South-South Cooperation Development Strategies for Rural Renewable Energy

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NATASHA ROBERTS, SEP 9 2011

At the root of poverty, lies a lack of access to modern energy. Without energy in rural areas, clinics cannot operate, agriculture is plagued by inefficiencies, schools cannot be lit, and opportunities to generate additional income are easily lost. In fact, most of the Millennium Development Goals cannot be fulfilled without first meeting the energy needs of the 1.6 billion people without access to modern energy services. Unfortunately, these people live in areas far from the electric grid. Thus, decentralized energy systems represent the best options to generate access. Many sustainable projects have been implemented to address energy poverty in rural areas; however their success has not been easily replicated. The Solar Market Garden project, lead by Solar Electric Light Fund, has demonstrated notorious success in Northern Benin; this project clearly meets the criteria for replication in other areas. Emerging South-South Cooperation initiatives and programmes of action may easily address this problem of replication. Several key requirements must be met for South-South Cooperation to successfully implement a programme of action, which addresses energy poverty in rural areas. These requirements are regulations, which promote local initiatives and trade in renewable energy technologies; financing mechanisms, which encourage local investments and promote rural markets; and dissemination, which improve knowledge of these technologies and their benefits for rural areas. In addition, advocacy strategies implemented by non-governmental organizations and South-South Cooperation forums will raise awareness of these rural renewable energy technologies and their value for local communities. Furthermore, local partnerships with experts and with the communities themselves aid the successful replication of any rural renewable energy project. The value of renewable energy in addressing energy poverty should not be underestimated; thus, the established Energy Access diagram encompasses various elements from access to renewable energy technologies to dissemination, regulation, financing mechanisms, and the promotion of local entrepreneurship.

Chapter 1: *Defining a Path*

1.1 INTRODUCTION

A world without poverty, where ¼ of the world's population (Chen & Ravallion, 2008, p. 30) living in conditions of hardship and scarcity have access to internet, mobiles, a heated home, food, clean water, and many other items, which are taken for granted in the developed world, might not be possible in the foreseeable future for this ¼ of the world's population. However, actions can and must be taken to empower these populations to improve their living standards.

Since the Independent Commission on International Development Issues in Germany released the Brandt Report in the 1980, the world has been depicted as divided into a global North and a global South (Quilligan, 2002)[1]. Today, this division cuts through a clear developmental, wealth, and digital gap. The global North includes North America (Canada and the United States), Europe, Russia, Australia, and New Zealand. The South encompasses about 130 countries and includes all the developing nations from the emerging economies of Brazil, India, and China to the least developed countries (LDCs) like Nepal and Bangladesh. According to a United Nations (UN) report for the General

Assembly, "the world population of over 6 billion people [is divided] into a two-thirds majority of poor people, living mostly in Africa, Asia and Latin America, and an affluent one third, living mostly in the industrialized societies of Europe, North America and parts of Australasia" (2009, p. 22). These two-thirds majority can be found in the global South, where various factors have hindered equitable and sustained development and the needs of the poor have not been generally addressed.

Rural populations accounted for "about 3.4 billion persons in 2005, slightly over half of the global population. Over 90 per cent of the world's rural residents (3.0 billion) live in the less developed regions" (U.N. Population Division, 2008b, p. 2). Hence this lead to the creation of the Millennium Development Goals (MDGs) in the year 2000; the first goal declares that by 2015 the people living in poverty should be halved (U.N. Department of Public Information, 2010). Efforts have been underway with mixed degrees of success. Non-governmental organizations (NGOs), governments, international organizations, and corporations have all implemented programmes for poverty reduction and for achieving the other MDGs. The large scale of these goals seems insurmountable, yet small steps have been achieved and it is these small, yet significant, successes which must be recognized, applauded, and replicated.

Nevertheless in many instances a lack of financing combined with a lack of global awareness prevents knowledge of these small successful projects from large-scale replication in other parts of the world. Initiative and innovation exist throughout the globe; however economic conditions hinder these movements and projects. Addressing energy poverty in rural areas represents the basis by which the MDGs may be reached, sustainable development may be addressed, and the economic development of a nation may progress in a more equitable manner. Figure 9 in the annex provides a regional comparison of electricity access in the global South; as can be noted, most of the South's rural populations (with the exception of China) have limited or no access to electricity. In fact, rural electrification rates are below 20% for these areas.

Without electricity, clinics cannot function, students cannot study, entrepreneurship is stifled, and income cannot be generated in an efficient and effective manner. Energy poverty must be addressed if the MDGs are to succeed and if rural development is to take place. The reemergence of South-South cooperation (SSC) in the last decade provides the necessary forum by which specific development strategies can be implemented to address energy poverty in rural areas of the global South. Thus, SSC is key to the success of the MDGs and for the South to catch up with the North.

1.1.2 What is South-South Cooperation?

SSC can be defined as an exchange of resources, knowledge, and technology among nations of the global South, which consider themselves equals. The United Nations Development Programme (UNDP) defines it as:

> a process whereby two or more developing countries pursue their individual or collective development through cooperative exchange of knowledge, skills, resources and technical expertise. […] South-South Cooperation is multidimensional in scope and can include all sectors and kinds of cooperation activities among developing countries, whether bilateral or multilateral, subregional, regional or interregional. (2007, p. 1)

Its goal is to achieve the same development status as the global North. The emerging BRICS (Brazil, Russia, India, China, and South Africa) economies are spearheading this movement forward by forging the path towards which the remaining Southern nations can begin to achieve the same levels of economic growth. Unfortunately, economic growth and higher income per capita do not automatically create conditions for equitable development. It is in this area where SSC can play a larger role and ensure rural development.

1.1.3 The Importance of Rural Development

In this respect, SSC can potentially provide the means and the impetus for the South to take full ownership over their own development plans and can ensure equitable and sustainable development for both urban and rural areas. Unfortunately, these latter areas do not always receive the necessary attention as urban areas' continued growth and expansion demand the attention of the government. In fact, large cities are perceived as a sign of development with

access to the most essential resources like water, goods, technology, and income, to name a few. However, sprawling, steadily growing cities are a cause of rural underdevelopment. “Urbanization has been driven by the concentration of investment and employment opportunities in urban areas as well as by the transition from low-productivity agriculture to more productive mechanized agriculture that has produced labour surpluses in rural areas” (U.N. Population Division, 2008a, p. 3). Thus, these areas face a double challenge: one of inherent underdevelopment and the other of labour and innovation migrating away from these areas.

Both challenges are clearly interconnected. Their importance is reflected in the growing literature and the establishment of various projects, programmes, and policies addressing rural development. Yet, governmental resources have not been completely oriented towards these underdeveloped rural areas. “Because of economies of scale, it is more efficient and cheaper to provide such services [employment, transportation, water supply, health, etc] to large and geographically concentrated populations than to populations scattered over large rural areas” (U.N. Population Division, 2008a, p. 4). Urban areas due to their large population numbers demand more governmental attention than rural areas, whose populations numbers are generally small, comparatively speaking.

1.1.4 What is Energy Poverty?

A key component for rural development is addressing the lack of access to energy resources and improving the access to sustainable energy sources. A Washington DC-based NGO, Solar Electric Light Fund (SELF), defines energy poverty “as a lack of access to clean and efficient energy systems” (Solar Electric Light Fund, 2011a). Access to financing, technologies, and training is a key requirement that would permit rural areas to achieve sustainable development. One of UNDP’s focus areas reinforces:

energy [as] central to sustainable development and poverty reduction efforts. It affects all aspects of development — social, economic, and environmental – including livelihoods, access to water, agricultural productivity, health, population levels, education, and gender-related issues. None of the MDGs can be met without major improvement in the quality and quantity of energy services in developing countries. (UNDP, 2011)

Many studies have been completed to analyze rural development and energy poverty. However, specific strategies that place SSC, as a forum through which a developmental framework may be created to address rural development and energy poverty within the global South itself, have not necessarily established the best approach to address the replication of small-scale projects under the umbrella of SSC.

Sustainable development was officially defined in 1987 by the UN World Commission on Environment and Development, known as the Brutland Commission, as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987, art. 1). In rural areas around the developing South, projects and programmes established to aid their development have generally met immediate needs and implemented activities based on current practices, which are not always sustainable for the long run. However, many projects such as the Alleviation of Poverty through the Provision of Local Energy Services (APPLES) programme have a stated goal “to find a sustainable mechanism for the effective delivery of improved local energy services to poor communities in South Africa” (APPLES, 2009, p. 6). Such objectives fit the Brutland Commission’s sustainable development paradigm to meet future needs and contribute to environmental sustainability.

It is not just about addressing energy poverty; it is about addressing it in a sustainable manner.

1.1.5 *Energy Poverty and Sustainability*

Shifting from unsustainable practices into sustainable ones is not always clearly achieved. However, beginning with sustainable practices sets a norm for future practices. Thus, a clear opportunity exists for renewable, clean sources of energy to be employed, specifically for those without energy access:

More than a quarter of the world’s population, mostly in Sub-Saharan Africa and South Asia, suffers from acute

energy poverty with no access to electricity. In India alone, 600 million people—roughly half the population—are off the electric grid. Hundreds of millions suffer chronic power outages due to an unreliable electricity system. In addition, roughly 40 percent of the world population still relies on traditional wood, crop residues and animal waste as their main cooking and heating fuels. Clearly for this half of humanity the meaning of energy security is different from that of the developed world. (Luft & Korin, 2009, p. 5)

Most of these areas lack access to electric grids. The costs of extending these grids are insurmountable. Solar power, hydropower, and wind power exemplify sustainable energy practices[2], which are renewable and ensure that the needs of both the future and the present are met.

Most renewable energy systems are generally decentralized and hence do not need to rely on the extension of grids for their implementation. Electricity "allows individuals to extend the length of time spent on production and hence on income producing activities. It also allows children time to read or do homework and access to television and film, which opens rural residents to new information that can instill the idea of change and the potential for self-improvement" (Baker Institute Energy Forum[3], n.d.). Without energy, human progress and development stalls in both the short and most importantly, the long term. Its effects transcend beyond the immediate community and affect overall national and regional development.

1.1.6 Electricity and Rural Development Linkages

Energy usage is generally evident in two main sectors: transportation and power generation (electricity). The focus of this study will be on this latter aspect of energy. The U.S. Energy Information Administration defines electricity as "the flow of electrical power or charge […] Electricity is actually a secondary energy source, also referred to as an energy carrier. That means that we get electricity from the conversion of other sources of energy, such as coal, nuclear, or solar energy" (2010a). Electricity can be generated by both renewable (for example solar, wind, geothermal, and hydropower) and non-renewable (for example coal, oil, and natural gas) sources of energy.

Renewable sources, as implied by the word, cannot be exhausted. On the other hand, non-renewable sources generally originate from fossil fuels. Oil, natural gas, and coal have a time stamp on them. They are also the types of sources that emit greenhouse gases and are not environmentally friendly. "Throughout the world today electricity is generated from coal (41%), natural gas (20.5%), renewable like hydroelectric, biomass, solar, wind and geothermal power (18.5%) and nuclear power (15%) […] Only 5% of world electricity is made from petroleum" (Luft & Korin, 2009, p. 6).

Climate change discourse today focuses on the use of technologies that will mitigate the effects of non-renewable energy sources such as coal and oil. However, an increased usage of renewable resources has not been on the top of the agenda due to the high costs associated with their implementation and the simple fact that solar power cannot work without sun, hydropower needs strong currents of water (droughts can affect this), and wind power is based on strong wind currents.

Notwithstanding, "electricity generation is entering a period of transformation as investment shifts to low-carbon technologies—the result of higher fossil-fuel process and government policies to enhance energy security and to curb emissions of CO2" (Organization for Economic Cooperation and Development/International Energy Agency [OECD/IEA], 2010, p. 8). The global community seeks changes to the manner in which electricity is generated, however many rural areas still have no access to electricity. This in turn has generated a natural process of rural-urban migration. In many instances, "urbanization becomes a problem when urban population growth exceeds the growth of employment or of housing, infrastructure and services. In that case, the growing urban population can find neither work nor housing, and rural-to-urban migration leads only to the urbanization of poverty" (Sheng, 2003, p. 143). Thus, it is imperative for governmental policies to address both urban and rural growth. Addressing rural development through the provision of electricity would affect urban development in a positive manner through the alleviation of migratory pressures.

Unfortunately, geopolitical and economic concerns sometimes prevent and hinder electricity provision in these rural

areas. “Energy security means different things to different countries based on their geographical location, their geological endowment, their international relations, their political system, and their economic disposition” (Luft & Korin, 2009, p. 5). Exporters of energy seek demand guarantees, while importers of energy seek guarantees of supply. The focus of this study is on the energy security of rural areas, of those 1.6 billion people who lack access to electricity and of those 2.4 billion people who still rely on biomass (wood, dung, agricultural residues, etc), which causes health problems (Baker Institute Energy Forum, n.d.). In many parts of the rural South, electricity usage is not as high as it would be in the North, where air conditioning, refrigeration, and other residential uses utilize a high portion of electricity.

In rural areas, “the most common uses of electricity are lighting and television, and there is some resistance to using electricity for cooking” (The World Bank Group, 2011a). Simple, basic uses that can make a world of difference in their lives; just lightning alone allows young children to study after the sun goes down and for parents to expand their ability to work from home or access information through the television or computers that can improve their living standards.

Electricity can be measured in units of power known as watts and kilowatts. “A kilowatthour (kWh) is equal to the energy of 1,000 watts working for one hour” (U.S. Energy Information Administration, 2010b). In rural areas, unlike urban areas, electricity use is minimal. Unfortunately, electric grid extensions do not reach these areas due to high costs and a policy focus on urban areas. Fortunately, rural energy development has been addressed in many forms by various NGOs and international organizations, which have succeeded in many of their projects as is the case with SELF. In the project of Benin, this NGO installed

an innovative solar-powered drip irrigation system to pump water for food crops. [… As a consequence,] not only are the women better fed, but so are the children and the rest of the villagers who now have year-round access to a steady supply of highly nutritious fruits and vegetables. (SELF, n.d)

The success of SELF will be replicated in another 8 villages in Benin. In view of its achievement, it would seem only natural that its replication by other organizations, governments, and various international entities would follow. Unfortunately, many of these sustainable projects do not always transform into larger scale projects that could affect the overall rural development of a nation or of a region.

1.1.7 Purpose of this Study: SSC-Energy Poverty Linkage

With 1.6 billion inhabitants without electricity, international, regional, and national priorities should clearly emphasize the replication of such projects, which address energy poverty in a sustainable manner. 90% of these rural residents reside in the South. Thus, it only seems natural that SSC represents the movement through which replication of successful renewable energy projects can be achieved in these areas. Specific development strategies need to be elaborated, which are applicable on a local, national, sub-regional, regional, and global level. However, SSC takes on many forms; in fact, many initiatives can be considered a part of SSC, from regional bodies such as the Union of South American Nations (UNASUR) and the African Union (AU) to numerous bilateral agreements between Southern nations. Foreign direct investment (FDI), sovereign wealth fund (SWFs) investments, and development assistance amongst Southern nations also falls under this category.

In recent years, SSC has also evolved to include the North in many of its initiatives: triangular cooperation can be defined “as partnerships between [Northern] donors and pivotal countries (providers of South-South Cooperation) to implement development cooperation programmes/projects in beneficiary countries (recipients of development aid)” (Fordelone, 2009, p. 4). Triangular cooperation allows for the best of both worlds: North and South. The global North provides expertise and financing, while the global South contributes financing in addition to technologies and above all an understanding of common developmental challenges. A UNDP study showed that:

what makes Brazilian cooperation stand out and in fact prove more effective than traditional North-South cooperation is that it owns current technology that developed, ‘Northern’ countries do not have, as they no longer face those issues – and if they once had it, it has now become obsolete, or the institutional memory has been lost. (UNDP, 2009,

p. 64)

Herein lies the future success of SSC development strategies and its potential contribution towards addressing energy poverty in rural areas of the developing world.

The purpose of this study will be to establish development strategies applicable to local rural contexts for international, regional, and national entities under the SSC umbrella with the goal of promoting, implementing, and replicating rural renewable energy projects. Many small projects sponsored by NGOs have proven their value in addressing energy poverty on a small, local scale. Moving forward, it will be imperative for these projects to become applicable on a larger scale, so that other rural areas may benefit from these advancements and further their development prospects.

The goal of this study is to determine the best mechanisms in which small-scale, successful projects may be replicated in other rural areas of the global South. Thus, the three main objectives of this research will be:

- To demonstrate successful cases of sustainable energy development within rural areas of the global South;
- Examine SSC policies on a subregional, regional, and international scale; and finally
- Recommend SSC development strategies to address energy poverty in rural areas and empower both national and local initiatives.

This study will also explore renewable energy technologies (RETs) as a means towards achieving rural development. Standard electric grid extensions are accessible to few rural villages as proximity to urban areas is a requirement for their expansion. High costs associated with their extension also hinder access to these grids. Decentralized, non-grid electric systems represent the best alternative for rural villages to access electricity and begin to improve their daily lives. “Poverty remains largely a rural problem, and a majority of the world’s poor will live in rural areas for many decades to come” (International Fund for Agricultural Development [IFAD], 2010, p. 47). Rural development is therefore crucial for the well-balanced development of a nation.

Access to electricity, a resource often taken for granted in the developed world, will allow for rural residents to access education, income, food, and clean water. “Now and for the foreseeable future, it is thus critical to direct greater attention and resources to creating new economic opportunities in the rural areas for tomorrow’s generations” (IFAD, 2010, p. 70). Currently, a great opportunity exists for rural development strategies to adapt sustainable measures to ensure that the needs of both the present and the future are met.

Access to renewable sources of energy, which are not cost-prohibitive, is key for development to truly move forward. This research will focus on electricity as a source of energy. Its availability and access in rural areas improves livelihoods through better access to education, technology, training, and effective and efficient agricultural practices. Electricity represents the foundation through which future development projects may be implemented and through which the vicious poverty cycle might be broken. Many successful rural renewable energy access projects go unnoticed, thus the main theme behind the final recommendations for SSC development strategies is about scaling up small-scale projects and replicating them in other parts of the South.

1.2 METHODOLOGY

SSC represents quite a large movement. In addition, rural development and energy poverty are large topics. As part of the research, these three large areas were narrowed down to allow for a proper analysis to be completed and recommendations to be formulated within the allotted time frame of three months. Thus, the concept of SSC was limited to policy recommendations enacted to address sustainable development. Energy poverty was delineated according to access to electricity and not coal and oil, which is what can be commonly inferred by the term. Rural development encompasses a range of strategies and outcomes. Its focus can vary from the provision of schools and clinics to rural-urban migration strategies and agriculture and non-farm economies. Since many rural villages subsist primarily through agricultural means, a specific focus on case studies, which improved agricultural subsistence using RETs, was chosen. Indeed, these three main aspects of the topic (SSC, energy poverty, and rural development)

deserve further research.

The implementation of development strategies, which apply to all aspects of rural development, would greatly benefit these villages. However, adaptation to local needs is required in all endeavors, thus the recommended development strategies presented at the end of this study have the potential of adaptation to other areas of rural development such as health, education, and the non-farm rural economy. Due to the time constraints and the inability to conduct field research, this study's main focus is based on the application of development strategies within the framework of SSC. This research emphasized a qualitative analytical approach with the inclusion of some quantitative data analysis to support the information gathered with the qualitative methods. Analysis was completed based on qualitative data collection methods, which included desk research, interactive research, and case study analysis.

1.2.1 Desk Research and Literature Review

The first goal of this study was to attain an understanding of what SSC encompasses. The concept of energy poverty as an inherent weakness of rural development was also a key topic required for the completion of this study. Without this initial groundwork, development strategies could not be recommended that would apply to the rural South. With this in mind, internet and literature research was conducted with the following objectives:

- Establish a clear definition of SSC and the various policies enacted under the multilateral framework;
- Review the relevant international instruments applicable to SSC;
- Define energy poverty and determine its influence on rural development;
- Gain an understanding of current international best practices addressing energy poverty in rural areas;
- Review the importance of RETs for rural development; and
- Determine the SSC framework under which development strategies could be recommended that would benefit overall rural development and address energy poverty.

Literature on the concept of SSC development strategies for energy poverty was not readily available. However, extensive research, through studies conducted by UN agencies and other organizations in addition to a few published books, was found on the SSC movement history and its main programmes of action. A thorough review of different UN agencies' resolutions was required to provide a context in which development strategies could be recommended. It also allowed for a greater understanding on how the various governments of the South view SSC and energy access in rural areas. The most current information, case studies, and recommendations were found online through the websites of these various organizations and their published case studies.

With its growing popularity and the emergence of the BRICS economies, SSC has moved to the forefront of many bilateral agreements, UN agencies and international organizations' mandates, and multilateral cooperative initiatives. On the other hand, the concept of energy poverty exists in many completed UN case studies, especially under the auspices of the various regional and country offices of the UNDP. However, studies on specific regional and global SSC strategies addressing energy poverty as a means towards achieving sustainable rural development are not readily available.

Energy poverty, rural development, and SSC are very large topics individually. There is always more to read on them, especially once one branches out and treats each topic individually. For example, energy poverty has an opposite side of the coin: energy security, which deals with the supply and demand of energy on a national scale. It is about the securitization of energy on a national and international scale. The specific focus of this study allowed for a more narrow analysis of this desk research and permitted a more critical approach towards the available publications from the various organizations conducting field work, case studies, and policy reviews.

1.2.2 Case Study Analysis

Due to time limitations and the lack of funding resources to complete field research, a full comprehensive review of selected case studies was limited. Going forward, field research could be completed within each village and a more comprehensive analytical study concluded on the various energy-related projects in rural areas of the South. Many

governments and NGOs address energy poverty through their rural electrification programs (such is the case with China, Nepal, and South Africa for example). Visiting rural areas would allow for a more comprehensive study on the positive and negative outcomes of the application of decentralized RETs in rural areas. In many cases, the work of rural cooperatives also goes mostly undocumented. Thus, further case studies could be analyzed based on local initiatives and field research.

Notwithstanding these limitations, a review of available case study documentation was completed. The initial case studies selected for this research were based on the following evaluative criteria:

- Application of RETs;
- Community empowerment;
- Environmental sustainability;
- Feasibility of replication;
- Implementation of financing mechanisms that allow for local ownership;
- Long-tern developmental sustainability;
- Measurable benefits such as increased income; and
- The provision of training and capacity building.

The desk research allowed for the establishment of these preliminary criteria, which represent key elements required for the successful replication of these projects in other rural parts of the global South. With the correct development strategies in place, governments of the global South can set up the proper mechanisms to replicate these projects. The establishment of these evaluative criteria limited the choice of case studies for analysis as few projects were found that could truly serve as a basis by which comprehensive development strategies could be applied.

For this reason, a greater emphasis was placed on the analysis of SELF's Solar Market Garden in the Northern District of Benin. Projects such as the solar ginger dryer in Nepal and the Highflats Energy Centre in South Africa address energy poverty in a limited manner. They do not necessarily represent easily replicable projects that could be implemented in other rural areas around the South as they lack a certain commonality with other rural areas. The Centre for Rural Technology, Nepal (CTR/N)'s Solar Ginger Drier focuses exclusively on dried goods, while the Highflats Energy Center does not provide for a suitable framework through which rural development can be addressed in an all encompassing manner such as SELF has achieved in Benin.

Notwithstanding, these projects and many others are important as their benefits in rural areas can be measured and experienced. An initial comparative case study analysis was completed for this research to ensure the feasibility of the Solar Market Garden's replication potential. However, this comparative analysis does not serve as the main analytical framework for Chapter 3's case study review[4]. Instead, the research focused on the measurable outcomes of the SELF project and its future replication potential throughout the global South.

1.2.3 Interactive Research

In addition to desk research and a case study analysis, interactive research was conducted to provide a context in which development strategies may be recommended based on the most current information from experts in the field. Interactive research was completed in two manners: through one-on-one interviews and through attendance at conferences in the Geneva area. The search for experts' opinion allowed for further insight into the workings of various NGOs, international organizations, and governments. Without these, final recommendations on how to address energy poverty would not be as thorough. Personal communication interviews also allowed for a more analytical perspective to take place as the inclusion of expert opinions from those who work in the field helped fill the gap, which might have otherwise have been filled with fieldwork.

The goal behind interactive research was to avoid unnecessary repetition of recommended polices already made explicit through the various studies referenced in this research. Expert opinions allowed for recommendations to be based on current best practices and not just those which were referenced in publications. Moreover, this component of the research allowed for the final recommendations to be based on the present developmental context and the

best way to move forward in addressing such an important problem as energy access in rural areas.

Finding the right experts to speak with was not an easy task in the fast paced environment of Geneva. Many practitioners are quite busy and had limited time available. Interviews were conducted in person where possible, however a certain level of flexibility was required and thus phone and email interviews were also completed. Many experts were also located outside of Geneva in locations such as Washington DC and Paris. A total of ten interviews were conducted with:

- Two UN Agencies
- Two NGOs working in rural areas
- Three NGOs based in Geneva
- One solar advocate; and
- One governmental Mission to the UN.

UN Agencies were chosen as entities which are truly international in scope; NGOs were selected due to their focus on specific issues and their ability to work closely with local populations; the interview with the solar advocate was conducted due to his experience in promoting solar energy with NGOs and social enterprises throughout the global South, while the opportunity to interview a governmental mission allowed for a greater understanding of the governmental barriers faced in the implementation of rural renewable energy policies.

Given more time, further interviews could be completed to deepen the research scope. Due to access constraints for these interviews, information gathered from conferences contributed towards the final research findings. The following conferences were attended:

- United Nations Conference on Trade and Development (UNCTAD) Conferences on South-South Cooperation held throughout Fall 2010 (the main focus was on the development of productive capacities);
- UNCTAD Short Course on South-South Cooperation held December 6, 2010;
- First International Gateway to Africa Conference titled “Africa’s Challenges Today and Tomorrow” held April 4-6, 2011; and
- UNCTAD Seminar on “Green Global Value Chains” held May 4, 2011.

These conferences provided a governmental perspective, which was missing from the interviews (as only one governmental interview was completed). In addition, these conferences permitted access to other experts in the field and increased an understanding of the research topic.

Data obtained from the interviews and the conferences was compared using a categorization system based on: Value of RETs, Dissemination Mechanisms, Value of SSC, Governmental Policies, and Financing Mechanisms. Once the data was separated into these various categories, a comparison was made between the interview and conference data obtained. In this manner, a final analysis was completed to determine best practices. Data collected from the interactive research was presented partially in Chapter 3, yet most of it can be found under Chapter 4. Overall, interviews and conferences provided the context in which development strategies could be recommended based on current policy space.

1.2.4 Quantitative and Qualitative Analysis

Case study data, interactive research, and quantitative data gathered from various sources lead to a thorough analysis of the many different aspects that affect energy poverty in rural areas. Data on these numerous factors was gathered from different sources with the goal of providing a comprehensive approach towards the establishment of SSC strategies. Without these different features, the final recommendations would be missing a key link. Thus, the following areas represented a key focus throughout this research:

- SSC policies;
- Financing mechanisms on a large scale (such as investments) and on a smaller scale (such as

microfinancing);
- NGO and international organization projects and programmes;
- RETs policies, costs, and sustainability; and
- Rural development programmes.

Without a comprehensive review of these different areas, a complete analysis would not be possible.

To this end, interview responses, data obtained from conferences, and the literature review were categorized under the following headings:

- Financing Mechanisms;
- Government Policies;
- Programme Dissemination;
- Programme Replication;
- Value of RETs; and
- Value of SSC.

This initial categorization allowed for a more focused approach towards the literature review and the case study analysis. The goal was to combine expert opinions and experiences with the data obtained from the desk research.

Quantitative research was not based on the collection of new data, but on the analysis of existing data, which was obtained from many diverse sources to establish the necessary foundations required to recommend SSC development strategies, which seek to address the needs of the rural South. Quantitative data was collected to analyze the potential financing mechanisms required. Thus, FDI, Official Development Assistance (ODA), rural energy costs, and the Benin project costs were evaluated to obtain a true understanding of required costs.

Research on the costs of RETs was also completed to provide a context under which financing may occur. The results varied. The costs for each country, depending on infrastructure, transportation, and access to technology were mixed. Thus data on average costs was not easily found. Time constraints also prevented a calculation on these costs, as data collection of the national costs of each technology within the 130 or so countries of the South would not be feasible within the time frame provided for this study. As a result, average costs as calculated by Practical Action, an international development charity, and Renewable Energy Policy Network for the 21st Century (REN21), a network established by the United Nations Environment Programme (UNEP), were used as a measurement. Both these organizations provided the most thorough data on the different types of RETs available to rural communities.

1.2.5 *Final Analysis*

Throughout this brief research period of three months, comparable projects to SELF's were not found. Many projects did not meet more than 75% of the evaluative criteria mentioned above. Thus, this study focuses on SELF's work in Benin and its potential for future replication in many others areas of the global South. In addition, the success of SELF in these two rural villages of Northern Benin is truly amazing. Its replication in other parts of the South would have positive long-term ramifications for many rural inhabitants. Thus, one of the main questions behind the case study analysis was: what made it so successful and how can it be replicated?

Final analyses of both quantitative and qualitative data lead to the creation of an Energy Access diagram, presented in Chapter 4. This diagram combines all the distinct elements involved in addressing energy poverty in rural areas. It is divided into three main elements: The Rural Cycle, based on access to RETs and knowledge awareness; Governments and SSC, based on Dissemination, Regulation, and Financing; and the Multiplier Effect, based on the long-term effects of the Rural Cycle's positive outcomes.

Each of the main components could easily become a study of its own; however, due to the limitations of this research, focus was placed on the most salient features of each element with the goal of enhancing an understanding of each

aspect and how it may affect rural renewable energy development. It is about scaling up small-scale projects into larger projects. The literature review provided the groundwork for the development of this diagram; however, it was the interactive research that allowed for the refining and adaptation of this concluding diagram to today's current developmental context.

Consequently, Chapter 2 will present the literature review findings, whilst chapter 3 will introduce and analyze the selected case study and the possibility of its replication throughout the global South. In addition, this section seeks to demonstrate the long-term effects of addressing energy poverty in a sustainable manner in rural areas. Chapter 4 will recommend likely financing mechanisms and will also suggest SSC development strategies that could potentially serve as a future framework to address energy poverty in rural areas. Finally, Chapter 5 will present the conclusion of this study.

Chapter 2: *Learning the Path*

2.1 SOUTH-SOUTH COOPERATION'S CONTRIBUTION TO DEVELOPMENT

In its myriad forms, SSC has contributed to both urban and rural development since the mid-1950s at its inception. However, in many instances it has had limited success. To address energy poverty in rural areas, SSC will need to enhance its international instruments and strengthen South-South relationships. Due to the fact that most people living without electricity can be found in the South[5], it thus becomes imperative for SSC to seek mechanisms in which it can address this serious problem. It is not only a moral obligation, but also one related to economic factors. If rural development is not addressed, rural to urban migration will continue placing a further strain on the resources of urban areas and creating "brain drain" in rural areas.

Sound economic policy should include both urban and rural development. Notwithstanding these migratory patterns, this study will focus on the needs of rural areas, specifically related to access to sustainable energy, without which, rural development cannot move forward. SSC traces its history back for at least 60 years; in that time, it has established many mechanisms and international instruments that will pave the path for increased cooperation in rural development and in many other areas relevant to the global South.

2.1.1 History of SSC and its International Instruments

South-South Cooperation dates as far back as the mid-1950s and 1960s, when the Arab League was formed, the Latin America Free Trade Association was established, and the Cold War led to the creation of the Non-Aligned Movement (NAM)[6]. However, it was not until 1964 when the Group of 77 (G-77) came to life under the auspices of UNCTAD that the idea of SSC established itself as its own entity.

Since then, SSC has taken on many different shapes and engendered alliances, partnerships, and agreements amongst the many developing nations of the South. However, the main goal of all these diverse organizations and initiatives has always been to promote economic and social development as declared within the Charter of Algiers (which established the G-77): "The representatives of developing countries, […] united by common aspirations and identity with their economic interests, and determined to pursue their joint efforts towards economic and social development, peace and prosperity" (Group of 77 [G-77], 1967, part 1). Under the context of the Cold War, the third world nations of the global South established a framework through which they could ensure the protection of their own interests and not have their interests subjected to the whims of the great powers of the time.

The idea of SSC originates in the NAM, the G-77, and most importantly in the enactment of the Buenos Aires Plan of Action.

On 12 September 1978 in Buenos Aires, capital of Argentina, delegations from 138 States adopted by consensus a Plan of Action for Promoting and Implementing Technical Cooperation among Developing Countries (TCDC). […] The

consensus adoption of the Buenos Aires Plan of Action marked the full success of this Conference, tributes to which were still being paid in the United Nations General Assembly when, in December 1978, it resolved to endorse the Plan and urged all Governments and elements of the United Nations system to implement its recommendations. (UNDP, n.d.)

Based on this Plan of Action, UNDP established the "Special Unit for South-South Cooperation" in 1978 to help promote this cooperative initiative amongst these nations. This plan established the means through which SSC could become fully effective. It set out a list of recommendations for the national, subregional, regional, interregional, and global actors. It established an overall objective "for developing countries to foster national and collective self-reliance by promoting cooperation in all areas. The aim is to supplement, not supplant, cooperation with developed countries" (UN General Assembly, 2009, p. 3).

The framework under which SSC can succeed depends on the will to establish cooperation amongst all the different nations and to ensure that this will diffuses itself within the different communities and societies. Full sustainable and equitable development is not possible without the contribution of small stakeholders such as those present in rural areas. The Buenos Aires Plan of Action established clear objectives and recommendations for the global South to attain social and economic development.

Despite these vital goals, SSC as a movement relapsed throughout the 1970s and 1980s. It was not until the beginning of the current millennium that SSC regained its impetus. In the year 2000, the MDGs were implemented at the United Nations Summit in September of the same year. They called on all nations to commit to eight goals ranging from poverty eradication to environmental sustainability and the reduction of maternal and child mortality by 2015. The declaration itself states the following:

We believe that the central challenge we face today is to ensure that globalization becomes a positive force for all the world's people. For while globalization offers great opportunities, at present its benefits are very unevenly shared, while its costs are unevenly distributed. We recognize that developing countries and countries with economies in transition face special difficulties in responding to this central challenge. Thus, only through broad and sustained efforts to create a shared future, based upon our common humanity in all its diversity, can globalization be made fully inclusive and equitable. These efforts must include policies and measures, at the global level, which correspond to the needs of developing countries and economies in transition and are formulated and implemented with their effective participation. (UN General Assembly, 2000, art. I.5)

For the developing South, these MDGs resonate clearly with the economic and social requirements needed to ensure true development. These goals are non-binding commitments to be fulfilled by both the global North and the global South. The responsibility lies with all nations. Following this declaration, SSC's regained impetus led to many high-level conferences, declarations, agreements, and programmes of action that all call for the implementation of an effective SSC framework.

In the same year as the MDGs, the Havana Programme of Action reiterated the importance of SSC for the developing world. One of its main articles noted:

South-South cooperation is a crucially important tool for developing and strengthening the economic independence of developing countries and achieving development and as one of the means of ensuring the equitable and effective participation of developing countries in the emerging global economic order. (G-77, 2000, art. IV.1)

SSC permits the developing world to join forces and implement the necessary actions in order to achieve a similar development level as that of the global North. The main objectives for SSC under the Havana Programme of Action include the renewal of efforts "to stimulate the expansion of South-South trade and investment […] to strengthen cooperation in the monetary and financial field […], to strengthen cooperation in promoting social development [such as] the enhancing of capacity-building and human resources [and] to promote multilateral cooperation and arrangements towards the expansion of [SSC]" (G-77, 2000, art. IV). In conjunction with the Buenos Aires Plan of Action, SSC has a strong foothold on which to base its initiatives. Trade, multilateral cooperation, capacity building,

technical cooperation, and many other important objectives have set the groundwork by which SSC may succeed.

Of particular note, the 2003 G-77 Marrakech Declaration on South-South Cooperation established a framework of implementation for SSC. Many of its provisions include the enhancement of coordination and joint efforts within multilateral settings such as the World Trade Organization (WTO), supporting existing platforms of regional cooperation, and promoting investment within developing nations (G-77, 2003). These latter objectives call for enhanced efforts towards the achievement of an equitable and sustainable developmental vision for the global South. The impetus exists in the South and the supporting legal instruments, both soft and hard, are also in place.

However, development within the South has not been equitable. Some nations have advanced further than others, while many have fallen even further behind. In this sense, SSC does not always represent a true exchange among equals. Common challenges continue to exist; yet the emergence of new global powers, especially those within the South, changes the rules of the game for both the North and the South.

2.1.2 The State of Development within the South

The rapid growth and emergence of the BRICS economies as new global players represents a clear advantage for the global South. “Malaysia, South Africa, India and Brazil have all been characterized by their extensive use of financial and political resources aimed at promoting developing-country perspectives in multilateral institutions and regional bodies” (Alden, 2010, p. 132). The promotion of the South’s interests by these emerging economies aids the promotion of their own interests. Their growing power permits them to exercise increasing influence within multilateral organizations. In fact, since the implementation of the Havana Programme of Action, “the G-77 noted that developing countries were committed to a global system based on the rule of international law, democracy in decision-making and the UN Charter. They drew attention to the importance of regional cooperation and integration as well as to the growing scientific and technological North-South gap” (Alden, 2010, p. 114).

The growing influence of the South, especially of the BRICS, displays a new shift in the natural order of North-South relations. In fact,

in 2009 China became the leading trade partner of Brazil, India and South Africa. The Indian multinational Tata is now the second most active investor in sub-Saharan Africa. Over 40% of the world’s researchers are now in Asia. As of 2008, developing countries were holding USD 4.2 trillion in foreign currency reserves, more than one and a half times the amount held by rich countries. (Organization for Economic Cooperation and Development [OECD], 2010, p. 15)

South-South trade is growing considerably in importance, as is its influence within the global market. The BRICS economies themselves have been paving this road through the expansion of FDI, research, trade, and investments.

The international arena reflects these emerging changes. However, a UNDP study noted that

the development context varies among the countries of the South. Some countries have taken a lead in South-South cooperation and do not require support from the United Nations system; others have requested UNDP support for their initiatives. Some countries have yet to fully recognize the potential of South-South cooperation and require encouragement to stimulate demand. (UNDP, 2007, p. X)

The various nations of the South are not developing under the same terms, conditions, and advantages. The agenda and subsequent initiatives for SSC must consider the various social and economic conditions, which these nations share, to help bridge the development gap. International organizations and UN agencies have played an important role in aiding these agendas and programmes of action, however the real impetus for true cooperation must stem from the will of the governments themselves. In this respect, the development achieved by Brazil, India, China, and South Africa has set them apart from other nations. If SSC does not remodel itself to address the needs of the other hundred or so nations, than a new developmental gap will emerge within the South itself.

Notwithstanding this necessary remodeling, SSC is "viewed by those participating in it from the perspective of political solidarity of the South, utilization of complementarities between developing countries and direct cooperation between larger developing countries and other countries in the South" (Yu, 2009). The growth of the BRICS creates leader nations within the South that will allow for international solidarity amongst all these developing nations. The assurance that the promotion of the South's development interests will be considered within the multilateral forum thanks to these leading BRICS represents a powerful mechanism under which SSC can and will flourish.

In fact, SSC embodies a forum under which best practices can be discussed within the framework of international cooperation, one that goes beyond the usual custom of international cooperation and transcends into a forum by which common challenges may be addressed. A United Nations General Assembly Resolution noted

the significant increase and expanded use of South-South cooperation by developing countries as an important and effective instrument of international cooperation, and in this connection urges developing countries in a position to do so to intensify technical and economic cooperation initiatives at the regional and interregional levels in areas such as health, education, training, agriculture, science and new technologies, and in particular information and communication technologies. (2002, p. 2)

The underdevelopment of rural areas throughout the South is one such area in which SSC can play an important role in ensuring that rural areas are not left behind in development plans.

Within the global South, a high percentage of the population still lives in rural areas[7]. In fact, "at least 70 per cent of the world's very poor people are rural, and a large proportion of the poor and hungry are children and young people. Neither of these facts is likely to change in the immediate future, despite widespread urbanization and demographic changes in all regions" (IFAD, 2010, p. 16). The high percentage of people living in rural areas, in conditions of poverty, gives rise to an obligation by the international community to ensure access to resources with the goal of eradicating poverty. In fact,

there is an ongoing debate on how best to manage aid flows; there is a growing recognition that the current mix of bilateral and multilateral arrangements causes aid to be too politicized, too unpredictable, too conditional and too diffused to act as a catalyst for growth and domestic resource mobilization. A stronger South–South and regional dimension in coordinating and channelling aid flows may be one way to improve the effectiveness of the aid system. (United Nations Conference on Trade and Development [UNCTAD] Trade and Development Board, 2010, p. 18, art. 69)

This obligation rests heavily upon the shoulders of national governments.

Since these governments can mostly be found in the global South, the opportunity exists to truly create development strategies which are applicable to local contexts and which are based on best practices in regions with similar overall development challenges. In this respect,

developing countries have accumulated abundant experience in rural poverty reduction through their long-term anti-poverty endeavors. It has been proven by practice that it is easier for countries with similar stages, levels and philosophies of development to share experiences among themselves. South-South cooperation is undoubtedly a key mechanism for partnerships among developing countries. (Omura, 2010)

Thus SSC serves as the framework under which rural development can be accomplished. Since the world's poor live mostly in rural areas, elevating rural development to the forefront of SSC will be key towards ensuring an equitable and sustainable development for all. Addressing energy poverty represents one of the first steps towards achieving this goal.

2.2 THE PATH TOWARDS DEVELOPMENT

Energy poverty and rural underdevelopment go hand in hand. Access to electricity permits rural development, without

which poverty may not be fully eradicated. Inadequate development in rural areas has lead to increased migration towards urban areas, further eroding the possibilities of development in rural areas as labour departs. This outward migration transforms into a detrimental migration of labour and innovation.

Unfortunately, circumstances in rural areas lead towards this increased migration. “1.6 billion people today do not have access to electricity, particularly in rural areas of developing countries” (Mueller, 2008, p. 166). A lack of access to electricity prevents innovation, education, and a well-balanced progress for all involved. Unfortunately, extending electricity services towards these areas has met with many challenges such as financing and proximity to urban centers and/or electric grids. Although,

Energy is a basic necessity for human activity and economic and social development […], global strategies for how to meet this basic need for the world’s rapidly growing population are sorely lacking. Lack of energy services is directly correlated with key elements of poverty, including low education levels, restriction of opportunity to subsistence activity, and conflict. (Baker Institute Energy Forum, n.d.)

Rural development transcends beyond a moral imperative to aid the world’s poor and meeting a key MDG goal. It has the potential to address economic development for the entire nation and ensure a balanced social development for the people of a nation. Unfortunately, rural development has not been prioritized in many key SSC instruments.

In many areas of the global rural South, agriculture represents a key component for survival; it also helps ensure food security within a nation. However, many small farmers are barely able to feed themselves, much less take their goods to the market. “Electricity allows tasks previously performed by hand or animal power to be done much more quickly with electric powered machines. Electric lighting allows individuals to extend the length of time spent on production and hence on income producing activities” (Baker Institute Energy Forum, n.d.). Energy leads to an overall improvement in the livelihoods of rural stakeholders. Without it, rural development cannot take place. Forthcoming agendas to address rural development under SSC will need to consider energy development as a key component of its programmes.

2.2.1 Energy and Rural Development

Energy poverty is closely linked with rural development, especially in the global South, where many of the world’s rural populations can be found living without access to electricity, a commodity which is taken for granted throughout the North and in many urban areas of the world. In addition,

the production of energy also affects agriculture at the global level. Energy consumption and income are linked. It is estimated that there are five billion low-income people in countries with rapid economic growth rate. These people are increasingly looking for additional energy suppliers. (Mueller, 2008, p. 166)

Demand for energy exists, yet the market does not seem to have effectively adjusted to supply this demand. In many rural areas, distance from urban zones inhibits access to electricity and impedes natural market mechanisms due to a lack of infrastructure. Under these circumstances, alternative solutions such as decentralized electricity generation through renewable energy sources represent the best solutions.

Notwithstanding, “grid electricity has been the most important means of increasing electricity access in the past, including in urban and peri-urban areas […]. However, for rural areas and especially for isolated areas this option becomes economically uncompetitive compared to standalone options” (Sanchez, 2010, p. 37). Energy poverty strategies must address these isolated areas, but they must go beyond the simple provision of energy services. Sustainable options will need to be provided if rural development is to truly succeed in the long-term. “When burned, traditional fuels often produce hazardous chemicals with negative health impacts, especially when used indoors” (UNCTAD, 2010, p. 2). In addition, “traditional fuels cannot produce a range of modern energy services such as mechanical power and electricity limits their ability to improve other aspects of life, including education and employment” (UNCTAD, 2010, p. 3). A reliance on traditional fuels to generate energy for daily usage is not sustainable in the long-term and affects the health of the household.

Renewable energy will be needed for rural areas to ensure energy sustainability and long-term viability. “RETs are energy-providing technologies that utilize energy sources in ways that do not deplete the Earth’s natural resources and are as environmentally benign as possible. […] By exploiting these energy sources, RETs have great potential to meet the energy needs of rural societies in a sustainable way” (UNCTAD, 2010, p. 5). Solar power, wind power, and hydropower are some examples of RETs, which can be used to address rural development. Their sustainable and generally environmentally friendly nature also implies long-term viability. Start-up costs are usually high, especially for solar power. However, in the medium and long-term, their benefits far outweigh their costs.

2.2.2 Energy Poverty and SSC

Renewable energy usually entails decentralized systems of power generation, which are off-grid and hence more easily accessible to rural populations located far from normal grid access. “One of the most important advantages of small decentralized systems is that they can be sized according to the specific needs of a community and they allow the involvement of the users at all stages of implementation, encouraging control and ownership by the users” (Sanchez, 2010, p. 39). Decentralized rural electrification not only ensures local participation, but also allows for the implementation of RETs, thus guaranteeing environmental sustainability.

In fact, these “renewable energy technologies are fertile ground for innovation; the possibilities for further developments and cost reductions are from being exhausted” (World Bank, 1996, p. 62). The advantages of these technologies are numerous; these sustainable technologies are environmentally friendly and cost effective in the long run. However,

> new renewable energy technologies still account for less than 2 percent of the primary energy supplies of developing countries, but in light of their promise, with good economic and environmental policies and with the development of the necessary support systems for installation and maintenance, their market shares should expand. Investments will also be required to acquaint energy engineers and managers with the technologies and to educate and train engineers and skilled workers. (World Bank, 1996, p. 62)

The developing countries of the global South have a clear opportunity to implement policies that promote RETs, which will be beneficial for rural areas’ environments and allow for economic development.

Trade in energy technologies will be key to allow SSC in conjunction with the North to enable access to these technologies for rural villages. For the success of RETs, training, and capacity building epitomize mandatory components. A World Bank study in the Pacific islands concluded that

> many PV [solar/photovoltaic] systems failed after installation, and it was only when supporting services were introduced that the programs began to succeed. These services included training technicians, ensuring timely maintenance, collecting fees on a regular basis, providing proper oversight to prevent the diversion of revenues to other projects, and obtaining prompt feedback on needs from local user communities and passing the information on to the supplying utility. (1996, p. 62)

The technology exists, however inherent weaknesses persist in its implementation. Without training and capacity building, the South will be unable to implement the necessary policies and programmes to address energy poverty as a part of rural development. “Successful programs require two main ingredients: (a) paying proper attention to program development, for example, initiating surveys of renewable energy resources, carrying out project identification and preparation, and investing in education and training; and (b) creating good enabling conditions through economically efficient pricing, credit, and tax policies” (World Bank, 1996, p. 64). NGOs and international organizations create the proper conditions for programme development, while pricing, credit, and tax policies are the responsibility of the local and national government.

However, the role of the smallest stakeholders must not be underestimated. “These [rural] households may rely to varying degrees on smallholder farming, agricultural wage labour, wage or self-employment in the rural non-farm economy and migration. While some households rely primarily on one type of livelihood, most share a tendency to

diversify their livelihoods base, to the extent possible, as a way to reduce risk and to maximize income" (IFAD, 2010, p. 70). The rural populace's income base is not very diverse, hence the need to address energy poverty as a means towards expanding this income base. Access to sustainable electricity improves efficiency of small-holder farming and agricultural wage labour; wage and self-employment in the rural non-farm economy benefit from electricity access through innovation and efficient production.

In addition, the value of remittances obtained through migrant family members transforms this income into further investments. "Mobility out of poverty is associated with personal initiative and empowerment, and is highly correlated with household characteristics such as education and ownership of physical assets" (IFAD, 2010, p. 70). All of these factors contribute to better livelihoods in rural areas.

With these characteristics in place, projects may succeed. However, a lack of access to electricity inhibits their true progress:

Without modern energy services, millions of women and children face debilitating illness or premature death; basic social goods like health care and education are more costly in both real and human terms, and economic development is harder to perpetuate. The services that energy enables, such as electricity, can create conditions for improved living standards, especially in areas of public health, education, and family life. (Baker Institute Energy Forum, n.d.)

The provision of energy services to rural areas cannot be successful without the participation of local communities. Thus, "facilitating the empowerment of poor people—by making state and social institutions more responsive to them—is also key to reducing poverty" (World Bank, 2000, p. 3). In this respect, the work of grassroots organizations and NGOs stand out in these societies.

Most projects and programmes implemented are established directly within rural areas and with the participation of the local population. "Actions will generally be necessary in all three clusters—opportunity, empowerment, and security—because of the complementarities among the three" (World Bank, 2000, p. 7). National policies and good governance on a local and national level thus play a key role in ensuring that these grassroots organizations and NGOs may expand their work and aid other local communities. In the global South, national governments should note that

in rapidly developing agricultural regions, the provision of electricity helps to raise the productivity of local agro-industrial and commercial activities by supplying motive power, refrigeration, lightning, and process heating. In turn, increased earnings from agriculture and local industry and commerce raises households' demands for electricity. However, when development efforts fail because of, say, poor crop pricing and marketing policies, electricity supplies may be able to do little to remedy the situation, nor will electricity or other modern fuels be in great demand. If it is to serve a useful purpose, electricity needs a "market," as do other energy forms such as LPG [liquefied petroleum gas] and renewables. (World Bank, 1996, p. 39)

Development policies must reflect the demand and supply needs of a market. On the other hand, the environment in which a market may succeed must be first created.

By enabling a market for energy services in rural areas, potential development policies may succeed, as opportunities, local empowerment, and economic security become a daily part of rural lives, allowing people to improve their living standards. One improved household multiplies into several and eventually raises the economic standards of a whole nation. Thus the diverse roles played by the various actors in rural areas overlap and must be coordinated to ensure maximum benefits are achieved. "Market reforms can be central in expanding opportunities for poor people, but reforms need to reflect local and institutional and structural conditions" (World Bank, 2000, p. 7). In addition, market reforms allow for energy services to expand in rural communities; however, the groundwork must first be set through rural community participation, NGOs' assistance, and effective, fair, and honest governmental reforms to minimize bureaucratic impediments.

Since many of the rural villages, which represent the focus of this study, are unable to access an electric grid, decentralized energy systems become a more cost-effective option to ensure access to electricity. “Decentralization that fosters community-driven choices for resource use and project implementation” (World Bank, 2000, p. 9) ensures local participation and the most effective mechanisms through which energy poverty can be addressed for the “roughly 1.6 billion people, which is one quarter of the global population” (Baker Institute Energy Forum, n.d.) without access to electricity in the global South. SSC can take on many shapes. Thus, its benefits for the Southern nations are clear. Targeting SSC development strategies towards addressing energy poverty in rural areas is key to sustain and to promote development for the nation overall. This fits in clearly with the stated goals of SSC.

Electricity’s contribution to development in any shape or form cannot be underestimated. Thus, development and energy poverty go hand in hand; for the success of development, the necessary policies must be in place to allow for economic growth. However, economic growth will be stalled if access to electricity is inexistent or very small; hence, the existence of an energy-development nexus. The addition of renewable technologies to this equation leads this nexus to expand into a new one: an energy-development-sustainability nexus. Hence, SSC encompasses this nexus and must seek to promote the sharing of best practices as well as the implementation of development projects.

With the growing BRICS economies, the South now has the necessary resources to propel SSC development policies even further. To ensure that the remaining Southern nations achieve economic growth, the North has an important role to play in assisting the South through their knowledge, technologies, and additional financing. Yet for SSC to succeed, projects should be implemented from the South for the South. Thus the North may act under the triangular cooperation umbrella or through the independent actions of numerous NGOs. However, the main task of energy provision will lie in the hands of the South itself.

Chapter 3: *Forging the Path*

3.1 COMBATING ENERGY POVERTY IN RURAL AREAS

The value of RETs is widely accepted; however this has not lead to their widespread use. High costs have usually inhibited their usage:

In the past, renewable energy has generally been more expensive to produce and use than fossil fuels. Renewable resources are often located in remote areas, and it is expensive to build power lines to the cities where the electricity they produce is needed. The use of renewable sources is also limited by the fact that they are not always available — cloudy days reduce solar power; calm days reduce wind power; and droughts reduce the water available for hydropower. (U.S. Energy Information Administration, 2010c)

Standard non-renewable energy sources such as coal and oil still play an important role, if not a predominant one, in the matter of energy consumption around the world.

According to a United Nations Industrial Development Organization (UNIDO) report, modern energy contributes to poverty reduction and rural development by

reducing the share of household income spent on cooking, lighting, and space heating; Improving the ability to cook staple foods; reducing post-harvest losses through better preservation; enabling irrigation to increase food production and access to nutrition; enabling enterprise development, utilizing locally available resources, and creating jobs; generating light to permit income generation beyond daylight; and powering machinery to increase productivity. (2009, p. 24)

RETs have already been defined in the previous chapter. Their value lies in their long-term sustainability not just for the environment, but for the livelihoods of rural populations. “The UN Millennium Development Goal of eradicating extreme poverty and hunger by 2015 will not be achieved unless substantial progress is made on improving energy

access" (OECD/IEA, 2010, p. 14). Unfortunately, renewable energy has been stigmatized: the high start-up costs usually associated with these technologies inhibit their promotion and implementation. Most stakeholders do not think of their long-term cost effectiveness and viability.

It is not just about the environment, but also about better business practices, ones in which health and daily living standards are clearly affected. "Given the high costs of grid extension into areas of relatively sparse population and low energy demands, the rural areas are currently the most promising markets for alternative or renewable forms of energy generation" (Wiens, n.d., p. 1). The dilemma arises when a lack of knowledge on a local, national, or regional basis prevents true rural initiatives from flourishing.

However, there have been successful cases of energy development in rural areas. For example, China's Rural Electrification Program based on hydro, solar, and wind power has brought energy to 98.5% of the population (Sanchez, 2010, p. 62); in fact, by 2015 the China Village Electrification program is expected to implement full electrification (Sanchez, 2010, p. 62). On the other hand, in Kenya, Practical Action East Africa funded a micro-hydro project, which now "generates an estimated 18 kilowatts of electrical energy. This amount can light 90 homes and Practical Action estimates that the power the system generates will benefit about 200 households" (Practical Action East Africa, n.d.). Many other projects around the world have implemented governmental and/or non-governmental initiatives to address the pressing concern of energy poverty in rural areas.

For a truly successful energy development program, the case of SELF is of particular note as it meets the main evaluative criteria noted above that will permit its replication in other villages. Based on an analysis of various case studies and the work of NGOs, certain elements are necessary for the success of rural renewable energy projects. RETs represent a path through which rural villages may gain access to electricity. Their generally decentralized nature offsets the costs of extending the electric grid to these villages[8].

With access to electricity, rural villages will raise their incomes, improve education levels, and have access to improved opportunities. News about the success of the many projects, which have been implemented to address energy access in rural areas, has not been widely broadcast. This study seeks to address mechanisms in which their success can be replicated in other rural villages. However, not every project can be replicated in the same conditions in every area. Thus, evaluative criteria were selected based on an analysis of the literature review and selected case studies. The following criteria were established:

- Application of RETs;
- Community empowerment;
- Environmental sustainability;
- Feasibility of replication;
- Implementation of financing mechanisms that allow for local ownership;
- Long-tern developmental sustainability;
- Measurable benefits such as increased income; and
- The provision of training and capacity building.

However, the key element, which is encompassed under community empowerment, is rural awareness of these innovations and their potential benefits for their long-term livelihoods.

3.1.1 Rural Renewable Energy Components

Each component referenced above works in tandem with the others. Some are of more importance than others, while yet others are closely interlinked with each other. Each one links with the other and embodies key factors required in any project that seeks to address energy poverty in the rural areas of the global South.

- Renewable Energy Technologies and Environmental Sustainability

RETs are not only key towards adapting and mitigating to climate change, but they are also an important component

for sustainable and environmental development. These energy sources are generally designated as wind, solar, geothermal, hydro, and biomass. In rural areas, each source, including the grid, encompasses a certain level of cost and accessibility. The below chart published by Practical Action summarizes the different types of possible available sources of electricity (renewable and non-renewable) and their benefits and challenges for rural populations.

Table 1: Rural Sources of Electricity

Source

Availability

Cost

Technical Issues

Grid Not available for isolated villages and communities Very high for rural isolated people, but for those living next to grid path it may be competitive Grid connection is a good solution, when the cost and availability are right Solar PV Available all over the world Very high ranging from $1.5-3.5 per kWh Limited use due to the high unit cost of energy, inappropriate for productive uses Small wind generation systems (below 1 kW) Frequently available but not everywhere High $0.30-$0.80 per kWh Sometimes there may be several days without wind, therefore back-up needed Small hydro systems Site specific Medium $0.20-$0.60 per kWh It is the most mature technology, proven technically and socially in the field Small diesel sets in remote areas Difficult access From $0.30-$1.20, depending on the intensity of consumption Difficulties operating and maintaining expensive spare parts, noisy and polluting Biofuels New source of fuel, still to be proven Expected to be high Long production chain, from farming, processing to energy generation and use (possible social complications)

Source: Practical Action: Sanchez, 2010, p. 54

Electric grid costs may vary according to the location of the village vis-à-vis the closest grid. In some cases, the cost of extending the grid to these isolated areas is higher than the total cost of electricity that will be used in these rural households. Unfortunately,

the great majority of [people without access to electricity] live in isolated rural areas in developing countries, where conventional grid-extension electricity supply is not economically viable, and small diesel sets may be inappropriate due to fuel costs, absence of reliable supplies, and a general lack of technical support. (Practical Action, n.d.)

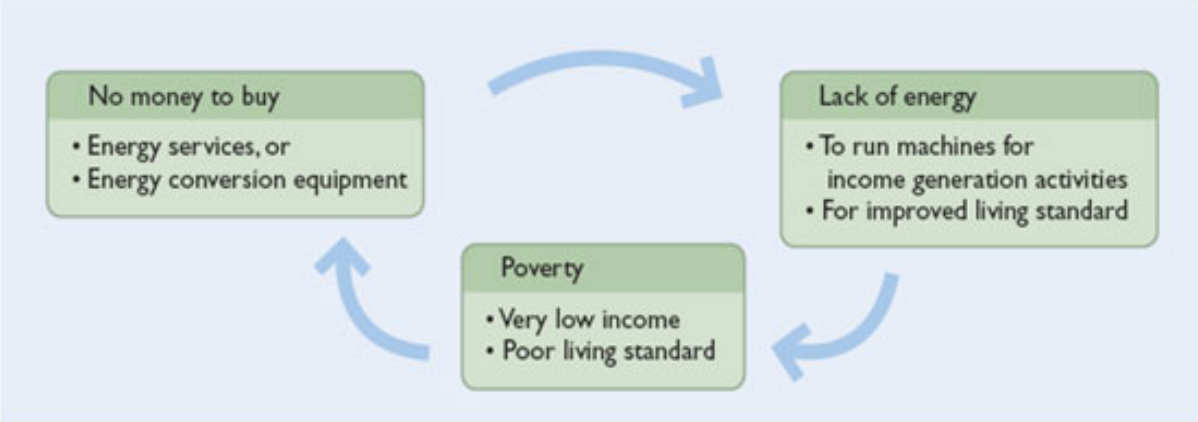
Thus, rural renewable energy represents a new alternative for these areas. As can be seen in the above chart, costs of RETs vary, however their value lies in their long-term investments and other tangible important benefits such as environmental sustainability. Small diesel sets are very polluting and fuel can be hard to come by. Each RET has its own limitations and its own benefits. Choosing the right one depends on location, access to technology, and most importantly the necessary expertise to implement its usage in rural areas.

- Community Empowerment and Measurable Benefits

Just as a child is more likely to learn not to touch a hot stove after burning his fingers, solutions engendered by local communities are more likely to succeed with their own participation. In this respect, community empowerment permits villages and individuals to take ownership of their own livelihoods. It makes them accountable for their own communities and stimulates the necessary motives and incentives to promote projects in their community that benefit them individually and as a group. In fact, community empowerment increases the success factors of a project and allows for substantive measurable benefits in income, education, health, and entrepreneurship. The achievement of these benefits empowers communities. Thus, it becomes a cycle, where an increase in income and education further

motivates participation in community projects. The below diagram published by the Organization of Petroleum Exporting Countries' (OPEC) International Development Fund exemplifies this linkage, especially in regards to energy access.

Figure 1: Energy Access and Poverty Links



Source: OPEC Fund for International Development, 2010, p. 185

A lack of energy perpetuates poverty, while high poverty levels translate into no income to purchase energy sources. The positive link in this diagram occurs once energy can be provided, whether this occurs through governmental expansion of the grid, international aid, or investments. Access to energy is likely to generate income. This in turn leads towards improved living standards and towards lower poverty levels, which then generates income for the purchase of other energy services as well as other goods related to health and education.

- Financing, Training, and Capacity Building

Community empowerment is closely linked with financing mechanisms, training, and capacity building. These elements represent the necessary resources by which the success of a program can be achieved. Capacity building, also known as capacity development, is defined as a "process by which individuals, organizations, institutions, and societies develop abilities to perform functions, solve problems and set and achieve objectives" (U.N. Economic and Social Council, 2006, art. 33, p. 7). Without knowledge and understanding of how to use the necessary technologies and how to benefit from them, communities will not be able to reap the full benefits of rural renewable energy. Thus training on how to use and maintain these various technologies is a key requirement.

In addition, financing mechanisms that transfer ownership of the projects create a system of accountability in which the rural populations will have a stake in the outcome of the projects. In conjunction with financing mechanisms, training and capacity building must also be present:

The fundamental issue involved in the efficient use of non-conventional energy sources is to bring about the integration of socio-economic changes with technological innovations, which essentially should be made simple, easy to understand and operate (maintain) by the agrarian population. […] The problem here is mainly the identification of available technologies, their testing to make them suitable in the local situations and for their acceptability in relation to their costs as well as, the financial or technological capacity of the rural people to operate, maintain and repair the hardware involved. (Hussain & Qurashi, 2005, p. 17)

From financing to training and capacity building, all these elements create accountability and ensure the long-term sustainability of a project. Financing alone cannot succeed.

For an individual to benefit from the grant or loan received, training and capacity building will be needed to ensure knowledge development. It is analogous to receiving a loan to start a restaurant business, yet not knowing the first

thing about restaurant management. The money might be spent in the correct manner, yet there would be no return on this loan as lack of skills in restaurant management prevents the restaurant from growing and generating income; in other words, the bank made a bad investment and the new entrepreneur is in worse shape than when he started.

- Feasibility of Replication and Long-Term Developmental Sustainability

Replication represents the doorway through which the experiences, growth, and programmes can be repeated in other parts of the global South. It is a key factor in ensuring large-scale successes. Of particular note to this study is that "the decentralized nature of some RETs allows them to be matched with the specific needs of different rural areas" (UNCATD, 2010, p. 5). The feasibility of replicating projects that are based on rural renewable energy is clear. In addition, because RETs are based on renewable sources, their long-term sustainability is guaranteed. Where one project works in one area, in others adapting the technology to local conditions will permit the success of the project to be replicated and for other rural areas to reap the numerous benefits of both a measurable and non-measurable nature.

Unfortunately, "renewables are generally more capital-intensive than fossil fuels, so the investment needed to provide the extra renewables capacity is very large: cumulative investment in renewables to produce electricity is estimated at $5.7 trillion (in year-2009 dollars) over the period 2010-2035" (OECD/IEA, 2010, p. 9). Considering the high start up costs of RETs, a system that provides for the proper local financing schemes, community empowerment, and capacity building is required to ensure not only the feasibility of a rural renewable energy project, but also its long-term viability, sustainability, and success. Investments by governments, NGOs, and other organizations should take place under the right conditions. An individual will not generally invest in any project if the initial costs do not outweigh the long-term benefits.

All of the factors mentioned above contribute to the success of any project as will be seen in the following analysis of the selected case study in Northern Benin.

3.1.2 The Solar Path: Benin's Villages Powered by the Sun

The Solar Electric Light Fund (SELF), based in Washington DC, has existed since the 1990s. Its mission is to "to empower people in developing countries to rise from poverty using energy from the sun" (Solar Electric Light Fund, 2011a). Solar energy is growing around the world as can be seen in General Electric's recent plans to invest $600 million in new solar panels (Sechler, 2011), China and Germany's commitment to green technologies (The Pew Charitable Trusts, 2010) and Google Inc's recent investments of $168 million in a solar power plant in the Mojave Desert of California (The Associated Press, 2011). Hydropower prevails in many parts of Latin America. China is the world's leading producer of wind turbines and solar modules (The Pew Charitable Trusts, 2010, p. 3). In addition, UNDP has partnered with various governments of the South (such as Bolivia, Brazil, Chile, China, Fiji, Malawi, Mauritania, Nepal, Niger, Rwanda, South Africa, Sri Lanka, Tanzania, and many others) to help promote and implement RETs (UNDP Energy Portfolio, n.d.). Most of these investments and initiatives encompass medium to large-scale projects with private sector investment and/or government support and regulation. Hence, comparatively speaking, initial costs are not as high as they would be for a single person in a remote rural village to gain access to RETs.

SELF's mission seeks to take these elements a step farther by working on the ground. In the words of Robert Freling, the director of this Washington DC-based NGO, SELF is "not a think-tank, but a do-tank" (personal communication, April 19, 2011). Addressing energy poverty in rural areas requires small, "hands-on" solutions. Thus, the work that SELF has accomplished in Benin is quite commendable.

Most of SELF's programs focus on countries in the global south. They have implemented programs in Benin, Haiti, Lesotho, Nepal, Rwanda, Vietnam, and many other countries. There are about twenty different projects in which SELF has implemented solar programs for health clinics, schools, microenterprises, and agriculture. "SELF's

projects are shaped by local priorities and led by local people, often women, and address critical needs in homes, schools, clinics, agriculture, and microenterprise" (Solar Electric Light Fund, 2011b). It has succeeded in "bringing the benefits of clean solar power to over 100,000 people" (Solar Electric Light Fund, 2011b).

In 2007, SELF partnered with International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to install a Solar Market Garden in two villages in the District of Kalalé in Benin. This was one of SELF's biggest projects to date. It sought to combine drip irrigation technology developed by ICRISAT with solar power technology provided by SELF. Drip irrigation "delivers water (and fertilizer) directly to the roots of the plants, thereby improving soil moisture conditions" (Burney et al, 2010a, p. 1848). The project provided for a Solar Market Garden, "an innovative solar-powered drip irrigation system to pump water for food crops. SELF engineers developed a 1.2 kW solar electric power supply that provides 100% of the energy for the pump" (Solar Electric Light Fund, n.d.). By 2009, the SELF Annual report concluded that the Solar Market Garden is cost-effective, environmentally sustainable, durable, and more economical over time than diesel-powered water pumps (Solar Electric Light Fund, 2009, p. 13). An initial analysis of the Solar Market Garden in Benin shows that it fulfils all of the necessary criteria needed to replicate rural renewable energy projects from a small scale to a larger scale in the global South.

The case of Benin provides an interesting context in which future programs can be sustained. "Benin is a small West African country, with a population of 8.7 million […]. Services and agriculture are two core economic activities which in 2005 accounted for 46 and 40 percent of total value added, respectively" (World Bank, 2009, p. 1). Agriculture plays an important role in Benin's economy, thus the benefits of the Solar Market Garden are not only important on a community level, but potentially on a national level as well. SELF's Solar Market Garden in Benin meets the necessary criteria required to ensure rural renewable energy access in the global South.

- Renewable Energy Technologies and Environmental Sustainability

The project in Benin combines drip irrigation technologies with solar systems, thus ensuring clean green technologies and environmental sustainability. In fact, the solar systems used for the water pumping cost less than other standard solar systems, as they do not require batteries to store energy:

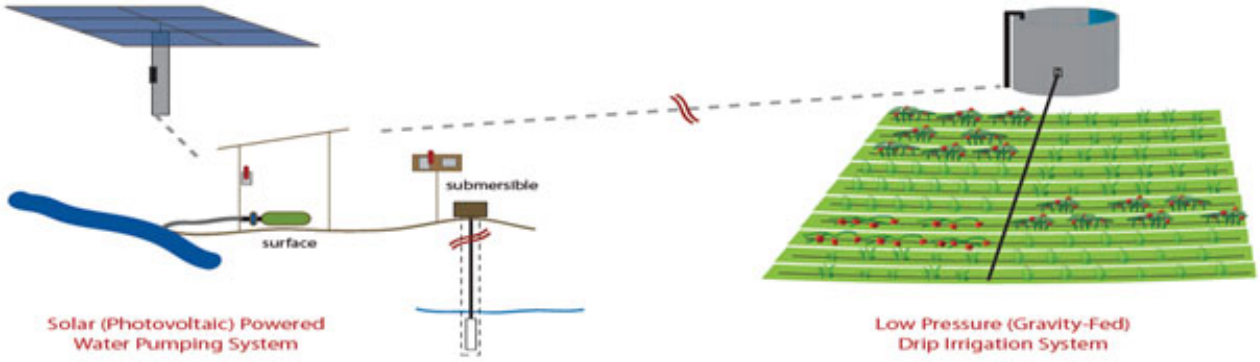
Water pumping has long been the most reliable and economic application of solar-electric (photovoltaic, or PV) systems. Most PV systems rely on battery storage for powering lights and other appliances at night or when the sun isn't shining. Most PV pumping systems do not use batteries – the PV modules power the pump directly. Instead of storing energy in batteries, water is pumped into storage reservoirs for use when the sun isn't shining. Eliminating batteries from the system eliminates about 1/3 of the system cost and most of the maintenance. (Solar Electric Light Fund, 2008, p. 10)

RETs lead towards environmental sustainability. However, as has been previously mentioned, high start-up costs generally inhibit their application. The technology employed by SELF is not only sustainable, but also lowers the costs of the system itself.

In Benin, this is particularly important due to "an insufficient electrical supply [which] continues to adversely affect Benin's economic growth" (Central Intelligence Agency, 2011). Decentralized renewable energies have proven their worth in Benin, where access to electricity is insufficient to meet the needs of the population. In fact, Benin imports 588 million kWh (2007 est.) in electricity (Central Intelligence Agency, 2011). The future development of sustainable energy sectors would help Benin reduce the need for electricity imports, whilst, most importantly, providing energy access to its rural poor. In the case of the Kalalé District, the implementation of "PVDI [Photovoltaic (solar) powered drip irrigation] systems have an additional advantage over liquid-fuel-based systems in that they provide emissions-free pumping power" (Burney et al, 2010a, p. 1852).

Combining drip irrigation technology with solar power has allowed these two villages to benefit from the advantages of drip irrigation, whilst also ensuring environmental sustainability.

Figure 2: Solar Market Garden



Source: Solar Electric Light Fund, n.d.

- Community Empowerment and Measurable Benefits

The District of Kalalé is located in northern Benin, a part of the world where the dry season lasts about 6 months. There are about 44 villages with "approximately 105,000 inhabitants [who] have access to minimal local infrastructure: Kalalé lies 100 km from a paved road, has no secondary school, and no electricity grid (although the main village does have a diesel generator)" (Burney et al, 2010b, p. 1848). With the Solar Market Garden, these two villages now have access to water and food during the dry season.

A study published by Stanford University's Program on Food Security and the Environment in the Proceedings of the National Academy of Sciences (PNAS) of the United States concluded that in the Solar Market Garden, "food access, both via home production and purchase, increased dramatically for the families of women's group farmers using the solar-powered drip irrigation technology" (Burney et al, 2010a, p. 1850). Nutrition improved and income increased for the inhabitants of these two villages. In addition, the solar powered pumps reduced the labor of water hauling, which is usually done by hand by women and young girls (Burney et al, 2010a, p. 1848). The effects on education levels have not yet been measured, as more time will be needed to determine the long-term effects of increased food security and more efficient agricultural work in these villages.

Will young girls go to school now that they spend less time on the field? Community participation in these projects has empowered the inhabitants. It would be safe to assume that education levels will increase in the future. "Within the development community, it is widely acknowledged that imposed solutions are unsustainable. Unless there is local ownership in the community, the results will not be maintained when the foreign assistance is withdrawn" (Andersen, 2008, p. 15). In the case of Benin, the local village community decided that the focus of SELF's project would be on addressing food security (R. Freling, personal communication, April 19, 2011). This choice ensured full community cooperation with the project and has permitted its success.

- Financing, Training, and Capacity Building

The Solar Market Garden was based on donations received through the World Bank (Solar Electric Light Fund, n.d.). However, SELF has established an innovative microfinancing scheme in other projects around the South that permits rural poor villages to access these solar technologies at affordable prices. In the case of Benin, PVDI systems require higher up-front costs, however group investments will "provide mechanisms for risk-spreading, access to capital (through group-based loans), economization of input purchases and marketing expenses, the ability to negotiate land and water rights, and knowledge-sharing" (Burney et al, 2010a, p. 1852). Adapting financing schemes to local conditions and income levels permits individual and communities to gain access to these important technologies that improve their daily livelihoods.

In other projects, such as the one in Vietnam, SELF implemented a microcredit system based on the idea of a "revolving" fund. It

was structured such that purchasers put 10% down, followed by monthly payments of $3 to $4 over four years. Because the installments were about the same sum families were already spending on the smoky, polluting kerosene commonly used for lighting in Vietnam, late payments were rare, and defaults even rarer. As the loan fund was replenished, additional loans were made. Soon, hundreds of households were getting the benefit of clean solar electricity from photovoltaic systems sold and serviced almost exclusively by women. (Solar Electric Light Fund, 2003, p. 3)

Financial ownership and access to the necessary credit permitted the growth and increased usage of solar systems either for home based use (as is the case with Vietnam) or in agricultural settings (as is the case with Benin).

However, financing alone cannot ensure the long-term success of these projects. Training and capacity building is also needed. In fact,

to promote technical sustainability [in Benin], the local community development organization hired a project team (director, solar technician, and agricultural technician) to oversee installation and maintenance, to facilitate operations, to provide continued training for farmers, and to lay the foundations for project expansion. The impact of having highly educated local staff members eager to work long term on a project in their home district cannot be underestimated. At each step of installation, additional technicians were trained: [l]ocal masons learned to construct and repair the large concrete reservoirs, pump mechanics and electricians learned to install and monitor solar-powered pumps, and the farmers learned to use and care for the pumps, drip irrigation lines, and filters. (Burney et al, 2010b, p. 1)

A team of experts in partnership with SELF and with the local communities provided the necessary technical knowledge to maintain and repair the solar panels. ICRISAT also provided training on drip irrigation and agricultural methods.

The level of capacity building and community participation that took place in 2007 to ensure the viability of the Solar Market Garden sets the stage for future projects in clinics and schools. It also potentially spreads word of mouth with other villages in the area, who will then be interested in rural renewable energy and the value it can bring to their own communities.

- Feasibility of Replication and Long-Term Developmental Sustainability

According to Robert Freling, SELF plans to replicate this project in the upcoming future in 8 other villages of this northern district; the long-term plan is to replicate it in all 44 villages of Kalalé District; "in principle, there is no reason why the Solar Market Garden could not and should not be replicated. Coordination, support of local communities and local governments, and partnerships with experts led to the success of the Benin project" (personal communication, April 19, 2011). Overall, the Solar Market Garden is feasible and replicable. It emphasizes sustainability, community empowerment, and partnerships with experts and local communities.

All of these elements in addition to technology, which is adaptable to other areas, establish the necessary mechanisms to ensure dissemination of the Solar Market Garden. A Stanford University study noted that the

widespread uptake of PVDI technology will require regional manufacture and a local supply chain, linkages to larger markets, and the financial institutions necessary for a vibrant private market in which consumers can reasonably invest in PVDI systems. While these institutional supports are developed, long-term involvement by PVDI project implementers will be critical in financing PVDI systems, facilitating extension services and maintenance, coordinating market access among groups of PVDI users, and providing the stability of demand necessary to jump-start the private sector. (Burney et al, 2010a, p. 1852)

The necessary conditions for longer-term widespread use of this technology are not yet in place; however the foundations have been built. There is still no evidence on the long term sustainability of the Solar Market Garden as the project is relatively new, however as seen by the initial results, it has impacted two villages in a very crucial manner— health, income and empowerment— three factors needed to foster entrepreneurship and to not only ensure the future success of the project in these two pilot villages, but in other villages around the global South.

3.1.3 Expanding the Path: Replicating Successes on a Larger Scale

Overall, the project in Benin meets each of the evaluative criteria. The Solar Market Garden is replicable. The application of the microcredit scheme used in other countries is easily transferable to this project. In addition, group financing is also an option. The Stanford University study concluded "that solar-powered drip irrigation can provide substantial economic, nutritional, and environmental benefits to populations" (Burney et al, 2010a, p. 1852). A future scaling up is required, especially when one considers that "for the 70 percent of the world's poor who live in rural areas, agriculture is the main source of income and employment" (The World Bank Group, 2011b). In a rural village, isolated from electric grids, in Northern Benin, access to electricity made a world of difference in the short term. The long-term effects can only be imagined, yet they are all positive. The economic, environmental, and technical characteristics of this project permit large-scale replication in other areas of the global South, especially those sharing the same local conditions as Northern Benin.

According to the World Energy Outlook Report, to meet the first goal of the MDGs, "an additional 395 million people need to be provided with electricity and an additional one billion provided with access to clean cooking facilities. To meet the much more ambitious goal of achieving universal access to modern energy services by 2030, additional spending of $36 billion per year would be required" (OECD/IEA, 2010, p. 14). This ambitious goal can only be achieved through small scale projects based on local participation and adapted to local conditions.

As has been seen, many factors led towards the success of the Solar Market Garden. To replicate it in other parts of the world would require a combination of these elements to be present. However, these factors combined are not sufficient without a level of awareness and knowledge present in rural communities. Creating the incentives and interests in rural communities and national governments to transfer these rural renewable energy models requires a development of knowledge and an understanding of the benefits inherent in rural renewable energy. The investment required to provide universal access is large, however, the opportunity exists. With the right framework, this goal can be achieved.

Chapter 4: *Building the Path*

4.1 RECOMMENDED DEVELOPMENT STRATEGIES

The Benin case study demonstrates the success of a small-scale project. There are many other projects that reproduce similar successes around the world; however, they do not always get replicated. There are many reasons for this ranging from a lack of financing, governmental support, or most importantly the projects lack the necessary elements for their replication elsewhere. In view of all these factors analyzed in the previous chapter, it is critical that development strategies focus on each established criteria.

However, no project will succeed without local community involvement. Thus, the most important criterion, which is encompassed to differing degrees in each element, is raising rural awareness of the resources available to achieve economic development. Once motivation and interest is there, then entrepreneurship can grow and energy poverty can be addressed. "Energy access must not be addressed simply as technical and economic issues only. It is important to take a people-cantered approach, by looking at how energy affects peoples' lives directly" (Organization for Petroleum Exporting Countries [OPEC] Fund for International Development, 2010, p. 192). Based on the results of Benin's Solar Market Garden and SELF's work, the basic criteria needed for smaller scale projects to become larger have been fulfilled for this particular case study. Plans for its future replication further support this notion. The next

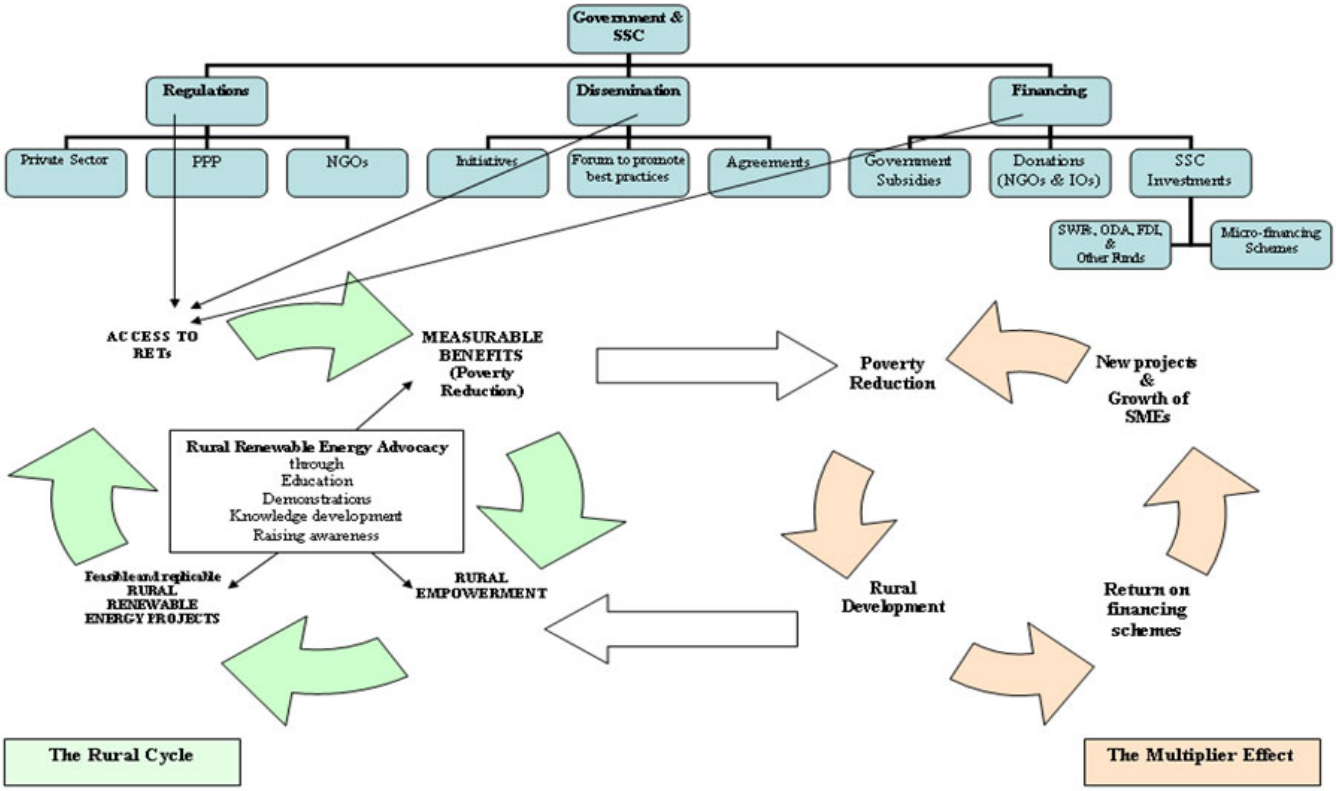
step is to establish the regional framework in which its replication may succeed.

Interactive research provided the context in which the necessary SSC development strategies can be recommended within a framework that will allow future replication of not only the Solar Market Garden, but also other rural renewable energy projects that can address energy poverty in the rural South. Analysis based on the findings of this research lead to the creation of an Energy Access diagram shown on the following page. This diagram outlines all of the necessary components for successful SSC development strategies.

It can be divided into five main parts, which all link closely with each other. The main component is the Rural Cycle, which involves Access to RETs, Measurable Benefits, Rural Empowerment, and Rural Renewable Energy programmes. Dissemination, Regulation, and Financing all fall under the category of Government and SSC and can be found towards the top of the diagram. They each represent their own category. Each one of these main headings leads towards an important element of the Rural Cycle.

The final section of the diagram has been titled the Multiplier Effect. It pertains to the long-term effects of measurable benefits and relates closely to the concept of entrepreneurship. In the long run, entrepreneurship will create a new linkage with the Rural Cycle. For this to take place, Government and SSC policies must take into consideration three main factors: dissemination, regulation, and financing. Thus, each main element of the diagram links with other elements and can potentially create a self-sustaining system in which energy poverty may be addressed.

Figure 3: Energy Access Diagram



Source: Based on author's analysis

4.1.1 Dissemination

Under this category, several actors play a key role in disseminating the value of rural renewable energy, its corresponding technologies, and the sharing of best practices. International organizations, bilateral, multilateral, and triangular initiatives, NGOs, and local and national governments have the power to bring RETs to the necessary rural sectors. Under SSC, forums can be established to promote best practices for rural development and to share experiences amongst the various nations of the South. In addition, cross border and regional cooperation agreements can establish framework regulations that promote the trade in RETs and the transfer of technology, so as to install and maintain these technologies.

According to Ambassador K. Kiwanuka of the Ugandan Mission to the United Nations and Other International Organizations in Geneva, Switzerland, "South-South Cooperation has been very helpful, China and India are doing a good job. They are more generous with their technology. They are bringing quite a good number of industries to Africa. Europe is also doing so but at a smaller scale" (personal communication, April 13, 2011). As a partnership, SSC is perceived to be the perfect medium in which investments, technology transfer, and the sharing of knowledge can take place. It represents a forum amongst equals, where the need to promote development amongst various Southern partners can sometimes outweigh other geopolitical concerns (i.e. the wish to prevail over other nations in the political and economical realms to guarantee national security).

In the case of the BRICS, where geopolitical concerns seemingly dominate more than in other Southern nations, establishing their position as powers in the region requires their commitment towards development as well. Natural resources and new markets represent elements of other Southern nations, which can further boost their own emerging economies. In this regard, the potential for SSC to promote and establish agreements which place rural renewable energy at the forefront of development strategies is critical for the success of small scale projects scaling up to larger projects and replicating in other areas of the South.

Since most of the rural populations live in the global South, prioritizing rural development must come from the South itself. Hence, dissemination should occur under SSC's forums and cross-border and regional cooperation agreements, which promote RETs and their installation. From a geopolitical perspective, RETs have the potential for promoting increased energy security in many areas of the South, especially those whose main exports are not oil or natural gas. "Decentralized energy can increase the energy security outlook of the regions in which it is employed both in terms of reduced infrastructure vulnerability and reduced dependence on imported fuels" (Sweet, 2009, p. 311). Thus, geopolitical concerns in addition to increased demand for markets will pave the way for SSC forums to discuss renewable energy and establish the correct framework under which rural renewable energy can then be disseminated to other rural areas by moving beyond urban demand into rural demand. Once there is regional and national support, then the doors are open to new alternatives outside the grid.

The incentive to access energy exists in rural areas; it is just a matter of supporting these alternatives on a national scale, so as to allow the locals to benefit from it. As Neville Williams, a solar energy advocate, who founded SELF, Solar Electric Light Company, SELCO-India, and Standard Solar Inc., declared: "There are plenty of talented people to start up these types of enterprises. You just need money and inspiration" (personal communication, April 8, 2011). The entrepreneurial spirit exists; it is just a matter of creating the right environment through the proper policy frameworks, raising awareness about rural renewable energies and allowing local solutions to adapt to these new technologies.

On the other side of the equation, many NGOs work on the ground with local communities. Unfortunately, in many instances they lack the technical expertise to implement such projects. Peter Illig, the development director at Franciscans International in Geneva stated, "Franciscans are people who choose to live and work among the poor. They are on the ground with local communities and gain their trust. They are connected to a global organization, but sometimes lack the technical expertise to implement projects that are self-sustaining" (personal communication, April 26, 2011). In order to remedy this, partnerships must be encouraged amongst various NGOs, governments, and other organizations. There is no need to reinvent the wheel or stop driving down the road because of a lack of knowledge.

Thus, raising awareness is multifaceted; it must be targeted at NGOs, businesses, governments, local communities, and regional bodies. Every organization that has a role to play in addressing energy poverty in rural areas must be informed and must understand the value of rural renewable energy. SSC forums can bring together these various actors and facilitate their entry into rural markets, even a bilateral agreement would allow NGOs and private investors to work closely with rural communities and create a rural market for renewable energies.

4.1.2 Regulation

Governmental and regional regulations play an important role in creating a conducive environment for the import of renewable technologies and for their implementation. With the proper regulations in place, the private sector and NGOs can work under facilitated conditions and truly implement self-sustaining projects. Since

reaching the unelectrified rural population is often only possible through decentralised energy systems, due to low potential electricity demand and economic development in these areas and sometimes also for political reasons, grid extension is not a feasible option. The high cost of energy transport and transmission infrastructure, such as high voltage power lines, oil and gas pipelines, is one of the factors responsible for the low progress in expanding national distribution electricity grids. (Moner-Girona, 2008, p. 12)

In the game of politics, rural populations are easily forgotten. High costs in both grid and decentralized technologies inhibit full government support and private investments. However, a shift must take place in this thinking to allow for the implementation of regulatory frameworks, which promote private sector investments, allow for NGOs to implement programs, and foster public-private partnerships (PPP).

Bhupendra Rana, the community development facilitator with the Inclusive Development of the Economy Programme in Nepal clearly states the value of PPP:

Simply put, PPP is the best model in the developmental arena of the world to address and sustain the economic poverty of any section. It applies to energy poverty as well. Generally public sector should lead policy formulation, proactive coordination and output based monitoring. Likewise private sectors that represent the economic pillars for development have to support, based on governmental policies and strategies, to make synergy effective and to avoid different types of duplications. Communities who act as right holders have to be involved in both processes and contributions from day one to achieve for ownership and sustainability. (personal communication, April 19, 2011)

Capital is needed, but it will not come unless the government creates the necessary conditions for its success.

The UNEP Finance Initiative works with large banks in a global partnership to promote sustainability. In a personal communication with Jessica Jacob, the task force coordinator for the Africa/Latin America UNEP Finance Initiative, it was noted that for banks "to expand into rural areas, the market needs to be developed. However, the first step is for governments to understand the important role that the financing sector plays, then they can create the proper regulations" (personal communication, April 19, 2011). Thus, governments must work with NGOs and private investors to set policies that allow for the success of the rural cycle from financing renewable projects to disseminating its usage and to empowering rural inhabitants. The costs can be borne by different actors throughout the process.

4.1.3 Financing Mechanisms

Capital represents a big concern in any venture and in the case of rural areas, the return on investments are not always perceived as valuable enough to merit the investment in the first place. However, "the low operation and maintenance costs of renewable energy power systems offset the initial capital costs, which makes them more efficient and cost competitive solutions" (Alliance for Rural Electrification, 2011, p. 1). Sources of financing are numerous ranging from government subsidies to donations from NGOs and international organizations, and SSC investments. These latter types of financing can also be quite varied in nature. ODA, FDI, and SWFs represent some of the forms in which funds can be targeted towards rural development and energy access.

ODA "comprises grants or loans to developing countries and territories […] that are undertaken by the official sector with promotion of economic development and welfare as the main objective and at concessional financial terms. Technical cooperation is included" (United Nations Statistics Division, n.d.). While, FDI is "the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor" (The World Bank, 2011c). Finally, SWFs are "state-owned investment funds composed of financial assets such as stocks, bonds, real estate, or other financial instruments funded by foreign exchange assets" (Sovereign Wealth Fund Institute, 2010). The largest SWFs can be found in the global South, with China and the United Arab Emirates dominating the top ten (Sovereign Wealth Fund Institute, 2011). Within the South, investments can take on the shape of any of these mechanisms. They can originate from the North, but most recently they have increasingly originated from the South (the 2008 Financial Crisis showed a downturn in these numbers; however it has generally been on the rise)[9].

In particular, South-South ODA has also been on the rise, mostly on a bilateral basis. "[The] main non-OECD [Organization for Economic Cooperation and Development] donors are Brazil, China, India, Kuwait, Mexico, the Russian Federation, Saudi Arabia, South Africa, South Korea, Taiwan, and Turkey. However, as a result of being outside the monitoring lens of the OECD Development Assistance Committee (DAC), data on South-South transfers is unreliable" (Ortiz, 2008, p. 7). In addition, SWFs have been used for development projects; such is the case with the China-Africa Development Fund, which has invested in 27 different projects on the African continent (Sovereign Wealth Fund Institute, 2008). This is an important turn of events in traditional North-South financial flows. "The fact that a number of developing countries have accumulated considerable foreign exchange reserves offers new options for monetary and financial cooperation among developing countries in general, and at the regional level in particular" (UNCTAD Trade and Development Board, 2010, p. 18, art. 71). It is just a matter of directing these investments towards energy access in rural areas.

In order to achieve this, microfinancing schemes and rural banks should be empowered and provided incentives to

lend for sustainable projects such as rural renewable energy. Yet, this is a two-way road:

Microfinance already promotes sustainable development by supporting eco-initiatives such as green microenterprises, organic farmers or renewable energy entrepreneurs. Some microfinance initiatives offer specific green loan products to their clients to buy solar panels for instance, while others actively provide microcredits to businesses implementing renewable energy systems, like solar, wind, and biogas. But those initiatives remain relatively scarce. Two key issues have to be tackled to move forward in this field: (1) the necessity to innovate to develop profitable green products at affordable prices that can offer great cost savings for clients, as well as environmental benefits ("win-win" products); and (2) the need to attract more money from investors in the sector to help microfinance initiatives' financing of such types of green activities and products. (J. Audran, the research and development analyst at Symbiotics Research and Advisory SA, personal communication, April 11, 2011)

In the case of SELF, a microcredit scheme was adapted to local conditions as was seen in the case of Vietnam. Of particular note is that "so far there have been no defaults and the user pays the full cost of the system without subsidy" (Sanchez, 2010, p. 60). Building the correct financing schemes requires ingenuity and an understanding of the local conditions. Participation by rural banks is key in any investment endeavor, whether that comes from FDI, ODA, or SWFs.

If one takes the data provided by the World Energy Outlook Report for 2010, there are about

- 1.4 billion people without access to electricity;
- 2.7 billion people relying on biomass (such as dung and wood) for cooking. (OECD/IEA, 2010, p. 14).

The Baker Institute estimates that of these totals,

- 99% of people without electricity live in the global South;
- 4 out of 5 of these people live in rural areas (Baker Institute Energy Forum, n.d.).

Taking these numbers into consideration, about 3 billion people need to receive access to sustainable energy in rural areas. In fact, according to the World Energy Outlook Report, to achieve universal access to modern energy services by 2030, "additional spending of $36 billion per year would be required" (OECD/IEA, 2010, p. 14). When compared to the high start up costs usually associated with RETs, this investment seems high. However, "each solar-powered drip irrigation system is about 1.24 acres (0.5 hectare) in size, costs approximately $18,000 to install and requires about $5,750 a year to maintain, the authors [of the Stanford study referenced above] said. Based on the projected earnings of the farmers, the system should pay for itself in about 2.3 years, they concluded" (Dean, 2010). Since the Solar Market Garden's technology adapts well to local conditions, it can be assumed that its usage can be replicated in other rural areas. For example, in the District of Kalalé, SELF plans on replicating this solar powered system with all 44 villages in which there are approximately 105,000 inhabitants (Burney et al, 2010b, p. 1).

In combining this data, approximate calculations for costs of replication may be obtained.

Table 2: Estimated Costs of Replication for the Solar Market Garden

Energy Access Costs (USD) Population in Need Worldwide Universal Energy Access $36 billion per year 1.4 billion without access to energy 2.7 billion reliant on biomass Solar Market Garden $18,000 start up cost 1 village in Northern Benin $5,750 maintenance/year Solar Market Garden Replicated $792,000 start up cost 44 Villages in Northern Benin in District of Kalalé $253,000 maintenance/year 105,000 inhabitants Worldwide Solar Market Garden Replication $10.56 billion start up cost 1.4 billion without access to energy $33.73 billion maintenance/year

Source: Based on own calculations from data obtained from the following sources: Baker Institute Energy Forum (n.d.), Burney et al (2010b), Dean (2010), & OECD/IEA (2010)

The final estimated total for Solar Market Garden's replication in rural areas is lower than the estimated total in

addressing universal energy needs for all rural areas (it should be noted that these calculations do not include priceless intangible benefits, such as climate change mitigation, increased food security, and women's empowerment). The World Energy Outlook report's estimates do not consider particular projects and their specific costs. However, the final start up cost of $10.56 billion, while high, can be easily offset through targeted aid and investments. Microcredit schemes play an even more important role, as it will allow actual investment and revenue growth in rural areas. It will also allow funds to "revolve" and grow on their own as opposed to long-term aid dependence for instance. Maintenance costs should be financed through these special microcredit schemes, especially once the Multiplier Effect begins its cycle.

Of particular note, are Neville Williams's words on financing: "Renewable energy cannot be given for free as the value of it will be lost to the recipients and there will be no long-term commitment for its success" (personal communication, April 8, 2011). A self-sustaining project cannot succeed if the factors for its success are lacking; financing is a key element.

4.1.4 The Rural Cycle

The main policies outlined above deal with dissemination, regulation, and financing. Each one feeds into the rural cycle, which is composed of four main elements that work closely together. One of the first elements to get the cycle started would require the implementation of feasible and replicable rural renewable energy projects. In this respect, international organizations, North-South initiatives, triangular cooperation, South-South initiatives, NGOs, and governments can play a key role in establishing the necessary conditions and most importantly in bringing these projects to rural areas. "Social norms and networks are a key form of capital that people can use to move out of poverty. Thus is it important to work with and support networks of poor people and to enhance their potential by linking them to intermediary organizations, broader markets, and public institutions" (World Bank, 2000, p. 10). Once these projects are in place, access to RETs can be established. Financing, regulation, and dissemination play an important role in ensuring this access.

The value of access to RETs in this cycle cannot be underestimated. At the First International Gateway to Africa Conference, former Secretary-General of the United Nations, Kofi Annan emphasized the important role of renewable energy vis-à-vis Africa: "We need renewable energy; we need to leapfrog mistakes of other countries. This requires major investments and governments need to create the right environment to attract the right investments ("The Future of Africa: Challenges and Opportunities," April 6, 2011). Initially these investments should be targeted towards feasible and replicable rural renewable energy projects, which will lead towards preliminary access to renewable technologies for the rural areas of the South.

The case of SELF has demonstrated that these two initial components (feasible and replicable projects and access to RETs) lead towards measurable benefits such as improved health, increased income, access to education, and food security. These benefits eventually create rural empowerment: "The Benin project has had very profound effects. Under one model, water, food, income, energy, and women's empowerment have been addressed. Drip irrigation is the cornerstone of the project, but it does not represent the totality; there are still schools, clinics, microenterprise centers, wireless applications, and many other uses for this energy. It is about a holistic approach to energy poverty" (R. Freling, personal communication, April 19, 2011). Knowing that you have benefited from these projects provides incentives and motivations to start other projects, thus rural inhabitants become empowered and search for new ways to apply these technologies in other feasible and replicable projects.

Nonetheless, this cycle is based on one central theme: Rural Renewable Energy Advocacy (i.e. knowledge development and raising awareness). The entire diagram revolves around this component. If people do not know about what is out there, then they will not be interested. As Matthew Lynch at the World Business Council for Sustainable Development (WBCSD) stated, "development needs to be demand driven" (personal communication, April 15, 2011). Promoting rural renewable energy requires participation by governments, NGOs, international organizations, small and medium enterprises (SMEs), and private sector. In addition, "businesses have to be good at responding to the needs of their customers. This can make them important actors in addressing the needs of the poor" (M. Lynch, personal communication, April 15, 2011). All of these actors contribute towards spreading word of

mouth of the benefits of rural renewable energy. However, the first steps need to be taken before word of mouth can spread like bushfire.

NGOs and businesses can provide demonstrations and educate the rural populations on the value of renewable technologies. Demonstrations can take the form of seminars, project implementation on minor scales (i.e solar lanterns) or larger scales (i.e. the Solar Market Garden), and sponsored visits to other rural areas where successful projects have been implemented. Rural inhabitants are not the only target audience; local and national governments represent an important target group as well.

Just like any business would be run to increase sales, the value of rural renewable energy technologies should be promoted through word of mouth, referrals, increasing awareness on a local, national, and regional scale, and proving its worth by validating results achieved through third parties and showcasing its success. Prove to the world that it works and that it is financially feasible and others will follow. “People can live for centuries not knowing what is possible for them, but once they know things happen” (R. Giuliani, Gateway to Africa Conference: “International Cooperation in the War Against Crime and Terror,” April 6, 2011). It is only a matter of time.

In this analogy, the salesmen and women are the entrepreneurs, NGOs, UN agencies, international organizations, and any one individual ready to act as a spokesperson. The customers are the governments, their regional counterparts, and the rural inhabitants. The entire diagram is contingent upon the promotion of rural renewable energy. Once this is in place, then dissemination, regulation, and financing by governments unilaterally or through SSC can take place.

The cycle will then continue in its path and eventually foster the necessary rural conditions in which it can continue to grow of its own volition. “A supply chain of expertise is needed that incorporates both local technical experts and the project proponents on the ground. It is about ensuring the necessary human relationships and trust that are essential for creating an energy utility at the local level” (P. Illig, personal communication, April 26, 2011). Partnerships between the various actors involved in starting the rural cycle engenders an environment of trust, where local communities will actively participate in raising their living standards.

4.1.5 The Multiplier Effect

Once the cycle has been established and the proper regulatory and financial frameworks are in place, poverty reduction and the benefits inherent within will foster entrepreneurship, thus leading to the establishment of SMEs and other such endeavors based on the installation and maintenance of these rural renewable technologies or based on the provision of goods and services, which are only possible with access to electricity.

The case of the Solar Electric Light Company (SELCO)[10] India proves that an entrepreneurial spirit exists in rural areas and it is only a matter of opportunity for it to grow. Neville Williams, a solar advocate, partnered with Dr. Harish Handi, a solar engineer from India, and founded SELCO, a social enterprise, in 1995 (SELCO Solar Pvt., 2008a) to prove that poor people can afford sustainable technologies and learn to maintain them; this social enterprise is run as a commercial entity and has “sold, serviced and financed over 115,000 solar systems to our customers” (SELCO Solar Pvt., 2008b). Its success proves the existence of a market for solar energy; it is just a matter of creating policies and economic conditions in which it can thrive in other rural areas.

In the words of Neville Williams, “by the start of 2005, SELCO had sold and installed over 50,000 solar-home lightning systems. No other company had achieved this. It was selling energy services to underserved populations, and its revenues were growing at 3 percent a year […] SELCO sought to reduce energy poverty among people in need, not exploit energy poverty” (2005, p. 256). Sometimes, as is the case with SELCO, it is about the right person at the right time at the right place.

However, without clean energy advocates, social enterprises such as SELCO would not be able to grow. Thus the work of SELF, APPLES, Practical Action, CTR/N and many other organizations is crucial for the Energy Access

Cycle diagram to begin. Eventually, one sustainable, replicable, and feasible project will lead to others and the Multiplier Effect may take place. Poverty reduction as seen through measurable benefits under the Rural Cycle leads towards rural development, which in turn leads towards entrepreneurship and the growth of SMEs. A return on the financing schemes allows rural banks or NGOs, whatever the case may be, to reinvest these funds in the replication of such projects in other parts of the global South. Another positive outcome of rural development and entrepreneurship is the establishment of new development projects such as lightning for schools and energy for clinics.

In order to achieve this Multiplier Effect and move towards universal energy access, "you need supporting public policy and financing mechanisms of a variety of types" (M. Lynch, personal communication, April 15, 2011). Of particular importance for the success of replication is access to credit in rural areas. However, microfinancing schemes cannot stand on their own: "Microfinancing needs to be attached to something that generates additional revenue so that recipients can repay the loan and increase their incomes in the longer term" (M. Lynch, personal communication, April 15, 2011). Everything is closely linked and it is only a matter of setting it in motion.

The implementation of microcredit schemes, which are self-sustaining, is required for the success of rural renewable energy projects. Following the example of SELF's solar home systems, microcredit systems can potentially create a "revolving" fund in which the replenishment of the fund allows for its future usage in the replication of other projects within the same village or in other villages. If the funds are invested correctly, new donor money would not be required. Concerns over individuals defaulting are minimal if one considers the incentives in place for these individuals and communities to contribute to raising their own living standards. In areas where individuals have no means whatsoever of raising these funds, cooperatives can play an important role by pooling the necessary resources to request the loan and pay it back as a community.

4.1.6 Moving Forward

The provision of electricity to rural populations brings together many actors with a different role to play. Sometimes, one actor can play many roles. However, each role must be fulfilled to ensure the feasibility and replication of rural renewable energy projects such as the Solar Market Garden in Benin. Promoting the social and economic impact of these technologies and raising rural awareness are at the center of these endeavors. In this respect, SELCO's work in India can be taken as a good example of marketing strategies adapted to local conditions. In a CNN article, some key lessons were outlined as leading towards SELCO's success:

> [(1)Teaching] customers: company employees went door-to-door listening to the needs of potential customers and explaining how a few hours of extra light after sundown could lead to more earnings, fewer fumes from gas lamps, and better study time for kids. [… and (2) selling] experiences. [Dr. Harish] Hande was determined not to simply sell the promise of solar energy – he wanted Selco India to communicate with customers and make sure the equipment worked. (Sen, 2007)

Local participation was key in establishing the right marketing plan for this social enterprise's success. Adapting ideas such as these to the work of NGOs and other organizations will raise rural awareness and permit rural renewable energy projects to flourish. "Policies for rural development must be adapted to local circumstances and so require a much larger investment in local knowledge" (Collier, 2007, p. 62). Promoting local participation and accountability should be an inherent part of any project.

Accountability should not only come from the local communities benefiting, but also from the NGOs, governments, banks, and various organizations. Within SSC itself, national participation and accountability will also lead to policies adapted to local and national contexts; the "dialogue should therefore concentrate on building the necessary mechanisms for development, in which countries from across the Southern Hemisphere come together to share their successes, failures, challenges and strengths" (Omura, 2010). Partnerships across the different levels of dialogue provides for a cohesive environment in which future replication of rural renewable energy projects is feasible.

In summary, four levels of development strategies should be implemented within the context of the Energy Access

diagram:

- On a local scale: training, financing mechanisms (which are “revolving”), local participation, access to technology, and the implementation of solutions based on immediate needs in consultation with local communities.
- On a national scale: establishment of rural renewable energy policies that encourage clean energy, promotion of trade and technology transfer in RETs, support of rural banks and microfinancing schemes, and provision of training and capacity building where needed.
- On a regional level: cooperation on best practices between nations, partnerships and agreements to establish forums in which local solutions and trainings may be exchanged with the goal of adapting to other areas, creation of technology transfer agreements, establishment of a regional policy for rural energy, and a forum to discuss financing mechanisms and the best use of ODA, FDI, and SWFs.
- On a global scale: promotion of specific regulations for the trade in renewable energy sources for rural areas (i.e. with the WTO), annual forum to discuss best practices and share lessons learnt (with participation of small stakeholders in rural areas), and the establishment of recommended guidelines for the targeting of funds towards rural renewable energies and projects that have proven their value (as is the case with the Solar Market Garden).

The latter two levels fall directly under SSC strategies, however local and national level strategies are also needed to ensure the viability of SSC strategies. Without these four levels, the success of rural renewable energy projects cannot flourish. A specific programme of action, which encompasses all of these various elements discussed, may be enacted under the auspices of SSC. In fact, this new programme of action may build on the existing programmes of action such as the Buenos Aires and the Havana Programmes of Action. The main goal is to address the replication of such successful projects as the Solar Market Garden. SSC’s importance as an international movement would allow such programmes to gain momentum and begin to address energy poverty in rural areas through effective instruments that promote local, national, and regional initiatives.

Chapter 5: *Walking the Path*

5.1 CONCLUSION

Clean energy is growing in many organizations. Initiatives have been launched at WBCSD, UNEP, UNDP, UNCTAD, the World Bank, and many other organizations around the world, including private entities such as Google Inc. and General Electric, who are now investing in clean energy. The discussion has moved beyond just energy as oil, natural gas, or coal. It is about clean energy as a source of electricity. There has also been a growing recognition of what energy means for the developing world and the achievement of each of the MDGs. Energy forms the basis of each goal, in particular the first goal of halving poverty. Without energy as electricity, most of these goals cannot be achieved. Its uses are taken for granted in many parts of the world, especially the developed world; people do not think twice about turning on the light, using a computer, watching television, or cooking. Electricity has become a natural part of life.

However, a lack of energy impedes progress in the rural South. The difference it makes in increasing income, study time for young children, or just making life a bit easier cannot be ignored:

Modern energy, especially electricity, allows the introduction of relatively low cost capital goods such as tools and sewing machines that can have a major impact on labor productivity (and hence living standards). Because most economic studies on global poverty focus on the provision of finance and education to create economic activity, the role energy services play in alleviating abject poverty and promoting sustainable development has not been clearly identified. (Baker Institute Energy Forum, n.d.)

The role of energy in the different aspects of a person’s life cannot readily be measured (nor has it always been

acknowledged); yet an improvement in living standards represents a positive, measurable outcome of access to electricity. Notwithstanding "energy access is not an end in itself but a means to an end for economic development and poverty reduction" (OPEC Fund for International Development, 2010, p. 205). Since the costs of extending the grid to many rural areas is sometimes prohibitive, alternative solutions must be implemented and in fact, have been implemented.

RETs "offer energy independence and security as well as the inherent environmental benefits of using clean and sustainable solutions" (Alliance for Rural Electrification, 2011, p. 1). Since most renewable technologies are also decentralized, the costs of extending the grid are eliminated to be replaced by solutions, which in the long-term are more cost-effective and can be adapted to suit the specific needs of an area. However, because most rural areas are far from urban areas and have low population concentrations, governmental policies do not necessarily focus on these areas. "Rural population densities are generally low, levels of demand are limited and the cost of providing energy supply is high compared with densely populated areas. Thus, electricity companies—public or private—have little or no incentive to provide services to these areas" (OPEC Fund for International Development, 2010, p. 192). Rural areas are at a disadvantage from a market perspective. Both private and public actors may refrain from investing in areas, where the rate of return is not high compared to urban areas. Tackling this challenge will be a necessary step going forward.

Capital is needed; technology is needed; demand is needed. The case of SELCO- India proves the existence of demand, and thus a market. Raising awareness was a necessary step towards creating and targeting this demand. Governmental policies can facilitate the rise of such social enterprises and the work of NGOs such as SELF by creating a regulatory environment in which they may prosper. Partnerships with experts and other organizations bring the technology required for the success of these projects. Whereas before, costs meant ignoring the advantages of rural renewable energy in favour of cheaper sources such as fossil fuels; the slowly decreasing costs of RETs have changed this. In addition, the re-emergence of SSC, its strong financial resource base, and its growing strength as a cooperative movement will aid the implementation of rural renewable energy projects.

The final key variable, capital, exists in the South. FDI flows are on the rise, the largest SWFs can be found in the South, and ODA is becoming increasingly important within South-South politics. SSC policies and forums should provide a framework in which these flows may be targeted towards rural investments. In fact, agreements on establishing a new aid framework would allow SSC financial flows to target areas, where the greatest benefits may be achieved. The right forums and policies will allow for increased development in the South and, in particular, its rural areas.

Unfortunately, policy makers alone will not focus on rural areas. A case has to be made for their importance; once this has been understood, then raising awareness of the value of renewables is the next step. Migration from rural to urban areas creates unnecessary pressures in urban zones and increases poverty in both urban and rural areas. A long-term focus on urban planning should encompass a strong focus on rural development. This same long term focus would thus also apply to renewable energy: "government support for renewable can, in principle, be justified by the long-term economic, energy-security and environmental benefits they can bring, though attention needs to be given to the cost-effectiveness of support mechanisms" (OECD/IEA, 2010, p. 9). Rural renewable energy is about long-term planning; however in the short term just its immediate effects in one community may justify the high up-front costs of its investments. The two villages in Benin showed improvements in income, food security, and women's empowerment. These effects were measured within 3 years since the program was implemented.

For large-scale replication to occur at a faster pace, governmental and regional support is needed. In fact, "when renewable energy technologies are politically supported they can reach people faster and achieve more than any other technology or master plan, in addition to preserving the current state of our ecosystem" (Alliance for Rural Electrification, 2011, p. 2). NGOs and business have an important role to play in raising awareness not just at the community level, but also at the government level. If there are to be other Solar Market Gardens in other parts of the global South, then SSC must create the necessary policy framework in which to address energy poverty, investments must be redirected, and rural banks and microfinancing schemes must receive the necessary support. SSC can be used as a mechanism in which development strategies can lead to the replication of innovative rural renewable

energy projects. In the case of the Solar Market Garden,

when considering the requirements for implementing a large-scale PVDI project, it is important to recognize that the PVDI system in this study is not an off-the-shelf product, but rather an integrated technology and management package with a significant associated learning curve. Access to extension services and technical support will be critical to ensuring the sustainability and long-term functionality of individual PVDI systems. (Burney et al, 2010, p. 1852)

Partnerships represent the foundation upon which the SELF project in Benin succeeded. The sharing of knowledge and technology requires a commitment to learn from others and to engage with local communities in passing on this knowledge.

This same partnership concept applies to SSC, thus the Energy Access diagram is based on the coordination and agreement amongst all the various actors involved in financing, disseminating, regulating, raising awareness, and implementing and replicating projects. On a regional and global scale, cooperation amongst nations and the promotion of best practices represent key instruments through which projects' successes may be known and interest generated in their replication. On a regional and national scale, implementing a cohesive regulatory framework fosters private sector growth on a small and large level. Trade grows and with trade comes development and a need to provide goods and services that may compete in the market. Proper financial regulations also create a conducive environment for investments, rural banks, and microfinancing schemes. On a local and national scale, rural energy policies and the work of NGOs creates the necessary conditions under which access to RETs may be achieved. In addition, local governments and NGOs working on the ground sponsor community lead solutions based on immediate needs. Most often than not, these needs can be met with access to electricity.

The Energy Access diagram resulting from the analysis completed during this research, displays the necessary regulatory framework needed for the replication of small-scale projects on a larger scale. Each component feeds into the next. Once the cycle starts, each actor within will need to do its part to ensure the continuation of the cycle. For example, NGOs such as SELF implement a project, such as the Solar Market Garden in villages of the rural South. This project implementation belongs to the Rural Cycle. By implementing this project, access to renewable energy technologies has been established. Financing for this project originates from NGOs and other organizations. In other instances, it can also originate from government subsidies or private investments. This access in turn has created measurable benefits; in the case of Benin, food security and higher income were the strongest benefits received. This in turn led to the empowerment of women in the community. They are now seeking new ways to improve their living standards and further increase their income.

The Rural Cycle links closely with the Multiplier Effect Cycle. With living standards' improvement, poverty reduction begins to take places. This is followed closely by the implementation of other minor projects within the village to continue improving their living standards. In the long run, this could lead to the establishment of SMEs and other development projects, even the replication of the current project in other nearby villages, either within the same country or in cross border relations.

Rural development and a return on microfinancing schemes (if enacted with the implementation of projects) create an investment environment for the future implementation of new projects and the growth of SMEs. Despite these two intertwining cycles, a lack of access to RETs would inhibit the entire process. Hence, the role governments and SSC play. The right regulations and financing mechanisms facilitate access to these technologies from other parts of the South and even the North. It also allows for a good working environment in which rural banks and microfinancing initiatives can flourish. In addition, the final component reflects the ability of the governments and SSC to disseminate the necessary information required for the implementation of these projects by NGOs and other organizations, both national and international.

SELF's Solar Market Garden is just in the beginning stages of this Energy Access diagram. Their potential for replication is clear. It is just a matter of time and increased governmental support and interest. Breaking the barrier behind the perceived large costs of solar energy will be key. Advocating Rural Renewable Energy, its value, and its

cost-effectiveness will take both time and patience by the part of entrepreneurs and many NGOs. At the center of the Rural Cycle lies this key component, which development practitioners will need to consider to ensure the long-term success and replication of their programs. Promoting effective solutions such as the Solar Market Garden requires networking and demonstrations to policy makers. It also requires education on a local level, not just with the communities involved, but also with the local governments.

In many cases, local support makes the difference in whether or not a project succeeds beyond its intended time frame. Once local support has been achieved, forging partnerships with technical experts and working closely with them on the ground and in the policy making realm will lead to the sharing of knowledge and the raising of awareness; both are key factors required for the multiplication of Solar Market Gardens and other innovative, feasible, and replicable projects around the world.

If we are to eliminate energy poverty, larger scale proactive steps will need to be taken. SSC reflects the interests of the South, where approximately 1.6 billion people without access to electricity may be found. SSC initiatives and new programmes of action can promote accountability and local ownership and have the potential to truly address the needs of these rural inhabitants. It is all about raising awareness on a regional and international level to allow for rural renewable energy to become a priority in SSC agreements. Each element must be taking into consideration for energy access to be achieved and for the 1.6 billion people to finally obtain the benefits that electricity can bring.

Bibliography

Alden, C., Morphet, S. & Viera, M. (2010). The South in World Politics. United Kingdom: Palgrave Macmillan.

Alliance for Rural Electrification (2011). Best Practices of the Alliance for rural Electrification: What Renewable Energy Can Achieve in Developing Countries. Retrieved April 23, 2011 from http://www.ruralelec.org/fileadmin/DATA/Documents/06_Publications/Misc/ARE_Best_Practice_2011.pdf

Andersen, Louise (2008). Fragile States on the International Agenda. DIIS Report 2008: I I. Retrieved April 1, 2011 from http://www.diis.dk/graphics/Publications/Reports%202008/R2008-11_Fragile_States_on_the_International_Agenda.pdf

Alleviation of Poverty through the Provision of Local Energy Services [APPLES] (2009). Alleviation of Poverty through the Provision of Local Energy Services: Project Summary. APPLES & Intelligent Energy: Europe. Retrieved March 5, 2011 from http://www.applesonline.info/fileadmin/applesonline/user/docs/Project_Summary.pdf

The Associated Press (2011). Google Invests $168M in Solar Energy Project. The Miami Herald. Retrieved April 23, 2011 from http://www.miamiherald.com/2011/04/11/2162591/google-invests-168m-in-solar-energy.html

Baker Institute Energy Forum (n.d). Poverty, Energy, and Society. Rice University: James A. Baker III Institute for Public Policy. Retrieved March 5, 2011 from http://www.rice.edu/energy/research/poverty&energy/index.html

Burney, J., Burke, M., Naylor, R., Pasternak, D. & Woltering L. (2010a). Solar-powered Drip Irrigation Enhances Food Security in the Sudano-Sahel. Program on Food Security and the Environment: Stanford University & International Crops Research Institute for the Semi-Arid Tropics. Proceedings of the National Academy of Sciences: February 2, 1010: vol. 107 no. 5 pp. 1848-1853. Retrieved February 15, 2011 from http://www.pnas.org/content/107/5/1848.full.pdf+html

Burney, J., Burke, M., Naylor, R., Pasternak, D. & Woltering L. (2010b). Supporting Information. Program on Food Security and the Environment: Stanford University & International Crops Research Institute for the Semi-Arid Tropics.

Proceedings of the National Academy of Sciences: February 2, 1010: vol. 107 no. 5. Retrieved February 15, 2011 from http://www.pnas.org/content/suppl/2010/01/14/0909678107.DCSupplemental/pnas.0909678107_SI.pdf

Central Intelligence Agency (2011). The World Factbook: Benin. Retrieved April 23, 2011 from https://www.cia.gov/library/publications/the-world-factbook/geos/bn.html

Chen, Shaohua & Ravallion, Martin (2008). The Developing World is Poorer than We Thought, but no Less Successful in the Fight Against Poverty. Development Research Group, World Bank. Retrieved April 1, 2011 from http://siteresources.worldbank.org/JAPANINJAPANESEEXT/Resources/515497-1201490097949/080827_The_Developing_World_is_Poorer_than_we_Thought.pdf

Collier, Paul (2007). The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It. New York, NY: Oxford University Press.

Dean, Ashley (2010). Solar-powered Irrigation Systems Improve Diet and Income in Rural Sub-Saharan Africa, Stanford Study Finds. Program on Food Security and the Environment at Stanford University. Retrieved April 28, 2011 from http://news.stanford.edu/news/2010/january4/solar-irrigation-africa-010610.html

Fordelone, Talita Yamashiro (2009). Triangular Cooperation and Aid Effectiveness: Can Triangular Cooperation make Aid more Effective? Organisation for Economic Cooperation and Development (OECD). Retrieved March 27, 2011 from http://www.oecd.org/dataoecd/63/37/46387212.pdf

Group of 77 [G-77] (1967). First Ministerial Meeting of the Group of 77: Charter of Algiers. Algiers, 10-25 October 1967. Retrieved March 16, 201 from http://www.g77.org/doc/algier~1.htm

Group of 77 [G-77] (2000). Havana Programme of Action. Group of 77 South Summit. Havana, Cuba. 10-14 April 2000. Retrieved March 20, 2011 from http://www.g77.org/summit/ProgrammeofAction_G77Summit.htm

Group of 77 [G-77] (2003). Marrakech Framework of Implementation of South-South Cooperation. Retrieved March 16, 2011 from http://www.g77.org/marrakech/Marrakech-Framework.htm

Hussain, Tajammul & Dr. Qurashi, M.M. (2005). Renewable Energy Technologies for Developing Countries: Now and to 2023. Islamic Educational, Scientific, and Cultural Organization. Retrieved March 16, 2011 from http://www.isesco.org.ma/english/publications/Renewable%20Energy%20Technologies/Renewable.pdf

International Fund for Agricultural Development [IFAD] (2010). Rural Poverty Report 2011: New Realities, New Challenges: New Opportunities for Tomorrow's Generation. International Fund for Agricultural Development. Rome, Italy: Quintly. Retrieved March 5, 2011 from http://www.ifad.org/rpr2011/report/e/rpr2011.pdf

Luft, Gal & Korin, Anne (2009). Energy Security in the Eyes of the Beholder. In G. Luft & A. Korin (Eds.), Energy Security Challenges for the 21st Century: A Reference Handbook (pp. 1-17). Santa Barbara, California: ABC CLIO

Moner-Girona, Magda (2008). A New Scheme for the Promotion of Renewable Energies in Developing Countries: The Renewable Energy Regulated Purchase Tariff. European Commission. Retrieved February 15, 2011 from http://www.energy.eu/publications/LDNA23284ENC_002.pdf

Mueller, Alexander (2008). Increasing Populations and Increasing Scarcity of Food, Natural Resources and Energy. In United Nations Department of Economic and Social Affairs, Achieving Sustainable Development and Promoting Development Cooperation: Dialogues at the Economic and Social Council. (pp.165-167). New York, NY: United Nations. Retrieved March 20, 2011 from http://www.un.org/en/ecosoc/docs/pdfs/fina_08-45773.pdf

Organization for Economic Cooperation and Development [OECD] (2010). Perspectives on Global Development 2010: Shifting Wealth. OECD Development Centre. Retrieved December 22, 2010 from http://www.oecd-ilibrary.org/

development/perspectives-on-global-development-2010/the-increasing-importance-of-the-south-to-the-south_9789264084728-9-en;jsessionid=3fgvdkkndosi8.delta

Organization for Economic Cooperation and Development/International Energy Agency [OECD/IEA] (2010). World Energy Outlook 2010: Executive Summary. International Energy Agency. Retrieved March 5, 2011 from http://www.worldenergyoutlook.org/docs/weo2010/WEO2010_es_english.pdf

Omura, Yukiko (2010). IFAD Vice President Addresses South-South Cooperation in Brasilia Conference. International Fund for Agricultural Development. IFAD Vice President Remarks at Brazil-Africa Dialogue on Food Security, Fighting Hunger, and Rural Development. Retrieved March 20, 2011 from http://www.ifad.org/events/op/2010/vp_brazil.htm

Organization of Petroleum Exporting Countries [OPEC] Fund for International Development (2010). Energy Poverty in Africa: Proceedings of a Workshop held by OFID in Abuja, Nigeria June 8-10, 2008. OFID Pamphlet Series 39. Vienna, Austria: OFID

Ortiz, Isabel (2008). New Developments in South-South Cooperation—China ODA, Alternative regionalism, Bank of the South and ALBA. In South Centre, South Bulletin: Reflections and Foresights. Issue 14, 01 May 2008. (pp. 7-9). Geneva, Switzerland: South Centre. Retrieved April 23, 2011 from http://www.southcentre.org/index.php?option=com_content&task=view&id=622&Itemid=105

The Pew Charitable Trusts (2010). Who's Winning the Clean Energy Race? G-20 Investment Powering Forward. *The Pew Charitable Trusts: The Clean Energy Economy.* Retrieved April 23, 2011 from http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/G-20Report-LOWRes-FINAL.pdf

Practical Action (n.d.). Small-Scale Hydro Power: Practical Actions's Position on Small-Scale Hydro Power. United Kingodm: The Schumacher Centre : Practical Action. Retrieved April 23, 2011 from http://practicalaction.org/energy/smallscale_hydro

Practical Action East Africa (n.d.). Microhydro in Kenya. United Kingodm: The Schumacher Centre : Practical Action. Retrieved April 22, 2011 from http://practicalaction.org/energy/micro_hydro

Quilligan, James B. (2002). The Brandt Equation: 21st Century Blueprint for the New Global Economy. *Brandt21Forum.info*. Philadelphia, PA: Brandt 21 Forum. Retrieved March 27, 2011 from http://www.brandt21forum.info/BrandtEquation-19Sept04.pdf

Sanchez, Teodoro (2010). The Hidden Energy Crisis: How Policies are Failing the World's Poor. Practical Action: Schumacher Centre for Technology and Development. Warwickshire, UK: Practical Action Publishing Ltd

Sechler, Bob (2011, April 7). Update: GE Unveils Plans for US Thin-Film Solar Panel Factory. The Wall Street Journal Online. Retrieved April 23, 2011 from http://online.wsj.com/article/BT-CO-20110407-710635.html

SELCO Solar Pvt. (2008a). Management. Retrieved April 21, 2011 from http://www.selco-india.com/management.html

SELCO Solar Pvt. (2008b). About Us. Retrieved April 21, 2011 from http://www.selco-india.com/about_us.html

Sen, Snigdha (2007, March 15). Lighting Up Rural India: Harish Hande's Vision of Bringing Electricity to the Countryside is Rallying Banks, Helping Low-Income Workers, and Inspiring Entrepreneurs. CNNMoney.com. Retrieved April 21, 2011 from http://money.cnn.com/magazines/business2/business2_archive/2006/12/01/8394996/index.htm

Sheng, Yap Kio (2003) Urbanization and Internal Migration. In Economic and Social Commission for Asia and the

Pacific, Fifth Asian and Pacific Population Conference: Selected Papers, Asian Population Studies Series No. 15 (pp. 137-155). New York: United Nations. Retrieved April 30, 2011 from http://www.unescap.org/esid/psis/population/popseries/apss158/5appc.pdf

Solar Electric Light Fund (2003). Powering a Brighter 21st Century: Renewable Energy, Empowered Women. A SELF White Paper: Spring 2003. Washington, DC: Solar Electric Light Fund. Retrieved January 15, 2011 from http://www.self.org/SELF%20White%20Paper%20-%20Renewable%20Energy%20Empowered%20Women.pdf

Solar Electric Light Fund (2008). A Cost and Reliability Comparison Between Solar and Diesel Powered Pumps. Solar Electric Light Fund: July 2008. Retrieved April 23, 2011 from http://www.self.org/SELF_White_Paper_-_Solar_vs_Diesel.pdf

Solar Electric Light Fund (2009). Annual Report 2009. Retrieved February 1, 2011 from http://www.self.org/2009_ANNUAL_REPORT_FINAL.pdf

Solar Electric Light Fund (2011a). Our Mission. Retrieved March 31, 2011 from http://self.org/mission.shtml

Solar Electric Light Fund (2011b). Go Carbon Neutral. Retrieved April 23, 2011 from http://www.self.org/carbonneutral1.shtml

Solar Electric Light Fund (n.d). Benin. Retrieved March 31, 2011 from http://self.org/benin.shtml

Sovereign Wealth Fund Institute (2008). China-Africa Development Fund. Retrieved January 15, 2011 from http://www.swfinstitute.org/fund/cad.php

Sovereign Wealth Fund Institute (2010). What are SWFs? About Sovereign Wealth Funds. Retrieved January 15, 2011 from http://www.swfinstitute.org/what-is-a-swf/

Sovereign Wealth Fund Institute (2011). Sovereign Wealth Fund Rankings. Retrieved April 23, 2011 from http://www.swfinstitute.org/fund-ranknqs/

Sweet, David M. (2009). The Decentralized Energy Paradigm. In G. Luft & A. Korin (Eds.), Energy Security Challenges for the 21st Century: A Reference Handbook (pp. 208-317). Santa Barbara, California: ABC CLIO.

United Nations (1987). Report of the World Commission on Environment and Development: Our Common Future. In Our Common Future, Chapter 2: Towards Sustainable Development (A/42/427) UN Documents: Gathering a Body of Global Agreements. Retrieved March 27, 2011 from: http://www.un-documents.net/ocf-02.htm#I

United Nations Conference on Trade and Development [UNCTAD] (2010). Renewable Energy Technologies for Rural Development. UNCTAD Current Studies on Science, Technology and Innovation No 1. New York and Geneva: United Nations. Retrieved March 20, 2011 from http://www.unctad.org/en/docs/dtlstict20094_en.pdf

United Nationa Conference on Trade and Development [UNCTAD] Trade and Development Board, 3rd Session (2010). Strengthening Productive Capacities: A South-South Agenda (TD/B/C.II/MEM.2/8). 15 December 2010. Retrieved April 22, 2011 from http://www.unctad.org/en/docs/ciimem2d8_en.pdf

United Nations Development Programme [UNDP] (2007). Evaluation of UNDP Contribution to South-South Cooperation. A.K. Office Supplies: United States of America. Retrieved January 15, 2011 from http://www.undp.org/evaluation/documents/thematic/ssc/SSC_Evaluation.pdf

United Nations Development Programme [UNDP] (2009). Enhancing South-South Cooperation and Triangular Cooperation: Study of the Current Situation and Existing Good Practices in Policy, Institutions, and Operation of South-South and Triangular Cooperation. Special Unit for South-South Cooperation: New York, NY. Retrieved

January 15, 2011 from http://southsouthconference.org/wp-content/uploads/2009/10/E_Book.pdf

United Nations Development Programme [UNDP] (2011). Energy for Sustainable Development: Overview. Environment and Energy: Sustainable Energy. Retrieved March 27, 2011 from http://www.undp.org/energy/

United Nations Development Programme [UNDP] (n.d.). Buenos Aires Plan of Action. Special Unit for South-South Cooperation. Retrieved January 10, 2011 from http://ssc.undp.org/ss-policy/policy-instruments/buenos-aires-plan-of-action/#objectives

United Nations Development Programme [UNDP] Energy Portfolio (n.d.). UNDP Energy Portfolio: List of Projects and Project Summaries. UNDP Environment and Energy. Retrieved April 23, 2011 from http://www.undp.org/energy/portfolio.htm

U.N. Economic and Social Council, 5th Session (2006). Definition of Basic Concepts and Terminologies in Governance and Public Administration. (E/C.16/2006/4). 5 January 2006. Retrieved April 23, 2011 from http://unpan1.un.org/intradoc/groups/public/documents/un/unpan022332.pdf

U.N. Department of Public Information (2010). Fact Sheet: Goal 1: Eradicate Extreme Poverty and Hunger. We Can End Poverty: 2015 Millennium Development Goals. New York: United Nations Summit High-level Plenary Meeting of the General Assembly. Retrieved March 27, 2011 from http://www.un.org/millenniumgoals/pdf/MDG_FS_1_EN.pdf

U.N. General Assembly, 55th Session (2000). United Nations Millennium Declaration. (A/RES/55/2). 18 September 2000. Retrieved March 16, 2011 from http://www.un.org/millennium/declaration/ares552e.pdf

U.N. General Assembly, 56th Session (2002). Resolution Adopted by the General Assembly on the report of the Second Committee: Economic and Technical Cooperation Among Developing Countries. (A/RES/56/202). 21 February 2002. Retrieved January 15, 2011 from http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/56/202

U.N. General Assembly, 64th Session (2009). Promotion of South-South Cooperation for Development: A Thirty-year Perspective: Report of the Secretary-General (A/64/504). 27 October 2009. Retrieved January 15, 2011 from http://ssc.undp.org/uploads/media/A_64_504__final_version_.pdf

U.N. Industrial Development Organization [UNIDO] (2009). Scaling up Renewable Energy in Africa. 12th Ordinary Session of Heads of State and Governments of the African Union : January 2009 Addis Adaba, Ethiopia. Vienna, Austria: United Nations Industrial Development Organization. Retrieved April 5, 2011 from http://www.unido.org/fileadmin/user_media/Services/Energy_and_Climate_Change/Renewable_Energy/Publications/Scaling%20Up%20web.pdf

U.N. Population Division (2008a). An Overview of Urbanization, Internal Migration, Population Distribution and Development in the World. United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration, and Development. Population Division: Department of Economic and Social Affairs (UN/POP/EGM-URB/2008/01). 14 January 2008. New York: United Nations Secretariat. Retrieved March 27, 2011 from http://www.un.org/esa/population/meetings/EGM_PopDist/P01_UNPopDiv.pdf

U.N. Population Division (2008b). Rural Population, Development, and the Environment 2007. Department of Economic and Social Affairs. New York: United Nations. Retrieved March 31, 2011 from http://www.un.org/esa/population/publications/2007_PopDevt/Rural_2007.pdf

United Nations Statistics Division (n.d.). Milleniuem Development Goal Indicators. The Official United Nations Site for the MDG Indicators. Retrieved April 21, 2011 from http://unstats.un.org/unsd/mdg/Metadata.aspx?IndicatorId=0&SeriesId=568

U.S. Energy Information Administration (2010a). Electricity Explained: Electricity. U.S. Department of Energy.

Retrieved April 22, 2011 from http://www.eia.doe.gov/energyexplained/index.cfm?page=electricity_home

U.S. Energy Information Administration (2010b). Electricity Explained: Measuring Electricity. U.S. Department of Energy. Retrieved April 22, 2011 from http://www.eia.doe.gov/energyexplained/index.cfm?page=electricity_measuring

U.S. Energy Information Administration, (2010c). Renewable Energy Explained. U.S. Department of Energy. Retrieved April 22, 2011 from http://www.eia.doe.gov/energyexplained/index.cfm?page=renewable_home

Wiens, Tom (n.d.). Rural Development and the (Renewable) Energy Linkage. The World Bank. Retrieved April 5, 2011 from http://siteresources.worldbank.org/EXTENERGY2/Resources/4114199-1243609415065/wiens_1.pdf

Williams, Neville (2005). Chasing the Sun: Solar Adventures Around the World. Canada: New Society Publishers.

World Bank (1996). Rural Energy and Development: Improving Energy Supplies for Two Billion People. International Bank for Reconstruction and Development. Retrieved March 5, 2011 from http://siteresources.worldbank.org/INTENERGY/Resources/Rural_Energy_Development_Paper_Improving_Energy_Supplies.pdf

World Bank (2000). Overview: Attacking Poverty, Opportunity, Empowerment, and Security. In World Development Report 2000/2001: Attacking Poverty. The World Bank Group. Retrieved March 5, 2011 from http://siteresources.worldbank.org/INTPOVERTY/Resources/WDR/overview.pdf

World Bank (2009). Benin: Constraints to Growth and Potential for Diversification and Innovation. Country Economic Memorandum. Report No. 48233-BJ. June 18, 2009. Retrieved April 23, 2011 from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/07/21/000333037_20090721001130/Rendered/PDF/482330ESW0BJ0p1C0Disclosed071171091.pdf

The World Bank Group (2011a). What is Electricity Used for in Rural Areas? Independent Evaluation Group. Retrieved April 22, 2011 from here

The World Bank Group (2011b). Agriculture and Rural Development. Working for a World Free of Poverty. Retrieved April 23, 2011 from http://data.worldbank.org/topic/agriculture-and-rural-development

The World Bank Group (2011c). Foreign Direct Investment, Net Inflows (BoP, current US$). Working for a World Free of Poverty. Retrieved April 24, 2011 from http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD

Yu, Vincent Paulo III (2009). S-S Cooperation Should be Defined by the South. South Centre. Retrieved February 8, 2011 from http://www.southcentre.org/ARCHIVES/index.php?option=com_content&task=view&id=1246&Itemid=287

[1] See Figure 1 in Annex.

[2] Please refer to Figure 7 in the Annex for a full description of the different types of energy sources.

[3] The full name of this institution is the James A. Baker III Institute for Public Policy at Rice University. Based in Houston, Texas, it is a university-based think tank on energy geopolitics and policy.

[4] Please refer to Figure 2 in the Annex for the compartive anaylsis chart of these initial case studies.

[5] Please refer to Figure 9 in the Annex for a regional comparison in the global South of rural electrification rates. Refer to Figure 10 for electrification rates in both the South and the North.

[6] For a comprehensive timeline on the development of SSC, please refer to Figure 3 in the Annex.

[7] See Figure 4 in Annex for a map of rural populations around the world.

[8] Please refer to Figure 5 and Figure 6 in the Annex for estimates on energy costs in rural areas. Refer to Figure 7 for a brief description on the different types of energy sources.

[9] Please refer to Figure 8 in the Annex.

[10] Of particular note is that in its initial stages, SELCO was a wholly owned subsidiary of SELF. It was a private company launched in the 1990s. It later became its own independent company, which commercialized solar household electrification. Partnerships among experts and local entrepreneurs can thus potentially lead towards the widespread implementation of RETs.

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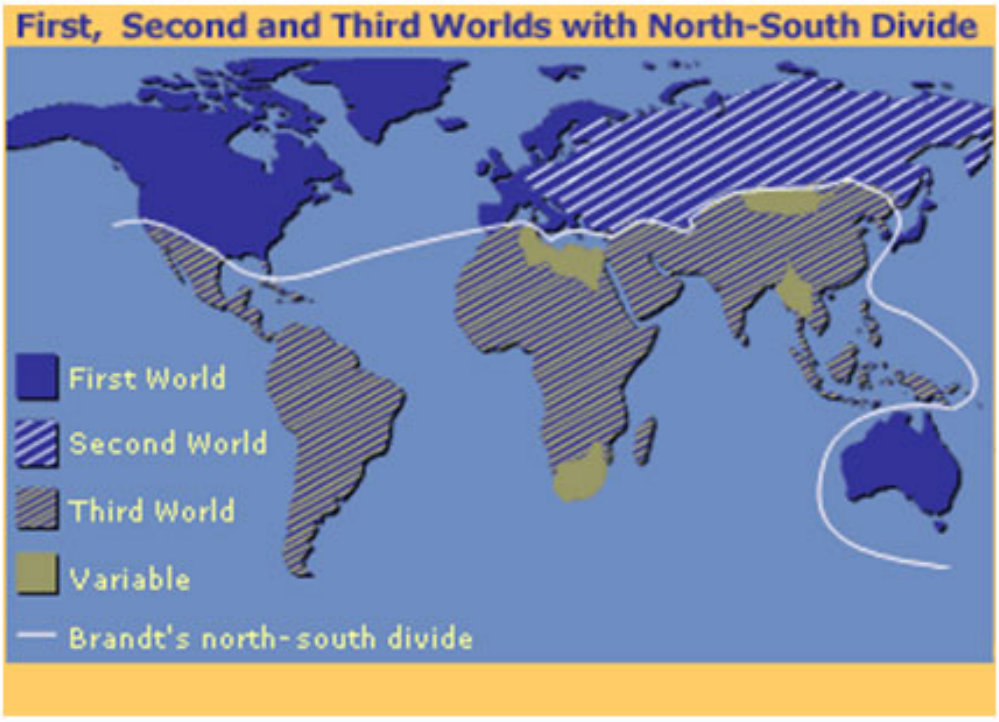
Annex

Figure 1: Map of the Global Divide: North and South



The Brandt Line clearly shows the North-South Divide.
Source: www.pbs.org
(Retrieved February 15, 2011 from http://www.pbs.org/wnet/wideangle/episodes/land-of-wandering-souls/a-developing-world-view/3407/attachment/wa_img_landwander_map_intro/)

Figure 2: Case Study Comparative Analysis

Evaluative Criteria	SELF: Benin Solar Market Garden	CTR/Nepal: Nepal Palpa District: Solar Ginger Dryer	Highflats Energy Centre	China Village Electrification Program
Community Empowerment	Yes; SELF partnered with NGOs and local communities	Not fully; CTR/N funded with EU and Nepalese government; Support of local cooperatives	APPLES project with EU funding; seeks to engage local communities	Participation of local governments and counties
Provision of training and capacity building	Yes	Training provided to "resource" persons, who would serve as guides for the farmers	Yes	Yes
Environmental sustainability	Yes	Yes	Yes	Yes
Renewable Energy Technologies	Solar panels with drip irrigation system	Solar	No; the focus is on all types of energies, including diesel, petrol, and paraffin	Small hydro, solar PV, and wind power
Long term sustainability	Yes	Yes	Yes, the centre is run by local communities and cooperatives	Yes
Implementation/facilitation of local financing mechanisms	No not yet; however, SELF has implemented microcredit systems in other solar projects in China, Sri Lanka, and Vietnam	Yes	Based on a business model; centre runs on its own now	Government subsidies
Costs	$18,000 USD with a payback time of 2 to 3 years	Yes	815,947 Euros (50% came from the EU)	$5 billion
Feasibility and replication	Adaptable to other agricultural areas; plans to expand	Yes	Replicable, however dependable on local and national support	Replicable with strong government support
Measurable benefits	Income, efficient labour, food security, and community empowerment	Yes	Yes, capacity building	Access to electricity estimated at 98.5%
Source	Solar Electric Light Fund (2011) www.self.org	Centre for Rural Technology, Nepal (2010) www.ctrnepal.org	APPLES (2009) www.applesonline.info	Practical Action: Sanchez, 2010, p. 62

Figure 3: South-South Cooperation Historic Timeline

Year

Event

1945

The Arab League was established

1955

Asian-African Conference in Bandung, Indonesia.

1960

The Latin America Free Trade Area (LAFTA) was established by the Treaty of Montevideo(1960-1980)

Central American Common Market (CACM) is established.

The Organization of Petroleum Exporting Countries (OPEC) was set up between 13 of the worlds largest oil producing countries

1961

Non-Aligned Movement (NAM) was set up at the Belgrade Summit, Yugoslavia.

1963

Organization of African Unity (OAU) was established.

1964

First United Nations Conference for Trade and Development (UNCTAD). At the end of the conference a group of 77 developing countries signed the "Joint Declaration of the Seventy-Seven Countries" creating the G77 the largest coalition of developing countries/Least Developed countries at the UN system.

1966

Protocol amending the General Agreement on Tariffs and Trade to introduce a Part IV on Trade and Development. This was first recognition of a need for special treatment for developing countries.

1967

Association of Southeast Asian Nations (ASEAN) was established.

I Ministerial Meeting of G-77 adopted the Charter of Algiers with the basic principles of the group as the New International Economic Order (NIEO) package

1969

Organization of Islamic Countries (OIC) was set up in the Summit of Islamic countries

Andean Community created by Treaty of Cartagena.

1972

UN General Assembly creates a working group on Technical Cooperation among Developing Countries – TCDC under coordination of UNDP

1973

Caribbean Community (CARICOM) established under the Treaty of Chaguaramas. Founding members were Barbados, Jamaica, Guyana, and Trinidad and Tobago.

1974

United Nations Resolution according to Resolution N°3251 (XXIX) set up the Special Unit to Promote Technical Cooperation among Developing Countries (TCDC) coordinated by UNDP.

UN General Assembly adopts Declaration for the Establishment of a New International Economic Order at request of G-77 and NAM Summit of Algiers in 1973.

1975

Economic Community of West African States (ECOWAS) was set up.

1978

UN Conference on Technical Cooperation among Developing Countries (TCDC) in Buenos Aires adopts, by consensus, the Buenos Aires Action Plan (BAPA) for promoting and implementing technical cooperation among developing countries.

1980

ALALC is replaced by Latin American Integration Association (ALADI) . Cuba becomes a member in 1999.

Southern African Development Coordination Conference – SADCC with the Lusaka Declaration.

1981

Gulf Cooperation Council (GCC) was set up

High-Level Conference of the G-77 in Caracas Venezuela. Adoption of the Caracas Programme of Action on Economic Cooperation among Developing Countries

1983

Economic Community of Central African States – ECCAS is established.

Perez Guerrero Trust Fund for Economic and Technical Cooperation among Developing Countries (PGTF) established in accordance with the UN General Assembly Resolution 38/21

1985

South Asian Association for Regional Cooperation (SAARC) was set up.

1987

The South Commission – an intergovernmental body of developing countries was established.

1989

Arab Maghreb Union is established at the Marrakesh Summit.

Ministerial Meetings of the Group of 77 – Agreement on the Global System of Trade Preferences Among Developing Countries (GSTP) entered into force. Forty-one countries ratified.

G-15 was created at a Summit Level Group of Developing following the conclusion of the 9th NAM Summit in Belgrade

1991

Treaty of Asuncion was signed creating the Common Market of South Cone (Mercosur). Members Brazil, Argentina, Paraguay and Uruguay.

Organization of African Unity Heads of State and Government signed the Abuja Treaty establishing the African Economic Community (AEC) at the 27th Ordinary Session of the Assembly.

1994

Treaty of Establishment of the West African Economic and Monetary Union (UEMOA) includes Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo and Guinea-Bissau

Establishment of the Common Market for Eastern and Southern Africa (COMESA) including 20 African countries

1995

South Centre – an intergovernmental body of developing countries was established in Geneva with 49 members currently. The South Centre has its origin in the South Commission of 1987.

1997

Developing 8, founded through the Istanbul Declaration to further development cooperation amongst Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey.

1998

Non Aligned Movement (NAM) created the Centre for South-South Technical Cooperation (CSSTC) located in Jakarta.

2000

First South Summit in Havana, Cuba of 132 member countries of the G-77. Havana Plan Action adopted among other issues calling members to improve South-South Cooperation.

UN General Assembly Millennium Summit set the Millennium Development Goals (MDG) to alleviate poverty and promote sustainable development in the developing world.

I Ministerial Conference of the Forum on China-Africa Cooperation (FOCAC) held in Beijing.

2001

The Third UN Conference on Least Developed Countries realised in Brussels calls for intensification of South-South Cooperation.

Shanghai Cooperation Organization (SCO) was set up. The SCO members are Kazakhstan, Kyrgyzstan, China, Russia, Uzbekistan and Tajikistan. Observer members included India, Pakistan, Iran and Mongolia

2002

The 37th Summit of the OAU 2001 formally adopted the NEPAD – New Partnership for Africa's Development strategic framework document.

Monterrey Conference on Financing for Development calls for South-South Cooperation.

African Union (AU) was established replacing former Organisation of African Unity (OAU).

2003

India, Brazil and South Africa sign the Brasilia Declaration setting up the IBSA Forum. In 2004 the forum created the IBAS Fund for alleviation of Poverty and Hunger in the South

UN General Assembly changed the name of UNDP's Special Unit for TCDC to Special unit for South-South Cooperation

Establishment of the G-20 group of developing countries at the WTO Ministerial Conference realised in Cancun, Mexico.

High Level Conference on South-South Cooperation (SSC) of G-77 with adoption of Marrakech Declaration on SSC, which called developing countries to enhance cooperation among themselves

The G90 was established at WTO Conference in Cancun. This is the largest grouping of members in the World Trade Organisation including poorest countries from African Union, LDCs and African Caribbean and Pacific and ACP group.

2004

UNCTAD XI realised in Sao Paulo with special session on The New Trade Geography: The Role of South-South Trade and Cooperation.

Third South American Summit with signature of Cuzco Declaration creating the Community of Nations of South America including 12 countries.

The African Parliament holds its inaugural session in Addis Ababa.

2005

Second South Summit realized in Doha, Qatar

First South America-Arab Countries Summit is realised in Brasilia

Hong Kong Ministerial of the WTO Joint Declaration of the G-20, the G-33, the ACP, the LDCs, the African Group and the Small Economies in order to develop a common approach to issues of common interest in the negotiations of the Doha Round.

2006

I Summit of IBSA: India Brazil South Africa Dialogue Forum hold in Brazil

Summit of the Non Aligned Movement (NAM) hold in Havana, Cuba.

III Ministerial Conference of the Forum on China-Africa Cooperation hold in Beijing. China announces doubling of financial aid to African nations by 2009.

I Summit Africa- South America Community of Nations in Abuja, Nigeria

2007

15th Session of the High-level Committee on South-South Cooperation, UNDP, New York.

Forum for East Asia Latin America Cooperation

2nd IBSA Summit, Johannesburg and Tshwane, South Africa, 17 October

Bank of the South established at a meeting of seven South American Leaders in Buenos Aires

2008

Common Market Gulf Cooperation Countries enters into force.

I Africa- India Summit held in New Delhi, India

Approved at the 2005 Second South Summit in Qatar, the South-South Fund for Development and Humanitarian Assistance will be formally launched at a signing ceremony during the annual high-level ministerial meeting of the Group of 77 in September. The government of Qatar has made an initial pledge of 20 million dollars, with an additional 2 million dollars each from India and China.

III Summit of South America Nations: leaders signed the Constitutive Agreement establishing Union of South American Nations (UNASUR)

Ministers of Foreign Affairs of Brazil, India, China and Russia met in Yekaterinburg, Russia. This was the first meeting outside the United Nation General Assembly where the group met regularly since 2007.

II Africa-South America Summit (AFRAS) , Caracas, Venezuela

UNCTAD XII realised in Accra, Ghana

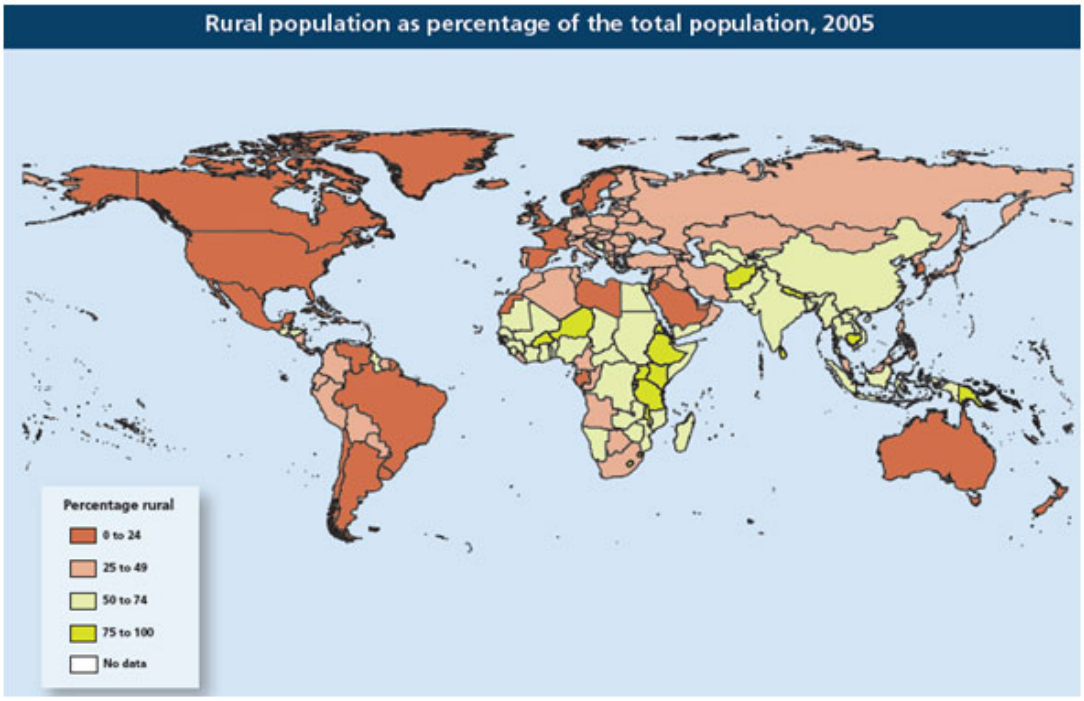
2009

II Arab -South America Summit scheduled to be hosted by Qatar

IV Ministerial Conference of the Forum on China-Africa Cooperation scheduled to be hosted by Egypt.

Source: Intellectual Network for the South, 2011 (Retrieved February 15, 2011 from http://www.insouth.org/index.php?option=com_content&view=article&catid=16%3Asouth-south-timeline&id=71%3Atimeline-milestones&Itemid=91)

Figure 4: 2005 Division of Rural Population around the World



Source: United Nations Population Division, 2007 (Retrieved February 15, 2011 from http://www.un.org/esa/population/publications/2007_PopDevt/Rural_2007.pdf)

Figure 5: Estimated Energy Costs in Rural Areas

Source	Availability	Cost	Technical Issues
Grid	Not available for isolated villages and communities	Very high for rural isolated people, but for those living next to grid path it may be competitive	Grid connection is a good solution, when the cost and availability are right
Solar PV	Available all over the world	Very high ranging from $1.5-3.5 per kWh	Limited use due to the high unit cost of energy, inappropriate for productive uses
Small wind generation systems (below 1 kW)	Frequently available but not everywhere	High $0.30-$0.80 per kWh	Sometimes there may be several days without wind, therefore back-up needed
Small hydro systems	Site specific	Medium $0.20-$0.60 per kWh	It is the most mature technology, proven technically and socially in the field
Small diesel sets in remote areas	Difficult access	From $0.30-$1.20, depending on the intensity of consumption	Difficulties operating and maintaining expensive spare parts, noisy and polluting
Biofuels	New source of fuel, still to be proven	Expected to be high	Long production chain, from farming, processing to energy generation and use (possible social complications)

Source: Practical Action: Sanchez, 2010, p. 54

Figure 6: Rural Energy Costs

Technology Typical Characteristics Typical Energy Costs (U.S. cents/kilowatt-hour unless indicated otherwise) Mini-hydro Plant capacity: 100–1,000 kilowatts (kW)

5–12

Micro-hydro Plant capacity: 1–100 kW

7–30

Pico-hydro Plant capacity: 0.1–1 kW

20–40

Biogas digester Digester size: 6–8 cubic meters

n/a

Biomass gasifier Size: 20–5,000 kW

8–12

Small wind turbine Turbine size: 3–100 kW

15–25

Household wind turbine Turbine size: 0.1–3 kW

15–35

Village-scale mini-grid System size: 10–1,000 kW

25–100

Solar home system System size: 20–100 watts

40–60

Source: Renewable Energy Policy Network for the 21st Century, 2010, p. 26 (Retrieved February 15, 2011 from http://www.ren21.net/Portals/97/documents/GSR/REN21_GSR_2010_full_revised%20Sept2010.pdf)

Figure 7: Types of Energy Sources

Type of Energy

What is it?

Biomass Biomass is organic material made from plants and animals (microorganisms). Biomass contains stored energy from the sun. When burned, the chemical energy in biomass is released as heat. If you have a fireplace, the

wood you burn in it is a biomass fuel. Biomass can be converted to other useable forms of energy, such as methane gas or transportation fuels, such as ethanol and biodiesel. Geothermal Power Geothermal energy is heat from within the Earth. We can recover this heat as steam or hot water and use it to heat buildings or generate electricity. Hydropower The source of hydroelectric power is water, hydroelectric power plants must be located on a water source. Solar Power Solar energy is the sun's rays (solar radiation) that reach the Earth. This energy can be converted into other forms of energy, such as heat and electricity. Photovoltaic (PV devices) or "solar cells" change sunlight directly into electricity. Wind Power Today's wind machines (also called wind turbines) use blades to collect the wind's kinetic energy. The wind flows over the blades creating lift, like the effect on airplane wings, which causes them to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity. Non-Renewable The four nonrenewable energy sources used most often are:

Oil and petroleum products — including gasoline, diesel fuel, heating oil, and propane

Natural gas

Coal

Uranium (nuclear energy) Grid Supplies in Rural Developing Areas Grids can be energized through any of the above mentioned energy sources

Source: U.S. Energy Information Administration, 2010
(Retrieved April 1, 2011 from http://www.eia.doe.gov/energyexplained/index.cfm?page=renewable_home)

Figure 8: South-South Foreign Direct Investment Flows

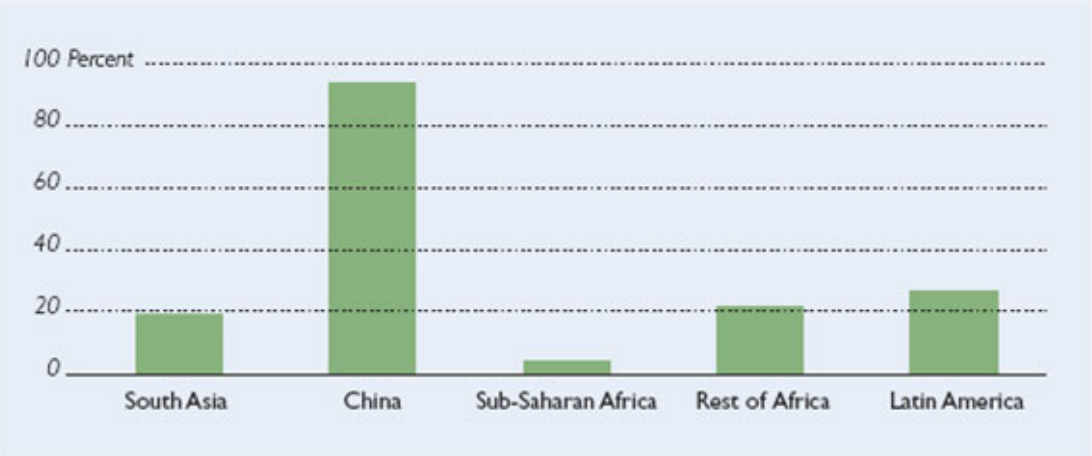
Evolution of South–South FDI. 1990–2006

Year	World outward FDI (billions of dollars)	South–South FDI* (billions of dollars)	South–South FDI as percentage of world total	Growth rate South–South FDI
1990	241	12	5	-14
1991	198	9	5	-23
1992	203	16	8	81
1993	243	17	7	6
1994	287	25	9	41
1995	363	27	7	10
1996	396	35	9	29
1997	476	45	9	28
1998	682	29	4	-36
1999	1077	37	3	28
2000	1233	35	3	-6
2001	753	41	5	16
2002	537	30	6	-26
2003	566	39	7	29
2004	920	77	8	96
2005	893	88	10	15
2006	1411	145	10	64
2007	2267	180	8	25
2008	1928	187	10	4
2009	1100	149	14	-20

Note: * Calculation excludes the Cayman Islands, British Virgin Islands, and Hong Kong (China).

Source: UNCTAD Trade and Development Board, 2010, p. 4

Figure 9: South Regional Comparison of Rural Population Access to Electricity



Source: OPEC Fund for International Development, 2010, p. 187

Figure 10: 2008 Global Rural Electrification Rates

	Population without electricity millions	Electrification rate %	Urban electrification rate %	Rural electrification rate %
Africa	589	40.0	66.8	22.7
North Africa	*2*	*98.9*	*99.6*	*98.2*
Sub-Saharan Africa	*587*	*28.5*	*57.5*	*11.9*
Developing Asia	809	77.2	93.5	67.2
China & East Asia	*195*	*90.2*	*96.2*	*85.5*
South Asia	*614*	*60.2*	*88.4*	*48.4*
Latin America	34	92.7	98.7	70.2
Middle East	21	89.1	98.5	70.6
Developing countries	**1,453**	**72.0**	**90.0**	**58.4**
Transition economies & OECD	**3**	**99.8**	**100.0**	**99.5**
World	**1,456**	**78.2**	**93.4**	**63.2**

Source: World Energy Outlook Database, 2008
(Retrieved February 15, 2011 from
http://www.worldenergyoutlook.org/database_electricity/electricity_access_database.htm)

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Written by: Natasha Roberts
Written at: Geneva School of Diplomacy and International Relations

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