

The Charcoal Project

Biomass Energy Efficiency Program in Rubaare, Uganda

Executive Summary

The Charcoal Project (TCP) , a US based non-profit organization, is dedicated to promoting, facilitating, and advocating for the widespread adoption of energy efficient solutions for communities in the developing world that depend on biomass energy as their primary source of fuel for cooking and household energy. As a way to carry out its mission and support the alleviation of energy poverty, TCP is starting a Biomass Energy Efficiency Program (BEEP) in Rubaare, Uganda with the Rubaare Education Foundation (REF).

The southwest area of Uganda has experienced significant deforestation, and this project will provide an alternative to the current use of wood or charcoal as fuel in Rubaare, a town of an estimated 20,000 inhabitants. Our project partner, REF, is a local non-profit organization that operates 6 schools in the area and which finds itself in dire need of fuel to support its student meal program.

The initial goal for BEEP is to establish a briquette production program for the REF schools using local agricultural waste materials. Once in place and operational, we will provide energy efficient options to the community at large to include fuel, cookstove, and tree-farming options. Thanks to the nature of the project, there will be multiple opportunities for local entrepreneurship and for women's participation in the value chain, thus yielding direct economic benefits over and above those of cleaner air and increased access to fuel sources.

Lastly, in addition to providing biomass energy efficiency solutions and economic opportunities to the REF schools and the broader Rubaare community, we expect this project to yield valuable information that will help TCP develop models for replication elsewhere in Uganda and sub-Saharan Africa.

TCP is currently seeking approximately \$40,000 to cover the start-up costs of buying briquette presses, training workers, monitoring the success and usage rates of the program at the REF schools, and upgrading the institutional stoves at those schools. In the second stage, we will need additional funding of between \$8,000 and \$10,000 for the larger community clean cookstove program.

Within a year of implementation, we expect this briquette project to be financially self-sustaining from the revenues generated by the sale of fuel briquettes. In two or three years, after the clean cookstove program is implemented and certified, opportunities for income from carbon financing mechanisms should be present.

About The Charcoal Project

TCP was established in 2009 to create and initiate model programs that advance the large-scale and widespread adoption of biomass energy efficiency solutions among the more than two billion people in the developing world who depend on wood, charcoal, and other solid biomass fuels for cooking and heating. By using a combination of online and traditional media, TCP also informs the public, policy-makers, reporters, and social media influencers about the urgent need for sustainable biomass fuel resources.

In addition to the Biomass Energy Efficiency Program, current TCP initiatives include:

- **The Tanzania Briquette-Makers Trade Association Program:** An initiative that supports fuel briquette entrepreneurs while also establishing favorable eco-friendly standards and practices for Tanzania's nascent yet thriving biomass briquette industry.
- **www.CharcoalProject.org:** A vigorous online community that nurtures and promotes a global community of biomass stakeholders. The Charcoal Project website utilizes best practices to employ social media and networking in the service of alleviating energy poverty around the world. We provide a dynamic and active online hub with access to a thriving marketplace of shared ideas and experiences, free resources, and the latest news concerning biomass development.
- **2012 International Conference on Charcoal.** This first of its kind event, to take place in Africa, will lay out a blueprint for achieving sustainable production and use of solid biomass fuels like woodfuels and charcoal. Our list of partners in this venture keeps growing but, to date, it includes The World Bank, International Energy Agency, The Nature Conservancy, and International Lifeline Fund.

Though relatively new as an organization, TCP is already well recognized within the Improved Cookstove (ICS) community as a key industry source of information for facilitating policy making within the sector and with larger audiences in the public and private sectors. To date, TCP has worked and partnered with well-established ICS focused organizations such as The Global Alliance for Clean Cookstoves (an initiative of the United Nations Foundation), HEDON, the Partnership for Clean Indoor Air (an initiative of the US Environmental Protection Agency), Impact Carbon, Aprovecho Research Center, StoveTec, Envirofit, BioLite, and academic and research institutions such as the Earth Institute, Columbia Business School, NYU Stern School for Social Enterprise, and the University of Colorado (Boulder) Center for Environment and Energy Security.

Profiles of TCP principals are offered in the Appendix.

Situation Analysis

About half of the world's population depends on solid biomass fuels such as wood, charcoal, and animal dung for cooking and heating. Traditional cooking methods over "three stone fires", found in some form or another in all regions of the world, are both highly inefficient due to the 80% dispersion of the generated heat and highly toxic due to the fumes emitted and inhaled in the home. Indoor air quality is very poor and leads to high rates of mortality, illness, and burns, especially in women and children.

Meanwhile, on an environmental level, almost 63% of global deforestation activities involve the gathering of wood for household cooking and energy needs. Needless to say, this rate of global consumption is unsustainable and if unchecked will lead to further wide-scale degradation of natural habitats as well as to increased aggravation of the impacts of climate change.

While investments in energy efficiency, renewables, and conservation have increased significantly in industrialized and emerging countries over the last decade, private and public investment in primary, sustainable technologies for the world's energy poor has remained stubbornly low. Yet, if not addressed on both a local, national, and international scale, countries that are already experiencing a lack of renewable sources of energy for cooking and heating will continue to see:

- Rising increases in poverty as more and more natural resources are plundered to meet basic energy needs.
- Greater public health management costs due to inefficient cookstoves that emit toxic fumes and the burning of impure biomass fuel which result in elevated incidences of asthma, chronic obstructive pulmonary disease, and cystic fibrosis.
- Ongoing wholesale deforestation and destruction of the world's biodiversity.
- Exacerbation of climate change impacts and catastrophic natural disasters as landscape barriers are stripped, leaving the land vulnerable to mud slides, uncontrollable flooding, and tsunamis.

Nowhere are the human costs of this problem more evident than in sub-Saharan Africa where more than 90% of the population relies on the unsustainable consumption of wood fuels. This has resulted in millions of acres of irreplaceable forests and woodlands burned for charcoal and stripped for fuel. The wake of this deforestation has left a highly impaired landscape where nature's vital ability to protect animal habitat, biodiversity, and watersheds is completely devastated.

Additionally, regional emissions from inefficient biomass combustion in the Sub-Saharan region alone now contribute between 20 – 30% of greenhouse gases in the atmosphere. This is roughly the CO₂-equivalent of Europe's transportation sector, which includes emissions from trains, buses, airplanes, trucks, and cars.

The human costs are equally devastating. The World Health Organization estimates that each year 1.5 – 2 million individuals die prematurely as a result of cooking in

their homes or trying to stay warm with solid biomass fuels. This surpasses the number of deaths caused by malaria and tuberculosis combined. Overwhelmingly, the victims are women and children condemned to live and breathe polluted indoor air that results from the inefficient combustion of their cookstoves and open fires.

These dismal statistics are a result of increased global demand for, and the rising costs of oil, gas, and electricity. Studies indicate the demand for wood, charcoal, and other biomass fuels will grow by more than 200 million consumers in the next 20 years. Meeting this future demand will be nearly impossible given projections that several African countries will run out of wood fuel by the end of this decade.

Rubaare – The BEEP Target Community

Rubaare, located in Southwestern Uganda, is a town of approximately 20,000 inhabitants with a fairly homogeneous population comprised of people from the Banyankore and Bakiga ethnic groups. The local economy is heavily dependent on agriculture with bananas being the main crop and the production of maize and rice as the next most important sources of food and income.

Members of the community use traditional three stone fires to cook, and cook inside their homes, generally without chimneys or other methods of effective ventilation. Due to the long-standing practice of collecting wood for the home fires, Rubaare has been heavily deforested and families must now travel great distances to gather firewood. The pattern is repeated throughout the country and the Ugandan government estimates it will run out of wood fuel by the end of this decade.

Families in Rubaare that can afford wood must spend US\$8-9 for a week's supply – a significant portion of the average household income. As a replacement for wood, banana stems are commonly burned, though they emit a lot of smoke. And the demand for fuel is high not only for cooking, but for boiling water as the water is not safe for drinking.

Project Partner – The Rubaare Education Foundation

The Rubaare Education Foundation (REF) is a private organization that runs five primary schools and a secondary school/vocational school. In all, REF serves over 1,600 students whose associated families are estimated to number between 8,000 and 10,000. REF receives some financial support from Genesis Aid, a Christian-based NGO located in Australia. The schools, which also offer boarding facilities for those students without safe home situations, operate year round with a few holiday breaks. Tuition is charged to parents who can afford to pay, though at a significantly subsidized rate, and the schools accept many students of limited means, including some of whom are refugees of the rebel war in the north of Uganda, victims of the Rwandan genocide, or AIDS orphans.

In exchange for living and schooling, the students, especially those who cannot pay the tuition, work during non-school hours and on holiday breaks to benefit the schools and the community. For example, the students have shaped every mud

brick used in constructing the schools and helped to build every classroom, dormitory and other school facilities. The education program offers “A” and “O” levels for 4 and 6 years respectively and every student is offered the opportunity to return after graduation for two years of practical skills in the vocational school. Courses in the vocational program include primary teaching, mud brick making, building, carpentry, electronics, plumbing, textiles, tailoring, knitting, animal husbandry, and farming..

All students are provided with a cooked lunch each day, a service that while ensuring their health and development, also requires a large supply of fuel. The schools currently spend close to US\$10,000 per year on wood for this purpose. Henry Twinemasiko, the REF Director, approached TCP for assistance in developing a program that will give the schools a consistent and inexpensive source of energy.

The Biomass Energy Efficiency Program

In coordination with REF, TCP has developed the plan for the Rubaare BEEP project, which will benefit not only the REF schools, but will eventually the community as a whole. In all, three key program components will be implemented:

- The briquette production program
- Clean cookstoves for institutional and home use
- Tree farming

Briquette Production Program

TCP is designing a program that will replace 100% of REF’s need for wood and also allow for the sale of excess briquette production to the community. In this phase, each school will be given 10 presses, which will allow for the production of fuel briquettes from locally generated agricultural waste including banana peels/stems and sawdust. In other words, the schools will be producing a suitable cooking fuel from renewable resources that are locally available, cheap, and currently have limited other uses (some farmers use this agriwaste for compost, but there is a considerable amount that goes unused).

Students at the vocational school and the primary schools will be trained in briquette making. We estimate that the 10 presses will need to be operated by 20 students for 2 hours a day, 4 days per week to meet the immediate fuel needs of the school system, or 186 briquettes per day. As production is increased, the excess will be sold to the community for 50 ugx each (\$.02), thus generating income for the school. An added benefit for the students is that once trained, they will have valuable business skills, over and above the manufacturing process, that can be applied to future entrepreneurial endeavors.

In addition to the students, the school system has a parent association membership of 1,000 and the program calls for their eventual training. This activity is expected to yield entrepreneurship opportunities and generate further economic benefits for Rubaare, especially with the women who will be actively targeted for training.

TCP has identified a portable press, called the Peterson Press, which uses a small hydraulic jack as an appropriate technology for this process. The jacks will be shipped from the United States and assembled with the frame in Kampala, Uganda. TCP will hire Isaac Owor to oversee the initial start-up of the program and the training sessions. Isaac runs a company called EnviroCoal that makes and sells briquettes in Kampala. He conducted the initial energy assessment at the schools on behalf of TCP. Lastly, Henry Twinemasiko, the REF Director, his wife Sofia, and other members of the school staff will oversee the management of the program on an ongoing and long-term basis.

Clean Cookstoves

Although the biomass briquettes will provide a sustainable fuel source for the school and the surrounding community, cleaner, more efficient cookstoves will need to be introduced in Rubaare to realize the benefits of lower emissions. While some of the schools have stoves that can be used with the briquettes, as noted before, most of the people in the community use traditional three stone fires. Briquettes can be used with the traditional stoves, and will therefore help local families meet their need for fuel, but there would no improvement in emissions, as combustion gases would not be burned efficiently. As part of implementation of the briquette program, TCP will introduce clean institutional stoves where needed in the school district.

Throughout the clean cookstove sector, it is widely recognized that one of the greatest barriers to long-term adoption of cleaner and more efficient stoves is cultural cooking traditions and the preferences of the women who use them. While Improved Cookstove NGOs have been around for decades, there is a long history of failed projects because the stoves introduced were culturally inappropriate and not suited to the needs of the women. Therefore, since there is no established market for clean stoves in Rubaare and no favorite model has yet been identified, TCP needs to conduct stove testing/market research to determine what type of stove is best suited for this community before committing to any individual model. There are a variety of efficient cookstoves available, but of utmost importance is ease of use. TCP's research methodology will focus on finding the combination of stove and fuel that will be most easily adopted by the women of Rubaare. Current models under consideration include: Holey Rocket Stoves (briquettes), Champion 2008 Stove (briquettes), Lucia TLUD stoves (fuel pellets), and Rocket Stoves (wood). TCP will investigate stoves that use fuel other than briquettes in order to establish whether briquettes are a long-term viable source of fuel for domestic use and how willing Rubaare families will be to switching to this alternative.

TCP will start with a small test sample of families within the Rubaare community to get feedback on ease of use and fuel efficiencies. The test will begin this summer with approximately 25-30 families each testing two or three stoves. Data will be collected using interviews prior to the start of the test, regarding cooking habits, fuel use, and weekly expenses for fuel. The families will then use the stoves for one

month at which point data will be collected again regarding ease of use, fuel consumption, fuel expense savings and the likelihood of purchasing each of the stoves. The goal of the tests is to determine which combination of fuel and cookstove will have the greatest chance of successful adoption by the community. Once the best fuel/cookstove option is determined, TCP will move to Phase II of the program and implement a rollout of the community cookstove program. This will involve determining the best manufacturing options for the stoves, developing a distribution plan, and determining the feasibility of using carbon financing.

If a briquette/stove combination is determined to be the optimal solution, savings from briquette usage will have a dramatic effect on increasing household income. Based on current needs, an average family would use 3 or 4 briquettes per day, and the briquettes will cost approximately 50 ugx or 2 cents apiece. Thus the households will reduce their spending from \$8-9 per week on wood, to \$0.70 per week on briquettes. Woodfuel stoves will also provide considerable household savings, as an efficient stove will use 40% - 70% less wood than a three stone fire. So an average family would save \$3-6 per week. In either case then, the community based cookstove program will result in direct poverty alleviation for the Rubaare community.

Tree Farming

As part of the BEEP program, TCP is including a small tree farming operation around the perimeter of the schools' property as a way to provide yet another sustainable fuel source. TCP is partnering with Trees for the Future (TTF), an organization that focuses on agro forestry and has a large presence in Uganda. TTF has met with Henry Twinemasiko and community members and will focus on species that enhance soil conservation, provide firewood, animal fodder, and timber for building. The project's first seeds were planted in April 2011. TTF will provide seeds, training, and follow-up to ensure the success of the program.

Funding Request

TCP is seeking funding in the amount of \$40,180 to cover the start-up costs of the briquette program, including the purchase of the presses, supply equipment, and training.

Project Consulting Fees	\$ 3,280
Presses & Supplies	\$ 14,900
Biomass Acquisition	\$ 3,500
Travel and Administrative	\$ 5,500
<u>Institutional Stoves</u>	<u>\$ 13,000</u>
Total Project Expenses	\$ 40,180

Current estimates call for the school briquette program to be self-sustaining within at most 6 months of starting, at which time TCP will begin to recoup its investment, from either briquette sales or the school system's fuel cost savings, as the program agreement with REF calls for such repayment. The total cost of implementing the

briquette program is expected to be repaid in a little over three years. While this income is expected to help support later program costs, we anticipate that the community cookstove project will require additional seed funds of between \$8,000 and \$10,000 at the onset, as briquette income to TCP will not be initially sufficient to fully cover the startup expenses of these activities.

The following chart shows the annual cash flows for the project between TCP and RE:

Summary of Payment Flows (\$US)	Year			
	1	2	3	4
From TCP for Project Costs	(40,180)	(6,001)	(6,001)	(6,001)
Repayment from REF	\$5,750	14,400	14,400	8,890
Net Cash Flows for TCP	(34,430)	8,399	8,399	2,890

Once the briquette program costs have been fully repaid, the ongoing production is expected to yield between \$1,000 to \$1,500 a month for REF, income that it can apply to cover further project development or its lunch program operating costs. Furthermore, in the longer-term, after the cookstove program has been successfully deployed, opportunities for carbon financing are likely to exist that could generate further income for new TCP programs and for Rubaare to undertake further local community development projects.

Appendix - Charcoal Project Bios

Jean Kim Chaix, *Director*

Before launching The Charcoal Project in 2009, Kim spent two decades as a television reporter documenting international current events and the intersection between population and the environment.

Kim gave up reporting in 2004 to join The Nature Conservancy in New York where he ran the organization's strategic marketing and communications division. At the Conservancy he chaired a task force on the integration of Climate Change, conservation science, and public policy.

Kim and his partner, Nina Grigoriev, started The Charcoal Project in response to the lack of energy efficient solutions available for the world's 3 billion people who depend on wood, charcoal, and animal dung as their primary source of fuel. Kim holds an undergraduate in biology and is a graduate of Columbia University's Graduate School of Journalism. He lives in Brooklyn, New York, with his family.

Sylvia Herzog, *Chief Operating Officer*

Sylvia recently joined the Charcoal Project because of a strong interest in alternative energy. After working on various environmental causes over the years, she saw that the Charcoal Project had practical solutions for addressing global warming and deforestation and wanted to contribute.

Sylvia has worked in various positions in banking and finance, including private placements and relationship management. She has an MBA, a Master of Public Policy and a BA in Economics, all from the University of Michigan. She currently resides with her family in Westchester County, New York.

Nina Grigoriev, *Director of Communications & Development*

Nina implements The Charcoal Project's communication strategy and provides direction for the organization's online fundraising. Nina currently works at the Guttmacher Institute with developing-country partners to communicate results of studies related to sexual and reproductive health. Prior to joining Guttmacher, Nina worked for more than five years as the marketing director of several online advertising and technology firms in New York City, including AOL, Tacoda, and Unicast. Nina is fluent in Russian and speaks advanced conversational Spanish. She holds a dual Bachelor of Science in Policy Analysis and Management and Human Development from Cornell University and a Masters in Public Policy from the University of Pompeu Fabra in Barcelona.

Christina Lutters, *Chief Information Officer*

Christina works as a developer for a media design firm in New York City. In the past, she has served as an educator, mediator and developer for NGOs in China, the Middle East and West Africa. Through technology, she hopes to help people in developing countries access and share information.

Christina has a BA in International Relations from University of Delaware. She is currently based in Brooklyn, NY.

Sara Cornish, *Reporter & Social Networking Strategist*

Sara works in strategic marketing at a global advertising agency in New York City. She has experience in branding, qualitative research, and strategy for both the private healthcare and nonprofit sectors.

While working in Ethiopia for Project Gaia, a nonprofit promoting use of renewable alcohol fuels for the energy poor, Sara created a multimedia campaign strategy, researched refugee income generation, and assisted with on-the-ground stove and fuel distribution, seeing firsthand how clean-burning fuel alleviates indoor pollution for Ethiopian households.

Sara graduated from Vassar College with a B.A. in Urban Studies, where she completed her senior thesis on participatory communication strategies for promoting renewable household fuel in Addis Ababa, Ethiopia. She lives in Brooklyn, NY.

BOARD OF ADVISORS

Emmanuel de Merode Ph.D., is Chief Warden of Virunga National Park for the Congolese Wildlife Authority. Illegal charcoal production using the park's forest resources poses the greatest threat to the 720 gorillas left in the wild in Congo, Rwanda and Uganda. Providing sustainable alternative biomass fuels for the communities surrounding the park is therefore a top priority. By mid 2011, Emmanuel hopes 300,000 people will be using biomass briquettes instead of wood and charcoal, and at least 7,600 people will have permanent jobs as a result of the project.

Rogério Carneiro de Miranda has 20 years of experience in the field of biomass energy, forestry, household energy and organizational development. From 1992 to 2004 Rogério has worked as a resident and visitor in many Latin American countries assessing and implementing projects for rural and urban energy development needs, and from 2005 to 2010 based in Washington, USA as senior

biomass energy expert for international organizations working in Africa and Latin America. Rogério has received multiple awards in recognition of his work, including the UK's ASHDEN award on sustainable energy, Brazil's national Home Planet award, and USAID's award of Appreciation. He has also been successful in creating local institutional capacity to modernize wood energy in different countries of Latin America, by formally organizing local biomass energy stakeholders, NGOs and SMEs to embrace new initiatives, such promoting efficient stoves and kilns, modernizing charcoal production, reforestation & forest management programs, and policy reforms.

Tuyeni H. Mwampamba, Ph.D., is a Tanzania native and UC Davis graduate currently doing post-doc research in Mexico. She is the author of an influential study on urban charcoal consumption in Tanzania and its implications to present and future forest availability. Her hands-on research also extends to Tanzania's forest carbon sequestration capacity and the implication for the carbon market, community, and forest conservation. She is presently researching payment programs for ecosystem services generated by communities in Mexico.

Alex Stojanovic is founding partner at **5H&Co** a New York City-based Urban Planning, Architecture and Design firm. Alex graduated from ETH Zurich in Architecture and has a post graduate degree in Developing Countries. Alex has lived and traveled extensively in Latin America, South Asia and Africa, and has worked on development projects in Nicaragua and India, where he studied the effects of unplanned urban habitat transformations. As an architect and urban planner, Alex is focused on exploring innovative solutions to urban design/management and ecological/economical sustainability problems.

Tim Tear, Ph.D., is The Nature Conservancy's Africa Program Science Director and has been working in conservation for 25 years. In the 80s and 90s, Tim worked in Eastern Africa on national park management in Kenya, Southern Sudan, and Tanzania. Tim joined The Nature Conservancy in 1998. From 2005-2008, Tim worked for the Conservancy's global conservation programs, leading an effort to establish conservation measures across the organization. His most recent scientific publications include evaluating the impacts of air pollution on biological diversity in the Eastern United States, improving resource management in the face of climate change, and setting objectives in conservation.

David VanLuven, is a private consultant in New York specializing in environmental fund raising, policy, and analysis. His work has focused on integrating people into biodiversity conservation efforts, particularly in the context of climate change. He has a joint M.S. from Tufts University in Biology and Environmental Policy, and a B.A. from Middlebury College with majors in Arctic/Alpine Ecology and Religion.