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SOCIAL ENTREPRENEURSHIP IN DEVELOPING COUNTRIES: GREEN TECHNOLOGY IMPLEMENTATION TO PUSH LOCAL SOCIAL AND ECONOMIC INNOVATION

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INTRODUCTION

In most developing countries, a large part of the people living in rural and suburban areas do not have access to energy, drinkable water, and education, because provision is often too difficult and expensive. A valid solution to such a lack may be offered by renewable energy generation from non-conventional energy sources locally available (sunshine, solar radiation, wind speed, hydro and biomass). In addition to allowing poor people to have a better quality of life, an increasing availability of reliable and affordable green energy may be a key factor in the promotion of local social-economic development and, at the same time, in the global commitment to preserving environmental integrity.

In last decades, both development assistance agencies and private businesses have often failed in their attempt to foster sustainable development in rural areas through small-scale renewable energy production, mainly because of little technical performance, unsuitability for local environmental conditions and users' needs, limited institutional and commercial viability, and lack of suitable mechanisms for equipment maintenance.

Milestone literature considers social entrepreneurship to be able to face the challenge to create and manage adequate, affordable and reliable energy services in rural areas, thus fuelling a local sustainable development. Indeed, social entrepreneurship initiatives have emerged throughout the world as highly innovative businesses both in terms of services supplied and processes adopted, able to combine social value creation aims with market-oriented practices, even though some authors claim that a strong business-based approach as well as some egoistic thought may lead social entrepreneurs to tilt their focus away from social aims towards profit-making.

Many studies have strived to outline the key elements characterizing social entrepreneurship, even though little attention has been focused on how the organizations operating in the field above described should arrange and enforce their business model in order to be able to jointly pursue local social-economic development, environment protection and economic profitability.

After a theoretically-based discussion of the issues above mentioned, this paper presents the start-up case being experienced in South Africa by Greentecno S.A., a for-profit organization having headquarters in Switzerland and dealing in green technology solutions to be implemented in developing countries. The analysis has been specifically aimed at investigating how this company, once identified the main opportunities and challenges, has strived to arrange a business model considered to be suitable to foster social-economic development in rural areas, while ensuring environment protection and business profitability, thus achieving environmental-social-economic sustainability.

1. GREEN TECHNOLOGY AS A TOOL FOR PROMOTING SOCIAL-ECONOMIC GROWTH IN DEVELOPING COUNTRIES

Both the academic and business worlds are recently paying a growing attention to the field of green energy implementation in developing countries, which may effectively contribute to local social-economic growth while fostering global environment protection (Prahalad, 2004; UNDP, 2007).

More than half of the people living in the world's rural areas still has no access to modern forms of energy, because the transmission and distribution of fossil fuels-based energy is often difficult

and expensive. Local production of renewable energy is considered to be a viable alternative, given the relative high quantity of non-conventional energy sources available (AusAID, 2000; Farrell & Remes, 2009). Access to energy may play a crucial role in fostering local social-economic development, by ensuring a better quality of life and a more suitable framework for local entrepreneurship implementation and/or growth.

The increasing interest in renewable energies is also due to environmental concerns about global warming and air quality worsening, as well as to the lower costs of renewable energy technologies and their improved efficiency and reliability. In fact, while fossil fuels cause greenhouse gas emissions leading to global warming and air quality worsening, renewable energies generally cause no pollution. Furthermore, many different types of technology may be employed depending on location and application chosen: hydropower, windpower, biomass (forestry, crop residues, etc.), solar photovoltaic, solar thermal, marine (wave/tidal), geothermal. Donor countries and agencies have certainly become aware of the importance of *sustainability*¹ issues and are working to ensure that environmental considerations are integrated into the poverty reduction strategies of recipient countries (Strange & Bayley, 2008).

As pointed out by some authors (Martinot, Chaurey, Lew, Moreira & Wamukonya, 2002), in the 1970s and 1980s many development assistance agencies attempted to promote small-scale green energy production in rural areas, such as: biogas, cooking stoves, wind turbines, and solar heaters in developing countries. Nevertheless, projects were often considered to be failures because of little technical performance and unsuitability for local environment conditions and users' needs (stemming from an insufficient involvement of relevant stakeholders). They also suffered from little institutional and commercial viability, as well as lack of expertise, sustainable sources of credit, and suitable mechanisms for equipment maintenance. Indeed, small resources were generally employed in meeting maintenance costs and providing local people with the technical and managerial skills needed to undertake their own entrepreneurship initiatives. As a result, by the late 1980s, donors became disillusioned, while aid recipients began to view renewable energies as second-class technologies that developed countries were unwilling to adopt.

New forms of multinational assistance in the renewable energy sector were launched in the 1990s in accordance with the recommendations of the 1992 UN Conference on Environment and Development, also known under the name "Rio Earth Summit". Many projects have been designed and implemented to promote sustainable technology diffusion while removing barriers to local entrepreneurship development, even though sometimes expected outcomes have not been fully reached. The market of green technology implementation in developing countries is recently expanding and investment patterns are shifting away from traditional government and international donor sources to greater reliance on private firms and banks. Since the late 1990s private multinational corporations as well as domestic firms have been spending large amounts of money for renewable energy investments in developing countries.

¹ The term *sustainable development*, referring to a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs", began to gain wide acceptance in the late 1980s, after its appearance in "Our Common Future" (also known as the "Brundtland Report"), the result of a UN-convened commission created to propose "a global agenda for change" in the concept and practices of development.

By drawing on past experiences, forthcoming initiatives aimed at fostering a sustainable development in rural areas through green technology implementation, are expected to avoid:

- unsuitability of technologies used for local environment conditions;
- failings in meeting target community's needs;
- low implementation quality;
- scarce attention to maintenance and sustainability issues;
- focus on technical and financial issues rather than on social ones.

Furthermore, when operating in developing countries, great attention should be paid to the local contextual forces, which tend to create a distinctive set of challenges and dynamics: abrupt and radical political shifts, frequent economic crises, low wealth levels, unfair income distribution, constraints to resource mobilization, limited institutional capabilities and scarce human talent pool (Austin, Gutierrez, Ogliastri & Reficco, 2006).

2. BUSINESS IN SERVICE OF POOR: CONTRADICTIONARY VIEWS

Recent studies (Seelos & Mair, 2005, among others) have pointed out that many *socially-oriented entrepreneurs* (Molteni, 2004) have developed business models directly and positively impacting on the accomplishment of Millennium Development Goals - MDGs, which comprise eight specific objectives² for development and poverty eradication by 2015 (United Nations General Assembly, 2000). In particular, a growing number of initiatives is being launched in the sector of green technology implementation in developing countries, with the aim of contributing to improve rural people's quality of life, while pursuing environment protection and profit generation. These initiatives may well be included in the realm of social entrepreneurship that, as remarked by some authors (Austin, Stevenson & Wei-Skillern, 2006; Trevis Certo & Miller, 2008; Simms & Robinson, 2009), just involves the recognition, evaluation, and exploitation of opportunities to increase social value, as opposed to personal/shareholder wealth. This implies that the welfare of a given human community should be pursued, by meeting basic and long-standing needs, such as food, energy, water, shelter, education, and medical services.

Actually, "social entrepreneurship" concept has not been fully defined yet and its boundaries still remain unclear (Dees, 1998; Mair & Martì, 2006; Noya, 2009). Indeed, as remarked by Defourney & Nyssens (2008), the international literature has provided a large number of definitions referring to a wide spectrum of initiatives ranging from voluntary activism to corporate social responsibility. Some authors have also pointed out that organizations, by acting as *hybrids*, may pursue both commercial and social objectives by combining them in several ways (Davis, 1997; Austin et al., 2006; Nicholls, 2006; Trevis Certo & Miller, 2008). However the term social entrepreneurship may be referred to "the development of innovative, mission-supporting, earned income, job creating or licensing, ventures undertaken by individual social entrepreneurs, nonprofit organizations, or nonprofits in association with for profit" (Pomerantz, 2003: 25). So, as pointed out by some authors (Peredo & McLean, 2006, among others), social entrepreneurship is exercised by people who:

- aim at creating social value, either exclusively or at least in some prominent way;
- show a capacity to recognise opportunities to create social value and take advantage of them;

² They are: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; develop a global partnership for development.

- employ innovation (ranging from outright invention to adaptation of somebody else's novelty) in creating and/or distributing social value;
- are willing to accept an above-average degree of risk;
- are relatively undaunted by scarce assets in pursuing their social venture.

Nevertheless, sceptic views have emerged on the matter. According to Zahra, Gedajlovic, Neubaum & Shulman (2008), the strong business approach needed in *sustaining social value creation* (Alter & Dawans, 2006) may tilt social entrepreneurs' focus away from social aim toward profit-making, thus shifting services away from people really in need, to only those who can afford to pay, or denying services to people who are too costly and/or difficult to be served. Eikenberry & Kluver (2004) claim that a strong emphasis on entrepreneurial orientation can cause the reduction, or even the abandonment, of the programs having uncertain outcomes, slow progress, or success rates difficult to be measured. So, according to them, instead of producing the expected change, entrepreneurial orientation may lead to have a number of potential clients marginalized, with basic needs un-served, or to force someone to pay more for allowing someone else to obtain services at a lower rate. According to Peredo & McLean (2006: 62), "only ventures willing to accept a significant reduction in their profits as a consequence of their pursuit of social entrepreneurship" should be considered to be social entrepreneurship initiatives. Furthermore, some authors (e.g. Longnecker, McKinney & Moore, 1988) have critically remarked that social entrepreneurs, while being driven by an ethical desire to improve communities and societies, may also be affected by some egoism leading them to undertake unethical practices in the conviction that any action aimed at fulfilling their aims/ambitions is ethically justified.

With specific regard to the bottom-of-the-pyramid (BOP) approach, Karnani (2008) considers the view of the poor as "resilient and creative entrepreneurs and value-conscious consumers" proposed by Prahalad (2004), to be empirically false, due to:

- too little emphasis on legal, regulatory, and social mechanisms aimed at protecting poor people, who are vulnerable consumers;
- over-emphasis on microcredit and under-emphasis on fostering modern enterprises that could provide employment opportunities;
- BOP proposition grossly under-emphasizing the critical role and responsibility of the state for poverty reduction.

According to Karnani (2008: 4), "this romanticized view of the poor does not help them, and actually harms the poor".

Against the above mentioned criticisms, social entrepreneurs are expected to really act as *change agents* (Dees, 1998), by:

- adopting a mission to create and sustain social value;
- recognizing and relentlessly pursuing new opportunities to serve their mission;
- continuously engaging in innovation, adaptation, and learning;
- boldly operating without being limited by resources currently in hand;
- exhibiting a heightened sense of accountability about outcomes.

Indeed, real social entrepreneurship initiatives should be based on three key factors (Skoll Centre for Social Entrepreneurship, 2007):

- *sociality*, whose notion entails a context, process and/or set of outputs that might be reasonably considered to be of benefit to community;
- *innovation*, that refers to the creation of new ideas and models addressing social or environmental issues (development of new products and services, use of existing goods and services in new ways, reframe of normative terms of reference to redefine social problems and suggest new solutions);
- *market orientation*, that refers to a performance driven, competitive outlook also leading to accountability and co-operation across sectors.

3. GREENTECNO CASE

This study profiles and analyses the business model developed by Greentecno S.A., a for-profit organization having headquarters in Switzerland and dealing in green technology solutions to be implemented in developing countries in order to contribute to the accomplishment of a local sustainable development.

3.1. Research methodology

Moving from the theoretical propositions³ and rival explanations formulated by the international literature, as outlined above, this study has strived to investigate how for-profit organizations intending to implement innovative green technology solutions in developing countries may arrange and enforce a business model allowing them to effectively pursue rural communities' social promotion jointly to environment protection and profit generation. In order to address the research purpose, which is based on a "how-why" question, case study strategy was applied (Stoecker, 1991; Yin, 2003), by identifying "case" with the process leading for-profit organizations to arrange and enforce a business model considered to be suitable for operating in the field of green technology implementation in developing countries with the aim to foster local social-economic innovation, while pursuing environment protection and profit generation. Given the complex phenomena, long-term dynamics, and difficulties in access affecting the field, an explorative research approach aimed at gathering propositions rather than testing hypotheses was chosen (Yin, 2003).

Greentecno's start-up experience was considered to be a *representative case* of the process attended to. It was analysed by using a detailed protocol of research in order to have *replicability* allowed. The study is based on qualitative data stemming from a combination of interviews and document examination. This procedure was aimed at enhancing confidence in the findings through *data triangulation* (Patton, 1987; Eisenhardt, 1989). Two rounds of in-depth interviews were carried out with Greentecno's managers. The first one was aimed at defining research goals, topic questions and suitable methods, once gained an overview of Greentecno's profile, with specific regard to its organization, areas of activity, opportunities and challenges, expected impacts. After that, some documents were collected from Greentecno's managers and website, as well as from international development agencies and public institutions' sources. Greentecno's business plan and financial biz plan, on the one hand, and company and product presentations, on the other one, were particularly useful. The second round of interviews was aimed at verifying

³ Theoretical propositions offer a "hypothetical history about why acts, events, structure, and thoughts occur" (Sutton & Staw, 1995).

the correct understanding of the documents previously examined, as well as at gathering further specific information about organizational mission and culture, strategies and management practices, social and environmental impact assessment, thus ensuring validity for the whole data interpretation process.

The case has been described and analysed in several sections, by using a narrative account with the addition of graphics and tables. Once profiled Greentecno's culture and activity, the approach used in designing products technically suitable for local environmental-social-economic conditions has been analysed. Then, attention has been focused on the decision-making process leading the enterprise to positively evaluate the opportunities offered by South Africa political and socio-economic frameworks for starting implementation. Finally Greentecno's commitment to pursuing environmental-social-economic sustainability has been profiled.

Despite the great complexity of the matter, an holistic approach to the case has allowed to uncover specific determinants and patterns about the arrangement and enforcement - in case of green technology implementation in developing countries - of a business model aimed at fairly combining the three entrepreneurial dimensions - environmental, social, and economic -, thus ensuring environmental-social-economic sustainability. Anyway, being based on a single-case study, the analysis has been aimed at formulating merely *sensitizing concepts* allowing to foster future researches on the matter in order to finally achieve *definitive concepts* (Blumer, 1969; Cardano, 2004).

3.2. Greentecno's profile

Greentecno S.A. is a business company based in Chiasso (Canton Ticino – Switzerland) and operating in the renewable energy sector. It has been set up in 2006 within Solar 3 S.A. Group, also comprising TC Systems S.A. which is leader in information and communication technology in Switzerland.

Vision and philosophy

Greentecno claims that it is envisioning a world where everybody can satisfy his/her basic needs while having the chance of developing the skills allowing him/her to give his/her contribution to his/her Country's development and well being.

Specific attention is being paid to three main emergencies:

- the lack of drinking water, publicly recognised as one of the main sources of political instability and, at the same time, the cause of huge social dramas (one child is estimated to die every 30 seconds for problems related to the lack of safe, drinking water);
- the lack of an effective educational system and of educational tools (due to social, political and organizational factors), considered to be one of the major factors preventing most developing countries from obtaining a sustainable development;
- the lack of access to modern and sustainable electricity, being a widespread issue in most developing countries, particularly in rural and remote areas where electricity grids are not likely to arrive due to logistic and financial unviability.

Greentecno bases its corporate philosophy on two concepts: "3-P" and "3-E".

The "3-P" concept refers to company's engagement in paying joint attention to:

- *people*, whose needs are expected to be at the basis of every business initiative;
- *planet*, whose needs should be always taken in account in order to not undermine people's future;
- *profit*, that allow the enterprise to satisfy its primary needs and positively impact on society.

The "3-E" concept refers to Greentecno's goal to demonstrate the viability of a business strategy based on both soul and rationality, that jointly pursue people's development, world's sustainability and the wellness of the company and of its employees. It comprises: *ethics, ecology, equity*.

Mission

Greentecno's mission is to design, build and commercialize equipment and concrete solutions for electricity generation from renewable energy sources, production of drinkable water, and provision of primary education in developing countries.

In order to pursue its mission, it has developed three parallel projects – Energy, Water, and Education – which, even if can be considered and purchased individually, have been designed to be integrated in a single package providing clean energy, drinkable water and education to rural communities in developing countries and emerging economies.

Its innovative business model allowed Greentecno to receive the "2007 European Renewable Energy Entrepreneurial Company of the Year Award" by the London based growth partnership company *Frost & Sullivan*.

3.3. Social-environmental issues addressed in designing products

Greentecno has designed three products addressing the lack of access to reliable and sustainable electricity, drinking water, and educational tools, affecting a large part of population in developing countries, particularly in rural and suburban areas.

LWH_1000_GOGO

In several areas of developing countries, expanding the existing electricity grid may seldom be a viable solution due to both financial and operational reasons. Great distances from the main grid, critical logistics, and little energy need by rural households/users often generate a negative net value for the projects aimed at expanding the national/regional grid to rural villages or communities.

Therefore the lack of access to energy should be faced through off-grid generation solutions. Until now, diesel generators have been widely employed even though they are a major source of GHGs (green house gases), also increasing the oil dependence of both end users and countries.

In order to ensure a steady and reliable supply of clean energy, Greentecno has developed the LWH_1000_GOGO, a hybrid wind/photovoltaic module for electricity generation, working with both wind and solar powers. It is specifically targeted to villages, communities, critical buildings (schools, clinics, public buildings) and stand-alone consumers in rural areas, whose electricity needs may be met through either off-grid generation and local grid development.

Its modular design allows it to be transported and assembled by hand, hence avoiding cranes and bridge cranes to be needed. LWH has been designed in order to be a simple, tough and durable

device, whose ordinary operation and maintenance is very easy and can be undertaken by local mechanics or radio/TV repairmen after a 2 days training hold by Greentecno's technicians.

WD - Water Device

Greentecno is fully aware that also safe drinking water should be provided for rural population in developing countries, in order to really foster their sustainable development. Indeed the lack of drinking water affecting the 29% of world's rural population (with much higher levels in sub-saharian Africa), in addition to cause political instability and social dramas, forces women and children to spend several hours per day to collect often unsafe water.

In order to produce safe drinking water from a widely available and free of charge source such as atmosphere humidity, Greentecno has developed an innovative device, the WD, that artificially reproduces evaporation and condensation processes⁴. Through a condensation-filtration process, it can produce from 0,7 to 5 litres of drinkable water per hour, depending on relative atmosphere humidity and temperature. It starts producing drinkable water at a relative humidity (RH) of 40%, ensuring a high level of water pureness through a four-phase filtration process and a subsequent UV-ray sterilization stage.

WD has been conceived to be highly tough. In addition, its modular design allows it to be completely adapted to single users/communities' needs, also being easily assembled and maintained. WD will be soon commercialized in its movable version that can be easily transported in emergency zones and situations and used to meet NGOs/humanitarian missions' needs.

Edu Computer

While trying to enhance people's quality of life in developing and emerging countries by providing sustainable energy and drinkable water, Greentecno also aims at fighting illiteracy and has designed the Edu Computer, a low cost and low energy-consumption computer that can be an innovative tool to create local based education communities.

In recent years, a number of programs generally known under the name of "One Laptop Per Child" have been aimed at fostering computer diffusion in developing countries, even though many troubles have emerged:

- unreliability of supply and maintenance;
- price increases in the period from product design to commercialization;
- laptops enhancing market expansion for multinational companies instead of basic education in developing countries;
- laptops too fragile for extreme climate conditions.

Edu Computer has been designed to be targeted to developing countries' conditions and needs, thus overcoming the troubles above listed. For example, a modular laptop instead of an ordinary one has been developed in order to overcome unreliability, fragility, and maintenance difficulties of previous products, as well as a waterproof gum keyboard has been adopted in order to perfectly work in extreme climate and rural conditions (where dust and other factors may cause damages and breaks). Basic programs based on Linux platform are installed, while educational

⁴ Solar irradiation causes the evaporation of water from oceans, lakes, and rivers. In natural conditions, warm air caused by evaporation goes upwards, then cooling and condensing in clouds. Water drops forming clouds increase in volume until they reach a weight that makes them fall in form of rain.

software and applications are expected to be regularly updated from "local mirrors" communicating with Greentecno's "central server" through satellite or fiber optic technologies.

3.4. Implementation opportunities in South Africa

Greentecno has decided to start its activity in Africa, wherein the largest part of the world's poor live and a radical change in the development trend is mostly needed. In particular, South Africa has been chosen as a starting point because local political-economic environment has been considered to be able to increase the value of Greentecno's efforts⁵.

As stated in the Department of Minerals and Energy (DME) Strategic Plan 2007/8 – 2010/11, one specific goal of the Government of the Republic of South Africa is to provide "services for effectual transformation of (...) energy industr(y) for economic growth and development, thereby improving the quality of life", and DME mission is to do that "for the benefit of all". DME's objective, as claimed by Minister Sonjica and DME's Accounting Officer, Adv. Nogxina, is to improve general access to electricity, particularly focusing on low income (rural as well as urban) households, by:

- restructuring the electricity distribution;
- strengthening the importance of alternative energy sources.

Further considerations have also driven the choice:

- the importance of South Africa market in terms of dimension and as "opinion leading" among developing countries and emerging markets, both in Africa and worldwide;
- already existing contacts with key decision makers in target sectors;
- the availability of highly skilled labour at a low cost;
- the availability of a modern and functional infrastructure;
- the existence of efficient banking and financial systems.

Greentecno's activity is primarily intended to contribute to the development of rural communities, hence avoiding the mass-urbanization trend, by allowing them to experience development in their native environments. As energy is considered to be the basis of an upgrading quality of life, and infrastructure the basis of development, efforts are being devoted to realize an infrastructure paradigm based on a new approach (as shown in Table 1):

⁵ As also pointed out by T. Creamer (2009).

Table 1 - Infrastructure paradigm in Greentecno's approach

Decentralization	<i>Versus</i>	Centralization
Rural		Urban
Small and fast		Big
Clean		Polluting
Bottom-up		Upside-down
Adaptation		One-size-fits-all approaches

Source: based on information in Greentecno's Business Plan - February 2009

Greentecno's efforts are being focused on the markets offering the greatest and fastest opportunities, such as those related to:

- Housing Development Programmes, implemented by the Department of Housing of the Republic of South Africa in the framework of a multiyear strategy aimed at giving a modern and sustainable housing to millions of citizens nowadays living in shacks and slums inside rural and suburban areas;
- investments from private entities, NGOs, Municipalities, and other institutions, aimed at offering electricity services to a number as large as possible of citizens living in rural and suburban areas, where electricity grid has not yet reached masses;
- blackouts frequently experienced by mining industry and explorations, that could be solved by generating electricity from the consistent volume of air constantly moved nearby mining plants due to the processes oxygenating tunnels;
- high traffic roads and highways that, due to the constant flow of vehicles in both directions, are the source of a constant artificially made wind, that can be effectively exploited for the production of energy to be stored, put into the grid, used for streetlamps (hence increasing security and reducing accidents);
- cooling towers in manufacturing industries and buildings, whose artificial flows of air can be effectively exploited to act as a backup of the main grid (hence limiting the damages of blackouts) or as a stand alone solution (for smaller applications);
- mid/high level households showing a twofold interest for renewable energy off-grid solutions, both in terms of wellbeing at home (undermined by frequent blackouts), and in terms of sustainability that, becoming more and more a "cool" issue, may lead them to spend money in highly visible green products considered to be "status symbols";
- telecommunication industry that, aiming to cover more and more remote areas with TLC providers (Vodacom; MTN; etc.), need to equip local antenna towers with UPSs and power backup systems as these areas have not been reached by the main grid;
- farms and other agribusinesses, needing reliable low cost solutions for their activities in rural and lonely areas;

- "sustainable tourism", needing reliable low cost solutions for lodges and other accommodations in rural environments, able to meet customers' exigencies also preserving activity's "green image".

Once penetrated these markets with its LWH_1000_GOGO (hybrid wind-solar generator), Greentecno aims at selling its single package also comprising its WD (device producing drinking water from atmosphere humidity) and its Edu computers ("modular laptops" for literacy purposes).

3.5. Pursuing environmental-social-economic sustainability

Greentecno focuses not only on manufacturing and commercializing products, but also on providing rural people with solutions effectively satisfying their needs of energy, water, and education.

Products have been developed by considering the environmental, social-economic, and logistic conditions of developing countries and emerging economies. They have been conceived to be very tough and resistant to extreme climate conditions. Thanks to their modular design, they can be easily transported, assembled, and even adapted to single users and communities' needs.

Effective and pragmatic solutions suiting local environmental and logistic conditions may be provided by Greentecno's staff, comprising people with long standing experience in developing countries. A total cooperation is offered by means of services ranging from need assessment and project development to implementation. In fact, as both activity sectors and technologies are very innovative, clients often need support in each phase of the project cycle in order to identify the most suitable solutions for their goals.

Affordable and competitive prices have been fixed in order to face the technical conservatism threat, thus competing with long time used products while maintaining a suitable average gross margin. Greentecno is also willing to further reduce its commercial margins (in a reasonable and financially sustainable measure) in order to enable rural communities and institutions to purchase its full range of products aimed at increasing access to electricity, drinkable water and education. Pricing has been graduated according to the ethical weight of the various market segments:

- NGOs, communities, "ethical projects";
- Government and other institutions;
- Corporate, tourist facilities, private purchasers.

This pricing strategy is expected to lead to a fast adoption of LWH initially in South-Africa and later throughout developing countries and emerging markets. In the medium term, increases in production volume should allow supply chain and manufacturing costs to go down, thanks to economies of scale in purchasing and production.

In addition to attractive prices, high quality and reliable Swiss designed technologies are ensured. In fact, R&D and administrative services are centralized while production, warehousing, and operation/maintenance services are expected to be decentralised in each target area, also by offering project ownership to local stakeholders. In such a way, the high quality standard of Swiss made technology and services is combined with proximity to clients/markets, and local entrepreneurship development is pushed.

Greentecno is willing to cooperate with local institutions and stakeholders for the development of revenue streams and micro-finance mechanisms enabling the establishment of local independent-power-producers (IPPs) that can take care of LWH's operation/maintenance. In order to enhance

capacity for project development and management, partnerships with local suppliers, distributors and project developers are realized, as well as training for the day-by-day device maintenance is provided for local technicians.

As shown in Table 2, Greentecno’s team has carried out a SWOT analysis (Strengths - Weaknesses - Opportunities - Threats) for its leading product - the LWH - in order to gather awareness of the difficulties to be faced and of the tools to be used in tackling them.

Table 2 - SWOT Analysis about Greentecno’s LWH

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> ▪ Lower price against competing wind systems ▪ Double working (solar panels / wind turbines) ▪ Easy and low cost maintenance ▪ Adaptability to customers’ needs ▪ No noise / electromagnetic fields ▪ Exploitability as an advertising tool ▪ Support to: <ul style="list-style-type: none"> - employment, through local manufacturing - micro enterprise development - medical activities (plug to connect medicine refrigerators) 	<ul style="list-style-type: none"> ▪ Higher up-front cost compared to diesel generators that can be negatively perceived by end users despite a much cheaper cost over the product life 	<ul style="list-style-type: none"> ▪ Tool satisfying the need of green off-grid electrification, (also combinable with drinking water provision and access to literacy) ▪ Tool meeting sustainability and low emission criteria increasingly driving stakeholders and fund providers’ decisions 	<ul style="list-style-type: none"> ▪ Technical conservatism and scepticism against new solutions ▪ Me-too products

Source: based on data reported in Greentecno’s Business Plan - February 2009

3.6. Findings: Towards an ideal-type business model

In its start-up experience Greentecno is striving to comply its behaviour with some criteria (described in Table 3) here considered to be crucial for promoting a sustainable social-economic development in favour of the poor people living in rural and suburban areas and, at the same time, pursuing environment protection and suitable profit generation.

Table 3 - Criteria for environmental-social-economic sustainability

	Declaration	Description
Criteria	Target people's needs to be met	Energy industry should consider the people living in developing countries as costumers, thus providing them packages tailored to their needs. A pre-implementation phase aimed at understanding target people's needs is crucial. Women should be particularly involved because they often have the most deep thought about energy uses and needs.
	Technology suitability and reliability to be ensured	Adopted technologies are expected to be suitable for available resources and target communities' conditions as well as to be able to ensure energy supply reliability.
	Local sustainable development to be pursued	Green technologies can provide a more reliable supply of power for lighting and other uses, but this does not automatically allow target people to gain also income benefit. Renewable energy projects should be linked with, or be part of, other projects pursuing economic development, as well as entrepreneurial skills should be locally developed in order to let communities fully benefit from the economic opportunities provided by these projects. Local technicians should be trained in order to be allowed to take care of equipment operation/maintenance and even to set up local businesses by employing the skills gained.
	Economic viability to be verified	Rural communities should be allowed to contribute to energy supply costs because and industry exclusively or prominently relying on subsidies can collapse under sudden policy changes.

Source: own elaboration

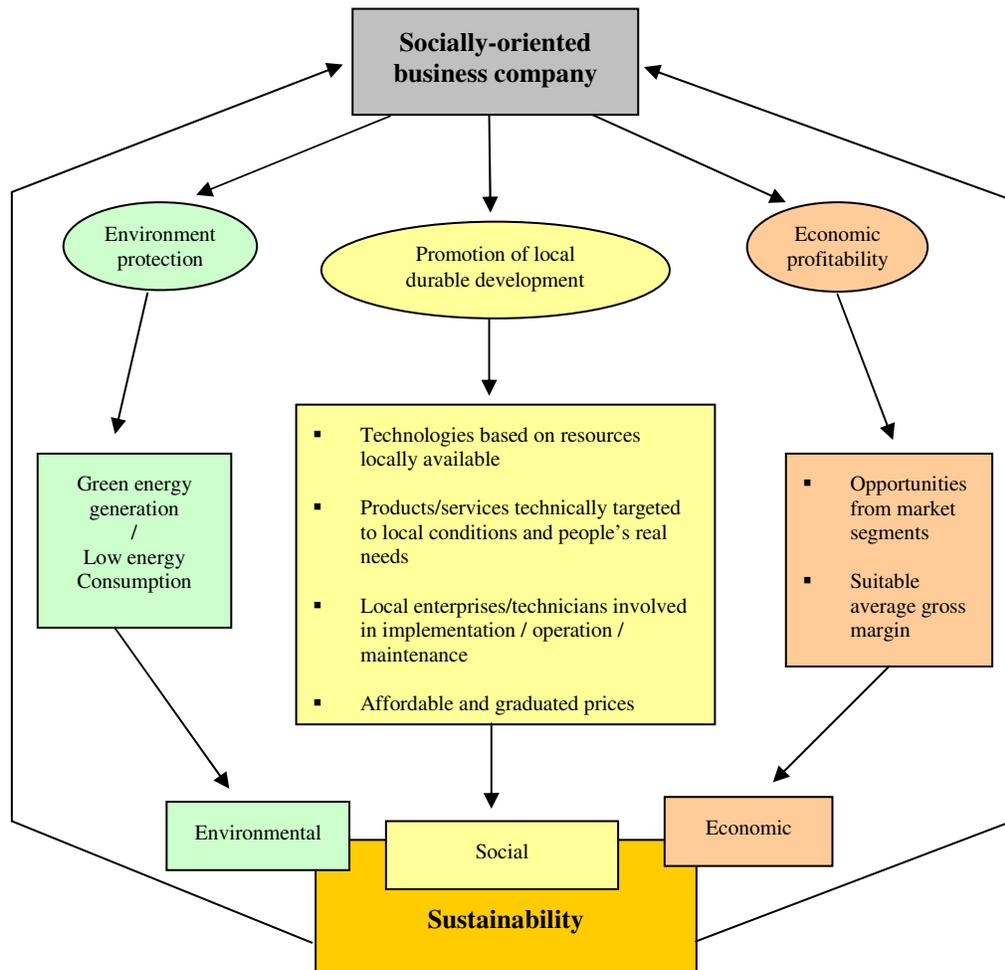
Indeed, Greentecno is showing a serious commitment to:

- conceiving technologies aimed at exploiting the energy sources locally available, thus avoiding/reducing reliance on foreign supplies;
- producing renewable energy or reducing energy consumption (depending on the product considered);
- designing products technically suitable for meeting local people's real needs, also thanks to their modular structure;
- ensuring easy and low cost maintenance;
- promoting the involvement of local enterprises/technicians in implementation/operation/maintenance, once provided a suitable training, thus fostering both regular device functioning over time and local entrepreneurship development;

- fixing affordable prices, even bearing a lower (but sustainable) income;
- graduating prices according to the ethical weight of the various market segments;
- recognising opportunities from public/business/charitable sectors and taking advantage of them.

By drawing on both the theoretical propositions provided by the international literature (as outlined in the paragraphs 1. and 2.) and Greentecno’s start-up experience, an ideal-type business model aiming at environmental-social-economic sustainability has been conceived (as shown in Figure 1). According to this model, great attention should be paid to each of the three entrepreneurial dimensions - environmental, social, and economic – which are considered to be closely related to each other. This implies that they should be jointly managed and fairly balanced in order to have the achievement of all objectives - environment protection, promotion of a sustainable development in favour of local communities, and suitable profit generation - ensured. Just the achievement of these three goals at the same time, leads a for-profit organization operating in the considered field to accomplish environmental-social-economic sustainability.

Figure 1 - A business model aiming at environmental-social-economic sustainability



Source: own elaboration

4. CONCLUSIONS

Many authors have pointed out that social entrepreneurship may play an active role in the fight against the deep poverty and social disadvantages - also stemming from the lack of access to energy, drinkable water and other essential services - that affect a large part of the people living in the rural and suburban areas of developing countries. In particular, a local sustainable development may be fostered by social entrepreneurship initiatives aimed at generating suitable, reliable, and affordable renewable energy from non-conventional sources locally available.

Against the great scepticism of some authors about social entrepreneurship's capability to truly pursue environmental, social and economic goals at the same time, many efforts have been made in order to identify the key elements that should inspire these initiatives and characterize their organization and activity. Nevertheless, little attention has been focused on how they may really act in order to successfully face the threats that have often led past initiatives to failure.

This study has strived to investigate how socially-oriented entrepreneurs intending to launch/enhance initiatives aimed at implementing green technologies in developing countries, should arrange/revise their business model in order to effectively contribute to the promotion of local sustainable development, while pursuing environmental protection and suitable profit generation, thus achieving environmental-social-economic sustainability.

The study of Greentecno's start-up experience - here considered to be a *representative case* - in the light of some crucial theoretical propositions and rival explanations formulated by the international literature, has led to conceive an ideal-type business model (shown in Figure 1) whereby the activity is clearly structured in three parallel dimensions, respectively devoted to:

- environment protection, by means of green-energy-production devices and/or low (green) energy-consumption products/services;
- promotion of local sustainable development, mainly by exploiting non-conventional sources locally available (thus avoiding, or at least reducing, reliance on foreign supplies), implementing products technically conceived to effectively meet local people's needs and to be easily and cheaply used/maintained, entrusting operation/maintenance (and, if possible, a part of the implementation process) to local technicians/enterprises previously provided with training (thus ensuring regular device functioning over time, also fostering local entrepreneurship development), and making prices allowing a number of people as large as possible to access to products/services;
- economic profitability, by identifying, evaluating and exploiting the opportunities coming from the various market segments, as well as by making prices that, although implying a lower average gross margin, do not threaten organization's financial sustainability and, consequently, its survivability.

These three dimensions are considered to be closely related to each other, so that environmental, social, and economic objectives need to be jointly pursued. In particular, organizations should show a serious commitment to jointly addressing environmental, social, and economic issues, in:

- designing products;
- identifying/evaluating/exploiting implementation opportunities;
- organizing product distribution/operation/maintenance;
- making prices.

Actually, a fair balance of the three entrepreneurial dimensions is very difficult to be achieved, nevertheless any possible efforts should be made to accomplish environmental-social-economic sustainability, thus having initiative successful ensured.

As remarked in the methodology paragraph, these propositions must be considered to be *sensitizing concepts* instead of *definitive* ones, because of: the great complexity of the matter, the limited empirical base used (stemming from a single-case study), and the initial phase of Greentecno's experience not allowing to really test the environmental-social-economic viability of its business model over time.

Anyway, findings provide interesting perspectives for both practitioners and academics. Indeed, this study offers forthcoming/existing for-profit organizations, useful insights to think/rethink their business model in order to successfully combine social and economic value creation even in developing countries, where the lack of suitable supportive structures and a distinctive set of challenges may seriously undermine business survivability. Similarly, despite its limitations, the study may be an important first step for a more inclusive empirical research agenda in the future. It has been just intended to stimulate a further exploration of the emerging issues related to social entrepreneurship's commitment to fostering a sustainable innovation process in developing countries.

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