges such as financial sustainability, dependency on subsidies, and complex regulatory environnement.

2.5.3. Research on Morocco

When it comes to Morocco, there is relatively little work, although a number of institutional reports (World Bank, IRENA, Ministry of Energy) map the progress of the country around energy transition. The research of [22] emphasizes the potential of Morocco as a green energy hub in North Africa, but notes the absence of decentralized deployment models that fit into a social dimension. In addition, the "DreamPower Morocco" project, analyzed in a case study by the [23], is an archetypical example of social entrepreneurship for rural electrification. This case study highlights community participation, pay-as-you-go models, and public-private partnerships as key success factors.

2.5.4. Literature gaps

However, the existing literature is deficient in some areas:- A less sophisticated analysis of the economic models of social enterprises in renewable energy that are actually sustainable over time.- A lack of inter-regional comparison within Morocco to evaluate the applicability of models to local contexts (i.e., rural, peri-urban, mountainous, etc.). A growing demand for longitudinal studies that would analyze the longer-term impact on socioeconomic and environmental conditions.

3. Data and methods

In this empirical part, we enter the theoretical confrontation phase with practice. The literature review was committed to exploring scientific literature related to the two central themes of our research. We presented the data in a structured way to make the field analysis easier for us and establish the complete guide for maintenance covering all aspects of renewable energy and social entrepreneurship.

To answer our research question, we gathered a diverse sample of executives from Moroccan renewable energy companies, particularly those operating in various sub-sectors, including solar, wind and biomass.

We have completed this study with a direct observation of these enterprises through the collection of existing data. For the sake of fairness and objectivity, we have chosen not to consider the gender of participants, assuming that it has no significant relevance in the context of renewable energy companies.

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3.1. Data collection method:

For the execution of this research, a qualitative approach was privileged, focusing on the perceptions of the managers of Moroccan renewable energy companies in particular those operating in various sub-sectors, including solar energy, wind and biomass

Starting in November 2024, an exploration of companies operating in various sub-sectors, including solar, wind and biomass was launched, using various sources such as the internet, social networks, contacts within accounting and consulting services, and direct interactions with network professionals. Despite requests to about ten companies, a significant number chose not to respond and only a few agreed to participate, which is one of the main challenges encountered during this research.

The empirical basis of this study is based on semi-structured interviews with ten Moroccan renewable energy companies, especially those operating in various sub-sectors, including solar, wind and biomass. This interview guide focused on four major aspects:

-Economic models: Strategies adopted to ensure financial sustainability while integrating social and environmental objectives.

-Challenges: Main obstacles encountered in the implementation of these models.

-Impact assessment: Social, economic and environmental benefits reported by these companies.

Growth possibilities: plans for expansion and alternative solutions to solve the challenges in the future. Secondary data was also gathered from government reports, industry publications, and financial statements to augment the interview findings. The exploratory phase allowed studying of different social relations and organizational processes. Semi-structured interviews are a qualitative method involving the use of preplanned open-ended questions while allowing free exploration of participants' ideas [24].

As part of this study is to explore how social entrepreneurship in the renewable energy sector in Morocco can reconcile economic profitability and social impact to meet energy needs while promoting sustainable development. The semi-structured interviews were particularly useful for gathering detailed information on participants' perceptions of Moroccan leaders regarding the strategy adopted to ensure financial sustainability while integrating social objectives and environmental, Main obstacles encountered in the implementation of these strategies, social, economic and environmental benefits reported by these companies and expansion plans and solutions envisaged to overcome future challenges.

3.2 Data analysis

Thematic content analysis categorizes the responses into three main dimensions, namely: economic profitability, social impact, and environmental sustainability values of business models, financing mechanisms, and sources of income, electrification rate, job creation, and community empowerment; lacks reducing the carbon footprint, preserving natural resources, and improving energy efficiency, respectively.

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4. Results and discussion

The results of the interviews were systematically presented in tabular form, categorizing questions asked to respondents in order to compare responses and highlight similarities.

4.1 Cost-effectiveness and business models

The majority of companies surveyed are adopting innovative business models to ensure their financial sustainability while maintaining social objectives. Pay-as-you-go (PAYG) models and crowdfunding are commonly used to provide affordable energy solutions.

Table 3. Prevalence of Business Models in Renewable Energy Social Enterprises in Morocco

Business models	Percentage
Pay-as-you-go	60%
Public-private partnerships	50%
Social crowdfunding	
Value-added services (maintenance, training)	40%
Attijariwafa bank	70%

These models enable social enterprises to maintain their operations while ensuring energy accessibility for low-income populations.

4.2 Social impact and community development

The study shows how much social entrepreneurship has transformed the communities in Morocco. In rural areas, electrification projects have improved health services, educational outcomes and economic activities.

Table 4. Social Impact of Renewable Energy Social Enterprises in Morocco

Key Social Impact Indicators	Percentage	Observed Improvements
Electrification of rural areas	85%	of surveyed companies contribute
Increase in small business creation	65%	of companies noted economic benefits
Improved access to education	70%	of respondents reported positive effects

This provided summary illustrates that renewable energy initiatives led by social enterprises boost social benefits in Morocco. The data collected show that 85% of the surveyed companies help with rural electrification advanced in daily life. Moreover, 65% of these enterprises foster the creation of small businesses, consequently invigorating the local economies, while 70% of them say their activities had a positive impact on education access. Thus, in the practical sense, such products or renewable energy systems provide important benefits to local populations.

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4.3 Environmental benefits and sustainability

The deployment of renewable energy solutions contributes significantly to reducing Morocco's carbon footprint. The companies surveyed report a decrease in CO2 emissions and a reduction in dependence on traditional biomass.

Table 5. Environmental Benefits of Renewable Energy Social Enterprises in Morocco

Environmental Benefit	Percentage of Companies Observing It
Reduction in CO_2 emissions	90%
Decrease in deforestation	75%
Increased energy efficiency	80%

There is a table which shows how renewable energy initiatives in Morocco have severely affected the environment. According to the respondents, 90% report a decrease in CO_2 emissions, meaning they are helping mitigate climate change. Furthermore, 75% of companies stated that deforestation was reduced due to a lesser extent to traditional biomass usage. 80% of companies reported increased energy efficiency in the fighting for sustainable resource use with a displayed role of renewable energy.

4.4. Challenges and opportunities

While social entrepreneurship in renewable energy offers significant potential for sustainable development in Morocco, it faces several obstacles that hinder its expansion. These challenges, primarily related to high costs, limited financing options, and regulatory constraints, require tailored strategies to ensure the sustainability and growth of enterprises in the sector.

Table 6. Environmental Benefits of Renewable Energy Social Enterprises in Morocco

Challenges	Percentage of Companies Observing It
High initial investment costs	70%
Lack of financing options	60%
Regulatory and administrative hurdles	50%
Need for specialized workforce	55%

Table 6 Notice the key barriers for the creation of MOROCCAN renewable energy social venture Initial capital costs of investment are a significant barrier for 70% of the surveyed companies. Moreover, 60% of respondents cite financing options as a concern, while 50% name regulatory and administrative barriers. The final one is that 55%of companies have a shortage of skilled labor, meaning that training and workforce development must be strengthened in this sector.

There are numerous growth opportunities to foster the growth of social entrepreneurship in Morocco in renewable energy. They can use law systems, unsecured loan agreements, equity investments, and balance sheets among other contributions to drive projects forward, address common barriers to

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deployment, and identify areas of risk-sharing through long-term contracts, credits, and incentives. Moreover, government incentives like tax exemptions, grants and subsidies can spur investment in green startups, encouraging innovation and competitiveness. Technological improvements, such as higher photovoltaic efficiency and better energy storage technologies for solar and wind sources, will lead to lower production costs and a more reliable energy supply. These innovations leverage renewable energy generation to create or distribute energy efficiently, making renewable energy more responsive to a grids- or an end-users oftentimes real-time usage needs, making renewable energy more focus on underserved communities often passing by mainstream drivers of adoption for new or alternative energy sources. Building a skilled workforce one that supports and scales will also be critical through better training programs and knowledge transfer will also be key in building a skilled workforce to sustain and expand the sector's impact.

Recommendation and conclusion:

In short, renewable energy-focused social entrepreneurship is not only an economic opportunity, but a moral imperative in the fight against climate change. This is an important lever to creating a more just, sustainable and resilient energy future for Morocco. That will promote economic, social and environmental progress, and for shareholders, it is a shared responsibility that we encourage and support.

By reiterating the importance of continued support for these initiatives, this conclusion streamlines the potential of social entrepreneurship in renewable energy as a fabric that integrates energy and responsibility, and offers a call to action not only for social entrepreneurs but also to the Moroccan society in general.

Suggestions to promote further development:

Supporting policies: Financial incentives, subsidies and regulatory facilities for social enterprises working in this area can be designed and provided by the government.

This can be done by establishing tailored training and support programmes to enhance the entrepreneurial capabilities of stakeholders in the sector of renewable energy.

Jumpstart Public and Private Partnerships: Encourage the public sector to work with financial institutions and private companies to help fund social impact renewable energy projects.

This idea would slowly develop into a broad-based awareness campaign that will encourage responsible energy consumption and production, further promoting sustainable ways of obtaining energy.

Incorporating these suggestions and building on its positive ecosystem, Morocco can ensure the further sustainability of this momentum towards a sustainable energy future, and continues to drive innovation and positive social impact in the renewable energy sector.

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