March 2021

ProGREEN Burkina Faso Renewable Energy Assessment

Consolidated Report

START

Québec

Fonds de recherche – Nature et technologies
Fonds de recherche – Santé
Fonds de recherche – Société et culture

About ProGREEN

START with financial support from the Research Fund of Quebec (FRQ) is implementing a multi-year effort in Burkina Faso and Senegal to strengthen understandings of transitions to renewable energy and the impacts of these transitions upon development, especially as related to food and water security and the well-being of the population. Specifically, the "Promoting Gains in Renewable Energy (ProGREEN) – West Africa" project is aiming to answer the question: "How can small-scale renewable energy systems contribute to a broader energy transition in West Africa?". In this study ProGREEN seek to identify:

- The main constraining and enabling factors regarding the development of renewable energy in West Africa
- The main impacts of renewable energy access on development in West Africa and the related challenges

This assessment report will serve as a decision-making tool for policy makers making strategic choices about renewable energy policies in Burkina Faso, for technical and financial partners, investors, and development and research organizations working in the renewable energy space.

Executive Summary

In this report, persistent energy-related challenges are investigated, as are Burkina Faso's efforts to boost the role of renewable energy in the national energy profile through policy initiatives including the National Plan for Economic and Social Development, the country's "Vision 2020" and the National White Paper, as well as through alignment with regional policies of the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS).

The ProGREEN Burkina Faso assessment team is comprised of 14 Burkinabe experts from multiple disciplinary and sectoral backgrounds who used an integrative approach to conduct the assessment. Methods included literature review, field data collection, individual interviews, and focus group discussions with energy program managers, energy users and other key individuals working on small scale renewable energy.

Findings show that renewable energy brings significant changes to living conditions of local communities through improving health care services, education, agricultural productivity and food security, gender equity, youth empowerment, and supporting more diverse income generating activities. Access is facilitated by government efforts to promote renewable energy and encourage private sector involvement, falling prices of solar equipment, and the support of NGOs to assist development of these resources in remote areas. However, the sector continues to face difficulties, especially relating to funding, a shortage of qualified technicians, lacking quality control, limited coordination among actors, poor knowledge of standards and regulations, and insufficient engagement and involvement of local communities.

Given the country's high renewable energy potential and the promising role renewable energy could play for sustainable development and economic growth, the assessment team makes the following recommendations:

- Improve regulations in the renewable energy sector including for equipment and installations;
- Refine the funding system to facilitate easier access to products and equipment and to encourage commercial banks to develop funding lines for renewable energy projects;
- Sharpen technical and financial skills and update best practices among actors in the renewable energy space;
- Specify guidelines for involving energy recipients in the development, implementation and operations of renewable energy projects, and create a favorable environment for people to follow best practices;
- Foster continuous dialogue between stakeholders to encourage and foster multi-sector cooperation on renewable energy programmes;
- Integrate needs of local communities relating to income generating activities and other priorities;
- Involve energy recipients in appropriate usage and upkeep of equipment and facilities, and encourage transparent monitoring, evaluation and financial support for this work.

ProGREEN Burkina Faso Team

The Burkina Faso assessment report is authored by 14 Burkinabe experts convened through a transparent selection and review process undertaken by START and the ProGREEN Advisory Group. The team is composed of junior and senior members (five women and nine men) from research, the private and public sectors, and civil society with diverse expertise in renewable energy (solar, biomass and hydropower) linked to water, food and agriculture, land use, health, socio-economics, Small and Medium Enterprise development (SME), and gender and youth empowerment. The aim of bringing together such a diverse team is to develop an integrative research approach that takes in account the background of each member to build and to strengthen networks between Burkinabe actors and to provide young researchers with an opportunity to learn from the extensive experience of seniors.

Left to right from top: Adama OUEDRAOGO; Emmanuel NANEMA; Mahamadou ILBOUDO; Arnaud OUERMI; Ramatou Konaté; Safietou Sanfo; Gwladys SANDWIDI; Germaine KI; Dothie YEDAN SOMA; Da LIN; Soumaïla GORO; Abdoulaye ILBOUDO; Boureima KABORE;Charles Didace KONSEIBO

List of acronyms and abbreviations:

ABER: Rural Electrification Agency of Burkina
ACP-EU: African, Caribbean and Pacific group of States – European
ANEREE: National Agency of Renewable Energy and Energy Efficiency
ANPE: National Agency of Job Promotion
ARSE: Regulation Authority of Energy Sector
AST : Job Situation Analysis
ADB: African Development Bank
BEP: Professional Studies Certificate
BT: Low Tension
CEAS Burkina: Ecologic Centre Albert Schweitzer of Burkina Faso
IEC: International ElectroTechnical Commission
ECREE: ECOWAS Regional Centre Renewable and Energy Efficiency
CMA: Medical Centre with Surgical Antenna
COPEL: Electricity Co-operation
CQP: Certificate of Professional Qualification
CQB: Brief Basic Qualification Certificate
CAP: Professional Skill Certificate
ECOWAS: Economic Community of West African States
CILSS: Permanent Interstate Committee for Drought Control in the Sahel
CNRST: National Centre of scientific and technology Research
DGER: General Direction of Renewable Energy
DGEE: General Direction of Energy Efficiency
DGESS: General Direction of Studies Sectoral Statistics
EE: Energy Efficiency
REN: Renewable Energy
RE: Rural Electrification
IRSAT: Applied Science and Technology Research Institute
HT: High Tension
ME: Ministry of Energy
MRAH: Ministry of Animal et Fishing Resources
MINEFID : Ministère de l'Economie, des Finances et du Développement
MEEVCC: Ministry of Environment, Green Economy and Climate Change
MENAPLN: Ministry of National Education and Local Languages Promotion
MJPEJ: Ministry of Youth and Youth Entrepreneurship Promotion
MT: Average Tension
SDG: Sustainable Development Goals
ONEA: National Water and Sanitisation Office
NGO: Non-Governmental Organisation
CSO: Civil Society Organisation
PERG: Rural Global Electrification Programme
PNB-BF: National Biodigester Programme of Burkina Faso
UNDP: United Nations Development Programme
PPP: Public and Private Partnership
ProGREEN: Promoting Gains in Renewable Energy
PRS: Regional Solar Program
TFP: Technical and Financial Partner
PV-GAP: Global Approval Program for Photovoltaics
PVRE: Photovoltaic Rural Electrification
RMC : Capacity-Job Referential
RNI: National Interconnected Network
SONABEL: National Electricity Company of Burkina
SP-CNDD: Permanent Secretariat of the National Council for Sustainable Development
WAEMU: West African Economic and Monetary Union
EU: European Union
UTSfSHS: Universal Technical Standard for Solar Home Systems

ASSESSMENT METHODS

- **Documentary research**: A literature review was conducted, primarily focusing on : i) solar photovoltaic and thermal energy, ii) bioenergy, and iii) regulatory texts. Sub-teams were formed to look at each theme in depth. The literature reviewed was largely focused on data sets available from existing projects and programs, available curricula and training documents, information from companies operating in the field of renewable energy, and existing legislative and regulatory texts at national and sub-regional level.

- **Surveys and field trips**: Surveys and field trips focused mainly on decentralized, small-scale (off-grid) photovoltaic and bioenergy projects. Nine Masters students from the Applied Sciences Training Unit of the University Joseph KI-ZERBO in Ouagadougou were recruited and trained to carry out the field data collection. Individual interviews and focus group discussions with project managers, energy beneficiaries and other resource persons sought to assess perceptions of the impact of renewable energy projects and programs on improving living conditions of involved populations.

- **Presentations from Project Managers:** Two project managers were invited to a ProGREEN assessment team meeting to present their projects and answer questions. The two project managers were from the International Development Support Service (SIAD) Burkina for electrification by off-grid photovoltaic solar systems and Actualité Energie which works in the field of solar PV and solar thermal.

- **Data analysis:** Collected data was streamlined and recorded digitally. Then, data exploitation sessions were organized during a team retreat meeting held in Ziniaré, Burkina Faso in September 2019. The exploitation was carried out in two stages: the first consisting of reading, analyzing, and synthesizing obtained results, the second involving presenting results to the entire team for comments and corrections.

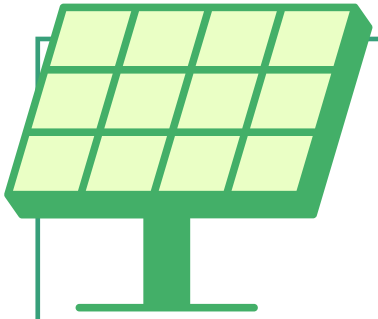
Renewable Energy Context

As of 2009, nearly 70% of the sub-Saharan population did not have access to electricity, with 40% of those in urban areas and 85% in rural areas (WAEMU, 2015). In West Africa, sustainable and equitable development faces challenges linked to availability and access to energy, the supply of which is largely based on burning fossil fuels. Projections show that the demand for energy in West Africa will increase substantially by 2050, due in large part to population growth (IRENA, 2015). Finding accessible, sustainable and reliable energy sources to meet these needs is therefore of urgent importance.

Burkina Faso, like other countries in the region, faces diverse challenges relating to energy. Most of the population (more than 90%) does not have access to modern cooking fuels, with people relying on traditional biomass for cooking, lighting and heating. As of 2017, the national electrification rate was 20.63%, with high disparities between rural and urban areas, with urban areas having a rate of 64.9% against 9.6% in rural areas (World Bank, 2017). The potential for harnessing renewable energies to meet these needs remains high, however, especially with regard to solar power and biofuels.

Today, Burkina Faso is investing substantial efforts in achieving socio-economic development goals and securing the welfare of vulnerable groups, as evidenced in the National Plan for Economic and Social Development (PNDES,_2016-2020). Further, the country has utilized guidelines emerging from regional policies of the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS) for access to energy services to set goals within the country's "Vision 2020" and a National White Paper (the Livre Blanc National). The aim of these efforts is to increase the usage of renewable energy up to 27% by 2030, especially in rural areas where the rate was as low as 0.5% in 2010 (PANER, 2015-2020/2030). This ambitious target requires investments of roughly 214.6 billion FCFA, or 429 million USD over a period of eight (08) years, 2012-2020 (PANER, 2015-2020/2030). Diverse projects are being developed to help meet these energy goals and to increase access to electricity though Photovoltaic (PV) systems, these include photovoltaic power plants linked to the national grid, implementation of isolated small scale off-grid solar systems, and setup of individual solar kits. In addition, a national biofuel development policy and a national biogas promotion program have also been created.

Despite all of these promising developments, change has been slow so far and numerous, often overlapping challenges remain, with interlinked factors relating to politics, technology, regulation, finance and security. Therefore, it is likely the country will face certain difficulties in meeting the ambitious targets set for 2030 unless sufficient attention is given to developing integrative and transparent approaches.



Current Energy Production and Renewable Energy Potential

Burkina Faso is highly dependent on imported fossil fuels, wood, charcoal and electricity imported from neighboring countries (Ghana, Cote d'Ivoire, and Togo). In 2008, the global energy supply in Burkina was 136,5 PJ or 3,26 Mtep (not including electrical energy imports). Burkina Faso's 2010 energy balance consisted of biomass (80.6%), hydrocarbon (19%), and hydroelectricity (0.4%) (INERA, 2013). The main sources of electricity production in Burkina Faso, are thermal fossil-fuels (88%), hydroelectricity (11%) and photovoltaic power, which represents only (1%). According to the ministry of energy, the total electrical power generated in Burkina Faso from 2008 to 2017 increased from 209 MW to 324.6 MW, respectively. However, this level of production does not meet the national demand which increases almost 10% each year (SE4ALL, 2013). The launch of the photovoltaic power plant at Zagtouli in south-west Ouagadougou in 2017 added substantial power generation of 33.7 MW, increasing hopes of catching up with national demand.

Indeed, Burkina Faso has high potential for energy production from renewable energy sources estimated at 60% from solar energy, 10% from biomass and 30% for hydroelectricity (ECREEE-PERC, 2015). Solar energy is the most abundant renewable energy source in Burkina Faso, with daily sunshine of 5.5 KWh/m2 for 3,000 to 3,500 hours per year, and the solar deposit is evenly distributed over the national territory with an average yield estimated at 1,620 KWc. This potential is highly underexploited, as most of the existing solar installations are small in size (inferior to 250 KWc). In 2017, major progress was made with the installation of two (02) photovoltaic power plants, one the aforementioned plant in Zagtouli with generation of 33.7 MWc, and one with generation of 1.1 MWc in Ziga.

It is also worth recognizing that there are a growing number of hybrid power plants based on coupling photovoltaic systems and generators (with or without energy storage). Further, solar kits (individual, semi-collective and collective) have been used as part of the decentralized rural electrification program and the promotion of solar street lights with a program of public lighting in the streets of major cities. Across the country, it is also possible to observe a small number of low-power photovoltaic installations for lighting and phone charging needs.

Current Energy Production and Renewable Energy Potential

Biomass is the most used energy resource in the country with an exploitable asset estimated at 2,515 m3. It is mainly used as traditional fuel, with around 90% of households using wood as their main energy source. The existing validated statistical data are from 2002 and show wood, charcoal and harvest waste consumption estimated at 4,124,970 tons. Firewood consumption was estimated at 6,186,194 tons in 2010 and 7,243,448 tons in 2012, and charcoal consumption was estimated at 330,719 tons in 2010 and 367,401 in 2012. With an estimated average carbonisation yield at 16% (or roughly 6 kg of wood for 1kg of charcoal), this means that wood consumed for charcoal was estimated at 2,066,992 tons in 2010 and 2,296,254 in 2012. The increasing pressure on forests due to wood and charcoal consumption has motivated a series of projects (e.g. GIZ / FAFASO and NAFA NANA) for development, use and dissemination of improved cook stoves in urban and rural areas.

The exploitation of biomass for large-scale electrical energy production is still in an early stage. The experiences of SN/SOSUCO (sugar production industry) using bagasse to produce heat and electricity, and of SN CITEC (food oil production industry) using cotton oilcakes to produce electricity are promising. Further, since 2009, an important building program using biodigesters has being implemented by the National Biodigester Programme of Burkina Faso (PNB-BF) with an original ambitious goal of 100,000 units installed by 2030. By June 2015, 7,000 biodigesters had been installed in rural households all over the country. A more realistic goal of 38,000 units of biodigesters being installed by 2030 has been retained.

Major Regulatory Frameworks

The institutional and organizational framework of the energy sector is governed by decree N° 2018-0272 / PRES / PM / SGG-CM of February 18, 2019 which describes the authority held by government ministries relating to the energy sector. Main energy sector stakeholders include governmental agencies and public or private institutions with varying degrees of involvement.

Policies and regulatory frameworks

In 2016, the country adopted a new five-year development framework, the National Program for Economic and Social Development (PNDES 2016-2020) This program promotes the transition to renewable energies, especially through its Axis 2 "developing human capital" and its Axis 3 "revitalizing growth sectors for the economy and jobs".

The vision of the Government of Burkina Faso includes universal access to modern energy services by making energy accessible and available in order to drive sustainable development that aligns with the 2016-2020 Energy Sector Policy Letter (LPSE). This vision entails, (i) an increase in the national electrification rate, from 18.83% in 2015 to 45% in 2020, (ii) a raise in the electric coverage rate, from 33.32% in 2015 to 80% in 2020, (iii) an increase in the share of renewable energies in total production, by 6.4% in 2015 to 30% in 2020.

Additional policies and strategies supporting development of the energy sector:

- The National White Paper
- The 2018-2027 Sector Policy for Industrial and Craft Transformations (PS-TIA);
- The 2019-2023 energy strategy, the overall objective including ensuring access to modern, quality energy services and to promote energy efficiency;
- The Energy Sector Development Policy Letter (LPDSE) adopted in 2000;
- The 2014-2025 Sectoral Energy Policy (POSEN) adopted in 2013;
- The 2016-2020 Energy Sector Policy Letter (LPSE) adopted in 2016 with the main objective of making energy accessible and available through the energy mix, the promotion of energy efficiency and the strengthening of conventional energy production;
- The action plan for energy management in Burkina Faso 2016-2020: with an electricity component that aims to assess the potential for saving energy;
- The National Renewable Energies Action Plan (PANER) 2015-2030 which operationalizes the Sustainable Energy for All (SE4ALL) initiative in its renewable energy component;
- The National Action Plan for Energy Efficiency (PANEE) 2015-2030 which operationalizes the SE4ALL initiative in its energy efficiency section;
- The communication strategy and action plan for the promotion of energy savings in Burkina Faso from June 2016 which aims at promoting the rational and efficient use of electricity in the public and private sectors, and households.

Major Regulatory Frameworks

In 2012, Law N ° 051-2012 / AN (November 08, 2012) focused on exemptions of customs duties and VAT for imports of solar energy equipment and VAT exemptions for domestic sales of solar energy equipment, was approved to promote solar energy. In the field of biomass- energy, the Ministry of Environment has a legislative and regulatory structure that primarily regulates activities related to the protection of the environment and the enhancement of livelihoods, this includes production and marketing of woody forest products through law N ° 006-2013 / AN (April 02, 2013) of the environment code and law N ° 003-2011 / AN (April 05, 2011) of the forest code in Burkina Faso.

More recently, Law No. 014-2017 / AN of April 20, 2017 was adopted which organizes general regulation of the energy sector, and its implementing texts aim to ensure an efficient, reliable, sustainable, and sufficient energy supply in order to promote sustainable socio-economic development. The law 014 brings improvements in the sector, including:

- Regulation of the entire energy sector excluding the hydrocarbons sub-sector
- Liberalization of the production and distribution segments
- Allowing the installation of independent producers of electricity throughout the national territory
- Lifting of the monopoly of SONABEL (the national utility)
- The introduction of specific provisions for the promotion of renewable energy and energy efficiency
- The expansion of the powers of the national Regulatory Authority of the Electricity Sub-sector to the energy sector as a whole, in line with the requirements of the Local Regulatory Authority, and the incorporation of its funding arrangements.

As of October 14, 2019, nineteen (19) application texts have been developed and adopted for implementing Law 014 the remaining are unprocessed.

Key Institutional Actors

The main actors of the energy sector in Burkina Faso include:

- Ministerial departments who implement the government policies and regulatory frameworks,
- Research and training centers specialized in training, developing capacities and implementing research technologies and research development,
- Private sector design offices which implement feasibility studies and recommend the types of equipment to purchase, along with companies that purchase equipment and maintain facilities. In this vein is the Association of Professionals in Renewable Energies of Burkina Faso (APER-BF), created on May 06, 2016 following the foundation of APER-ECOWAS, which has 118 professionals members. The association aims to facilitate investments in the renewable energy sector through advocating for tax exemptions with the Government, for financing of green projects, and for the implementation of consumer credit at concessional rates with financial institutions. However, the private sector still faces significant challenges in accessing commercial debt.
- Non-Governmental Organizations (NGOs), Civil Society Organizations (CSOs) and Technical and Financial Partners (TFP) that provide technical and financial support to the government in or order to promote renewable energy and support local communities.

Technical and Financial Mechanisms and Opportunities

In order to gather the necessary $429 million USD needed to increase the renewable energy contribution in Burkina Faso up to 27% by 2030, the country collaborates with technical and financial partners (TPFs) in the energy field including sub-regional and regional institutions, international organizations, and bi & multilateral cooperation agencies. These partners support the implementation of regional energy policies at national levels and play a key role in financing energy infrastructure and supporting research and policy development. Regional organizations like WAEMU and ECOWAS are leading the implementation of regional projects with variations at the national level to support the member countries (policies, demonstration projects, structuring projects, etc.). International agencies provide support for renewable energy activities that align with their mission and international agreements such as the Paris agreement.

Primary financial mechanisms for renewable energy development and promotion are based on loans and grants from development partners including the World Bank, the African Development Bank and the Green Climate Funds.

Assessment of Solar Energy Programs and Projects

Given its high solar exposure, Burkina Faso is developing numerous initiatives to increase the share of solar energy in its national energy balance, especially to support development and economic growth in rural areas. The Ministry in charge of energy is implementing small scale solar projects for public infrastructure like schools and health centers. Photovoltaic Rural Electrification (PVRE) programs in the country have brought electricity to 26 villages through an off-grid PV system. This program motivates public officers to work in more remote areas where the living conditions without access to electricity were difficult, and allows the community to access improved services related to education and health. Local communities also develop new income generating activities with the available energy. The government is supported in these programs by the private sector and civil society organizations which help push these efforts to more marginalized areas of the country, widening the scope of positive impacts on living conditions. With the PVRE, the most common types of facilities installed are rooftop PV systems for health centres and schools, and off-grid plants for villages and income generating activities. Further, solar pumping systems have been installed in certain areas, bringing improved sanitation and health, as well as improving agricultural production through year-round irrigation.

Beneficiaries report significant changes with access to renewable energy, however, interviews informing this report also identify numerous remaining challenges including:

- Financial constraints: Community members find it difficult to afford the operation and maintenance of the energy facilities. In addition, local communities have been able to access introduced facilities like this for free in the past, and so changing this to a paid system is challenging. Further, private sector business models sometimes overestimate the contribution that local users, primarily seasonal farmers, are able to afford with their existing purchase power.
- Communication and Community Involvement: Local communities are seldom consulted during the conception of projects, this leads to challenges in later stages of the programs where their involvement and willingness is fundamental to sustaining the facilities. Further, the size and design of facilities can be ill-matched to a community's needs if the communication from early stages is not open..
- Security: The country's current security situation in the north or "red zone", which has the highest exposure to solar radiation, has constrained research and development largely to the southern part of the country. This represents missed opportunities to harness energy and marginalization of communities in the north.
- Limited Off-Grid Projects: Data also shows that 100% green photovoltaic projects (off-grid) are very limited in number. Most of the implemented photovoltaic projects have at least some connection with the national interconnected grid (RNI), and certain decentralized hybrid projects initiated by Electricity Cooperatives (COPEL) are mixed with oil generators.

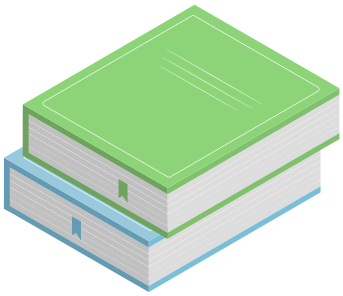
Assessment of Bioenergy Programs

Bioenergy in Burkina Faso has three core components: biodigesters run by the National Program of Biodigesters (PNB-BF), biofuels promoted by the government, private actors and civil society and improved cook stoves pushed mainly by civil society and research centers like IRSAT, FAFASO and GIZ. Bioenergy plays a key role in environmental sustainability by reducing the quantity of wood used for cooking and lighting, and the quantities of chemical fertilizer that farmers rely upon. This in turn reduces pressure on forests and helps to combat climate change in dry regions such as Burkina Faso. The ProGREEN team's data collection shows that bioenergy projects in the country significantly reduce workloads of women and help to reduce smoke-related diseases. Further, these projects have been seen to improve agricultural productivity and food security through the use of bio-fertilizers. PNB-BF is the main actor who organizes the sector and works to strengthen the value chain involved with facility construction, owner maintenance, and repairs to systems with damage requiring technically skilled solutions.

The government, along with its partners at the Forest Investment Program (PIF) and the Complementary action project of the Mobile Data for Moving Herd Management and better income project (PAC-MODHEM) of the Dutch Development Organization (SNV) have also developed a communication campaign and subsidy program to widen the use of biodigesters to more remote areas. However, beneficiaries of these programs still believe that the acquisition cost is expensive and this remains a constraint. Non-subscribers interviewed said that the lack of financial means is the main barrier to utilizing a biodigester, though they know the goods biodigesters provide.

Biofuel projects are also seeing growing interest in improving access to energy, diversifying and increasing farmers' incomes, creating green jobs, reducing poverty, and reducing greenhouse gases (GHG). In Burkina Faso, these projects primarily focus on jatropha, a tropical plant native to Central America, as a resource to produce biofuel which is characterized by the high oil content of its seeds (up to 40% by mass) and its resistance to arid climates. However, this energy is encountering challenges including push back against converting large parcels of fertile land to jatropha production, and the logistical costs of harvesting, transporting, storing, processing and drying the raw material. These challenges make the cost of biofuels less competitive, further, the availability of processing units for converting the raw biofuel materials remains problematic due to the remoteness of the production areas.

Traditionally, three-stone stoves were used for cooking in remote areas. In more recent years, a number of projects promoting improved cook stoves have boosted interest in them in rural areas, motivated by numerous benefits, especially for women's health. These stove projects have also worked to strengthen artisan skills and strong markets. Overall, consumers and artisans agree that the improved stove projects have had positive impacts including with income generation, reduced need for purchasing coal and wood, and less time dedicated to collecting wood. However, artisans and beneficiaries still see a need for financial support to help cover the costs of stove production and purchases.



Critical Analysis of Capacity Development Efforts

With growing renewable energy programming, there is an increasing need for qualified and skilled professionals, therefore the government and higher education providers are developing initiatives to meet the accompanying training and market demand. There are two main avenues for renewable energy training and education available. First are a number of specialized programs provided through professional training centres, and public and private higher education institutions. These programs offer professional baccalaureate degrees focused on renewable energy, along with certain highly skilled professional certificate programs. Secondly, there are a number of continuing education efforts that provide more concise training in a variety of renewable energies and techniques. Though these programs are promising for building a stronger base of skilled renewable energy professionals, they generally suffer from a lack of sustainable funding, as most were created under cooperation programs with foreign donors. When the donors leave or the projects end, the government has difficulty ensuring the proper functioning of these programs. In addition, Masters and Ph.D. candidates encounter numerous financial challenges when carrying out their research and attending international conferences and trainings. This impacts their ability to build and improve their skills and to complete their degrees within the allotted timelines.

Burkina Faso does not yet have an intermediate diploma focused on renewable energy such as Certificate of Professional Aptitude (CPA) and Diploma of Occupational Studies (DES). This hinders young practitioners who do not otherwise hold a degree. Indeed, renewable energy technicians without a technical baccalaureate are often trained on the job. The National Agency for Renewable Energies and Energy Efficiency (ANEREE) is currently implementing a training program for 5,000 young people in renewable energies to try and partially address this issue.

Lessons for Livelihoods, Health and Development

The ProGreen assessment in Burkina Faso reveals that access to renewable energy significantly impacts the livelihoods of local communities. Small scale off-grid solar plants make it possible for local communities to access commodities such as lighting, ventilation, refrigeration, internet, television and other entertainment. Lighting further allows for all students to have more time for studying after dark. These plants along with solar pumping systems reduce women's workloads, allowing more time for leisure and to develop small businesses, and girls are able to devote more time to studying and other activities. Solar pumping systems further have been shown to improve sanitation and reduce disease, as well as to increase agricultural productivity and food security. Remote health centres connected to off-grid systems are able to provide higher quality healthcare, being better equipped for surgeries, night time births, and medicine storage. These centres also save substantial amounts of money through buying less fuel for generators, and through rechargeable batteries. Solar off-grid systems further support a green economy through many different types of small business development including selling cold beverages and ice, recharging phones, powering mills etc.

Bioenergy initiatives (biodigesters, biofuels and improved cook stoves) also have substantial positives impacts on livelihoods and wellbeing in rural areas, along with positive environmental impacts. Through biogas production, biodigesters have an energy potential estimated at 173,375 kWh / year which, if fully exploited, would prevent the destruction of approximately 3,856 hectares of forest / year (PNB-BF Activity Reports). The organic fertilizers produced are also promising for restoring degraded soils, improving agricultural productivity and bolstering food security. Using improved cook stoves further reduces workloads for women by saving time spent collecting firewood, and health is improved through reduced exposure to smoke.

Numerous challenges remain, however, including:

- High costs of renewable energy access for rural communities
- Inadequate communication between project managers and beneficiaries
- Poor quality and inappropriately sized equipment for local facilities
- A lack of raw materials for improved stoves
- Limited available land and controversy over land conversion for biofuel production
- Lack of skilled technicians for maintenance of systems
- Absence of strong business models for sustaining renewable energy programs

Constraining and Enabling Factors for Renewable Energy

Enabling Factors

- A favourable international and sub-regional policy and funding environment (i.e. the presence of funds in the field of green energies, international policies and strategies such as the SDGs, the National White Paper, etc.);
- The political will displayed with the adoption of texts of laws, decrees, and orders in favour of the renewable energy sector;
- Favourable natural conditions (solar potential, biomass, etc.);
- Awareness raising thanks to civil society organizations and opinion leaders working in the field of renewable energies;
- The enthusiasm of the population due to the projects which have succeeded;
- Low material costs;
- Improvements of technologies;
- Availability of equipment.

Constraining Factors

- High investment costs for rural communities;
- The absence of credits and other financial products;
- Inaccessibility of existing funding (carbon credits, etc.) due to the lack of capacity for the development of competitive projects;
- Difficulties in mobilizing private investors who consider the energy sector as risky, especially the rural electrification segment;
- Lack of a semi-industrial systems for agricultural and food processing;
- Lack of cooperation between actors;
- Poor approaches to project implementation, (non-involvement of local communities in the planning phases, lack of communication and awareness raising for projects, etc.)
- Dominance of politics in projects and beneficiary choices;
- Extreme poverty of certain beneficiaries;
- Absence of business models for projects;
- Absence of national norms and standards;
- Absence of a framework for interaction between the actors;
- Competition between energy technologies (renewable and conventional).

Recommendations

At the State Level

- Create a funding system to promote the acquisition of products and equipment;
- Address gaps in renewable energy training in order to ensure quality and proximity of services, and to reduce youth unemployment;
- Develop and adopt standards and requirements in the field of renewable energies for equipment, installers and facilities;
- Create a unit or laboratory for testing and quality assurance of renewable energy equipment / facilities;
- Strengthen the mandate of enforcement institutions such as Agence Nationale des Energies Renouvelables et de l'Efficacité (ANEERE) on monitoring and evaluation, inspection, and control of products and services provided by third parties to local populations;
- Incorporate productive use such as Income Generating Activities (IGAs) in projects;
- Establish and enforce specifications for projects to involve beneficiaries in the development, implementation and exploitation of renewable energy projects;
- Ensure compliance with corporate social responsibility (CSR) clauses;
- Facilitate the establishment of guaranteed funds at commercial banks for renewable energy credit;
- Encourage the private sector, in particular commercial banks and insurance companies, to finance renewable energy projects and provide renewable energy products and services;
- Publicize and to share monitoring and evaluation reports of projects;

At the level of Installation Managers

- Update skills of technicians through periodic training sessions;
- Consider quality in the choice of equipment and facilities;
- Ensure monitoring, control and maintenance of installed facilities/systems;
- Ensure scrupulous compliance with contract clauses;

Recommendations

At the level of Technical and Financial Partners

- Establish an appropriate communication plan for projects involving local stakeholders;
- Consider Income Generating Activities in renewable energy projects;
- Improve public awareness of the usage of equipment;
- Introduce into calls for tenders clauses that allow renewable energy project managers to track and monitor equipment and facilities commissioned;
- Create a loan guaranteeing funds hosted by a qualified state agency;
- Support commercial banks to develop credit lines for renewable energy projects;
- Facilitate access to credits for decentralized projects;
- Finance business to business (B2B) meetings between training centres and businesses;
- Publicize and share monitoring and evaluation reports of projects;
- Strengthen local youth capacities to ensure small maintenance and repairs;

At the Level of Recipients

- Ensure proper usage of equipment through organization and securing of facilities;
- Favour Income Generating Activities development over lighting in the event of access to energy.

Cross-cutting Lessons and Conclusions

This assessment aimed to identify factors that influence the development of renewable energy in Burkina Faso. The main source of renewable energies used at local levels are bioenergy and photovoltaic solar, with photovoltaic solar systems predominating. The government is improving the regulatory framework and policies to provide a better environment for actors to develop renewable energy access, especially in rural areas. Our assessment further shows that access to renewable energy in rural areas impacts positively on the living conditions of local communities in diverse ways relating to food security, health, education, gender equity and youth services. In addition, decentralised renewable energy projects support an array of livelihoods (e.g. milling, sewing, welding, water extraction, small business activities for women, and others) to help promote a greener economy.

Despite these gains, development of renewable energy projects continues to face challenges including poor communication between actors, especially projects managers and beneficiaries, grave security concerns, “top down” approaches that are not sufficiently inclusive of local inputs, a lack successful economic models, absence of monitoring of facilities, the low purchasing power of rural populations, the low quality of equipment, among others.

To bolster the quality of the services provided and to meet the renewable energy market demand, many professional and academic trainings are being offered. However, most of the training centres are located in urban centres and the cost of training is expensive in private schools. The public institutions including universities and research centres have difficulties securing funds for sustainable training programs. In addition, formal intermediate level training in renewable energies is non-existent.

This abridged report reviewed lessons learned from the ProGREEN Burkina Faso assessment. Phase two of the ProGREEN project will build from these results to further enable greater capacity development and action supporting transitions to renewable energy in Burkina Faso.

Acknowledgements

The Promoting Gains for Renewable Energy (ProGREEN) West Africa project is supported by The Research Fund of Quebec (FRQ).

START thanks FRQ and all of the ProGREEN Burkina Faso team members listed below for their time, energy and enthusiasm on this important effort.

- DA, Tierbio Lin, Programme National de Biodigesteur / PNB-BF
- GORO, Soumaïla, Direction Générale de l'Efficacité Énergétique / DGEE/BF
- ILBOUDO, Abdoulaye, BUY-US
- ILBOUDO, Mahamady, Nouvelle Vision Africaine / NVA
- KABORE, Boureima, Univ. Ouaga1
- KI, Sima Germaine, Direction Generale des Energies Renouvelables / DGER/BF
- KONATE, Ramatou, Univ. Ouaga1
- KONSEIBO, Charles Didace, Centre Ecologique Albert Schweitzer / CEAS
- NANEMA, Emmanuel, Institut de recherche en sciences appliquées et technologies / IRSAT/CNRST
- OUEDRAOGO, Adama, Ministère de l'Environnement de l'Économie Verte et du Changement Climatique / MEEVCC
- OUERMI, Arnaud, Société Nationale d'électricité du Burkina Faso / SONABEL
- SANDWIDI, Gwladys Wendwaoga, Programme National de Biodigesteur / PNB-BF
- SANFO, Safietou, West African Science Service Center on Climate Change and Adapted Land Use / WASCAL
- SOMA, Do Thie, Programme National de Biodigesteur / PNB-BF

For a full list of report references or for more information about ProGREEN, please contact Dr. Mariama Camara at mcamara@start.org.

www.start.org

Québec
Fonds de recherche – Nature et technologies
Fonds de recherche – Santé
Fonds de recherche – Société et culture