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Research Paper

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the Power of Entrepreneurship”

The WorldStove Five-Step Program’s Social Value-Creation

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Abstract

In this paper the mechanisms of the WorldStove Five-Step Program are discussed together with the key product, namely the LuciaStove. The LuciaStove is the first certified carbon negative clean cooking stove and provides measurable carbon offsets. In addition the bi-product of the cooking process which is the LuciaStoves primary function, is biochar. Biochar provides a wealth of opportunities in agriculture and soil conservation. The focus of the paper is on the social value created by the WorldStove Five-Step Program. The direct and indirect outcomes of the program are analyzed briefly. This paper lays the foundation for future work on SROI analysis and empirical verification of indirect social outcomes.

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1 Introduction

Clean cooking stoves have been around for a number of years, with simple models coming out in the mid-1980s, such as the first rocket stove from Aprovecho Institute (Bates, 2010, p. 132). However, despite the technology being available for clean cooking stoves since the 1980s, still 1,6 million deaths occur annually as a result of exposure to solid fuel smoke according to the World Health Organization (Perez-Padilla, Schilman, & Riojay-Rodriguez, 2010, p. 1083). Moreover, approximately 3 billion households rely on solid fuels as their principal source of fuel and solid fuel use is closely linked to poverty, hence these same households generally have poor access to health care as well (Dherani et al., 2008). Evidently there is a huge social need for these 3 billion people, to improve their health through merely being able to cook cleanly.

A number of social enterprises have recognized this social need and have been designing clean cooking stoves to be sold and used in developing nations. Bates (2010, p. 137) identifies three main competitors in the clean stove market, all of which are able to mass produce their respective stoves. The three main competing stoves are Aprovecho Stove-Tec Greenfire Rocket, Anila / Retort Stove and LuciaStove from WorldStove. Bates (2010, pp. 137-138) compares the stoves in detail examining factors from fueling and cooking times to shipping costs and manufacturing in his recently published book “The Biochar Solution”.

The purpose of this paper is to examine the unique manner in which WorldStove is addressing this social need with their LuciStove for developing nations. Particular attention will be given to the WorldStove Five-Step Program and its social value-creation. The program establishes locally run and owned stove hubs in developing nations. In addition, the fact that the LuciaStove is the only clean cooking stove that is carbon negative certified, adds a previously untapped revenue stream to assist the Stove Hub owners in establishing themselves (Mulcahy, 2010). WorldStove pledges all carbon credit revenue to the respective stove hubs and in this way is accelerating the establishment of stove hubs. Currently WorldStove operates in twelve countries and is growing rapidly (Mulcahy, 2010). As way of introductory it is useful to present a summarized overview of the WorldStove Five-Step Program.

1.1 An overview of the WorldStove Five-Step Program

In the majority of cases a WorldStove Pilot Program is undertaken prior to the launching of any Five-Step program. The objective of the Pilot Programs is twofold, on the one hand is to develop and test an adapted version of the LuciaStove for the respective region, and secondly to determine the feasibility of establishing a Stove Hub through the Five-Step Program in the respective region (WorldStove, 2009c, p. 1). The LuciaStove can be adapted to local cooking habits, hence preserving cultures and foods and in so doing respecting the people of the developing world's way of life, which lowers the barriers to adoption of this clean cooking stove (WorldStove, 2009c, p. 1).

A brief overview of what a Pilot Program involves is as follows; it should last between three to six months, with 35 to 50 stoves in the field. The following types of data should be collected from the stoves in the field; requirements and feasibility of local adoptions of the LuciaStove; monitoring of indoor air quality; health tests of people in the cooking area; locally available feedstock documentation and analysis, local soil analysis, test plots with biochar for local soil improvement. Finally a market analysis and the development of a business plan for a five step program should be undertaken (WorldStove, 2009c, p. 2).

The WorldStove five-step program has three core objectives;

- 1) To improve the health of stove users
- 2) To improve environmental conditions
- 3) To create local jobs (WorldStove, 2009b, p. 2)

A brief overview of each of the five steps in the program follows;

Step 1: A local group who want to establish a Stove Hub, organizes a building and personnel. WorldStove provides three Biucci and twenty Beaner stoves plus a small briquette press, free of charge (Bates, 2010, p. 135).

Step 2: Once the Stove Hub has demonstrated availability of all materials necessary to complete construction of 500 stoves, WorldStove will arrange for the first 500 critical components of the LuciaStove, necessary tools and a small pellet press to kick start the program (WorldStove, 2009b, p. 3).

Step 3: When the Stove Hub has demonstrated orders for stoves or fuel or having established a reliable demand for stoves, then a large pellet press which can produce 600kg per hour, will be provided to or purchased by the Stove Hub (WorldStove, 2009b, p. 3).

Step 4: To enter the Carbon Credit program the Stove Hub needs to demonstrate that they are measuring, evaluating and storing biochar (WorldStove, 2009b, p. 3).

Step 5: Once the Stove Hub has collected 5 tons of biochar, WorldStove will help the Stove Hub develop reforestation and soil restoration programs (WorldStove, 2009b, p. 4).

In order to understand how social value-creation takes place and what it entails a brief discussion on social enterprises and social value measurement theory follows.

1.2 Social Enterprises and Social Value Measurement

As Nathaniel Mulcahy so rightly pointed out in the interview a social enterprise takes a much longer time to break even (Mulcahy, 2010). Moreover it is crucial that social enterprises are for-profit alongside the core mission of social-benefit. As without profit it is difficult to sustain and increase the operations of the social enterprise and naturally the beneficial social impact as well (Löfberg, 2010). The difficulty arises when speaking about social enterprises that metrics and concepts that are generally widely published in the business press about conventional for-profit organizations are unintentionally applied to thinking about social enterprises.

A distinction needs to be made between outcomes and output of an enterprise, as outcomes are the desired level of performance, intentional effects and consequences of supplying a service or product. Whereas output of an enterprise is the actual manufactured product or service delivered (Haugh, 2006, p. 181). In conventional commerce an emphasis on economic and financial outcomes is prevalent, as these provide objective measures, but adopt a narrow view of outcomes (Haugh, 2006, p. 181). Indirect economic outcomes such as improved skills acquisition, social outcomes such as increased independence and empowerment, and environmental outcomes such as improved conservation of the local environment are overlooked (Haugh, 2006, p. 181). In addition, an individualistic economic perspective that excludes the perspective that the entrepreneurial enterprise involves multiple people and hence neglects including possible society transforming noneconomic forces. Moreover previous studies of entrepreneurship

have focused on single target groups and their associated impacts thus neglecting the multiple level impacts on the individual, local, regional and macroeconomic levels for instance (Haugh, 2006, p. 181).

Measurement is key in addressing the areas that often get overlooked, but commonly what gets measured is what gets attention. Hence, the dominance of easily quantifiable tangible outcomes, with financial and economic metrics being the most commonly used (Haugh, 2006, pp. 186-188). In order to alter this focus there is a need to measure the intangible and difficult to quantify social and environmental benefits of enterprises activities.

Social accounting is suggested as a possible method of assessing the indirect outcomes of social entrepreneurship, although it focuses on anticipated indirect outcomes and thus overlooks unanticipated economic, social and environmental impacts. Another method is to conduct regular community based audits to determine the changes in the communities' quality of life and qualitatively capture indirect impacts through the identification of trends over time (Haugh, 2006, p. 199). The drawback from both of these methods is that they require a large amount of resources, which the social enterprises who should conduct these, often cannot accommodate such methods with their scarce resources. Moreover the allocation of the scarce resources available to measuring the indirect economic, social and environmental outcomes could divert the social enterprises resources away from social value-creating activities (Haugh, 2006, p. 200). The "catch-twenty-two" that social enterprises face is that in the long term measuring of such beneficial indirect outcomes is necessary to prove their effectiveness in achieving social, economic and environmental impact to stakeholders in general, thus providing the social enterprise with legitimacy (Deephouse & Suchman, 2008).

Social return on investment (SROI) is another method that is linked to the management accounting commonly used metric of return on investment (ROI). The difference is that SROI focuses on monetizing the social benefits and costs relative to the financial costs of an enterprise's operations. The calculation is based on the net present value of these non-market impacts in monetary terms. The objective of SROI when used on an ongoing basis is to inform management of the enterprises performance with respect to social value creation (Lingane & Olsen, 2004, p. 119).

According to Lingane and Olsen (2004, p.119) “SROI analysis is the set of practices necessary to generate meaningful SROI figures and other quantified social metrics.” This includes four steps and assists managers and investors to accomplish three critical tasks, these are displayed in Figure 1.



Figure 1: Social Return on Investment Analysis and Critical Tasks supported
Adapted from (Lingane & Olsen, 2004, p.119)

The steps involve the following; ongoing collection of the social performance data; prioritization of the data that should be tracked; incorporation of the prioritized data into management decision-making and reporting; the valuation of the social value which can be both created or destroyed by the enterprises activities and then using this valuation to allocate resources optimally (Lingane & Olsen, 2004, p.119). The three critical tasks that SROI assists management and investors with are common practices in business, but with a social enterprise perspective could be described as follows. Assisting the social entrepreneur to plan and modify their business model as learning and insights into how to serve customers needs over time change (Teece, 2010, p. 187). The managing of the social enterprise is assisted by SROI in that the scarce resources can be allocated to the operational areas where the greatest social-value can be created, which improves the effectiveness of the social enterprise (Lingane & Olsen, 2004, p.119). With respect to assessing, SROI allows the social enterprise to gain legitimacy amongst investors and thereby enabling the social enterprise to take advantage of identified opportunities with investor backing (Lingane & Olsen, 2004, p.119).

It is at this point that it is necessary to discuss the research methodology followed in preparation of this paper, as a number of delimitations have scoped this paper, resulting in a full SROI analysis being beyond the scope of this paper.

2 Research Methodology

In preparing this paper a unique blend of group research and discussion with individual inquiry were followed. Initially groups were formed, ours consisting of four members. The research group was tasked with undertaking empirical research through interviews with members of the chosen social enterprise, affiliates, beneficiaries related industry players. Our group chose WorldStove as our social enterprise and a number of group meetings were conducted where research from secondary sources, primarily online, were discussed. This approach was adopted in order to speed up the learning experience about WorldStove's activities.

Contact was initially made during the Cradle to Cradle Conference in September 2010 held at the Copenhagen Business School, with Per Löfberg from Cradle to Cradle Sweden. An interview was arranged with him in Malmö. Prior to the interview the research group pooled interview questions, so as to cover a wide spectrum of perspectives.

The Interview in Malmö provided an introduction to WorldStove and useful contacts information for the founder of WorldStove Nathaniel Mulcahy. An interview was secured with Nathaniel Mulcahy, which proved to be extremely valuable for this research paper. Requests for contact details to a Pilot Project were made, but time constraints have resulted in no contact details having been provided to date.

A class presentation motivated the research group to refinement their respective research questions. After the class presentation the group divided and each member began preparation of their individual research paper. A selective literature review resembling more of a small analysis was conducted. With an emphasis of linking theoretical frameworks and constructs from the Social Entrepreneurship course to the social enterprise examined in this research paper.

Finally a number of delimitations are necessary due to the type of data that was collected. The interviews provided qualitative data and no quantitative financial data has been collected. Hence no full SROI analysis will be undertaken. Thus this paper will be

scoped to the accumulation of social value-creation outcomes of the WorldStove Five-Step Program.

This paper continues with a discussion about the fact that the LuciaStove is carbon negative and the mechanics of how that works. Thereafter various potential areas for social value creation are discussed and each of these WorldStove is trying to address in one way or another. Lastly a data analysis of the WorldStove Five-Step program is done where the direct and indirect social incomes are linked to the Five-Step Program.

3 The Carbon Negative Clean Cooking Stove

The LuciaStove's development began in 2002, with Nathaniel Mulcahy setting out to design and produce a fuel-efficient, low-emissions, biochar-producing stove that could meet the cooking needs of the poor who lacked reliable sources of fuel (Bates, 2010, p. 132). The aim was to develop a stove that could utilize biomass that could not be burnt in other clean cooking wood or charcoal stoves, and this biomass or fuel stock was to exist in abundance in the respective region. Examples of biomass were the grasses in the tropics and ground nutshells in East Africa (Bates, 2010, p. 133).

The LuciaStove has fulfilled all these design goals and more. In brief a technical description of how the stove works follows and the components of the latest "origami" LuciaStove are shown in Figure 2. The top and bottom components of the LuciaStove which are precision cut, extract the gases from the fuel part of the chamber and generate Bernoulli-principle-driven venturis to create a negative pressure, while the flame cap based on Fibonacci spiral geometry prevents oxygen from entering the pyrolysis chamber (Bates, 2010, p. 133). The design forces a clean, complete burn, with maximum carbon retention in the biochar, which is also nitrogen-gas-charged biochar that has an almost neutral pH 7 to 7,5, which makes it excellent for agricultural use (Bates, 2010, p. 133). The WorldStove Five-Step Programme and the LuciaStove recently became the first fully certified carbon sequestration clean cooking stove and offers measurable carbon offsets certified from Bios.

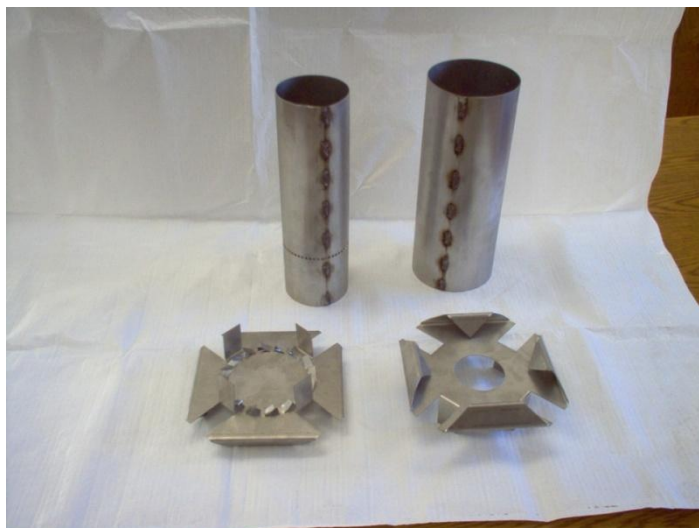


Figure 2: The components of the "Origami" LuciaStove Taken from (WorldStove, 2009c)

The simplest manner to explain how the LuciaStove is carbon negative, is through an example. Bates (2010, pp. 135-136) provides the following illustrative example;

A family that uses one of these stoves [LuciaStove] for cooking produces 300 grams of biochar per day, on average. That's 109.5 kilograms, or a tenth of a ton, per stove per year. Since 80 percent of the [bio]char will be retained in the soil more or less permanently after being charged with compost, [nearly a third of a ton, 321.5 kilograms]¹ of CO₂ is measurably sequestered per stove per year. For every million stoves, villages can sequester [321,500]² tons of CO₂ annually. Moreover, if one adds in the wood not being burned in open fires, since gasifying stoves are at least twice as efficient, WorldStove's million stoves are projected to supplant tree-to-CO₂ conversion by 38 million tons per year by 2020.

The key points here are that the LuciaStove burns biomass that is pelletized and not wood or charcoal, hence no firewood is required for owners of the stove to cook. Secondly that the bi-product of the cooking process is not ash like and open fire, but rather biochar which is rich in carbon and when added to the soil promotes microbe activity

¹ Calculation error corrected on advice from Mr Nathaniel Mulcahy of WorldStove LCC with the corrected calculations and a note about the error, to follow; "There is an error in Bates' book which you quote. I hasten to explain that the error is not the fault of Bates but in a note we [WorldStove] sent to him. In any case, when converting 87.6 tons of carbon to CO₂, the published multiplier employed is 2.86. There is an error in that. The paragraph [in Bates' book] on pp. 135 and 136 and the footnote given on p. 202 (#3), was based on only a single Oxygen in CO₂. i.e. (C=12, O=16, for total of 28; (28/12 = 2.33). We should include the second oxygen in CO₂, would give 3.67, instead of 2.86 (C=12, O₂=32, for total of 44; (44/12)/12 = 3.67), meaning 1 kg of carbon gives 3.67 kg CO₂. So 87.6 kg carbon is the equivalent of 321.5 kg CO₂ (which is from 87.6*3.67)" (Mulcahy, 2011, *Via E-mail Correspondence*.)

² Calculation error correction, see note above.

(Löfberg, 2010) as well as sequestering carbon (Mulcahy & Mulcahy, 2009). Biochar has a half life of a few thousand years (Mulcahy & Mulcahy, 2009, p. 3).

To confirm the social need is present the next few sections look at indoor air pollution, unemployment and deforestation.

4 Potential areas of Social Value Creation

4.1 Indoor Air Pollution

The World Health Organization reported that of the 1,6 million deaths resulting from exposure to smoke from open fires, 693 000 deaths are due to Chronic Obstruction Pulmonary Disease (COPD) and 910 000 due to Acute Lower Respiratory Infections (ALRI). Moreover the adverse effect to the peoples' health while still alive and being exposed on a daily basis to smoke inhalation results in 38,5 million Disability Adjusted Life Years (DALYs) which are mostly attributed to ALRI (Perez-Padilla et al., 2010, p. 1083)

Smoke inhalation “alter several mechanisms of lung defense, including the efficacy of both the mucociliary escalator and the macrophage function.” (Perez-Padilla et al., 2010, p. 1083). Exposure to biomass smoke has been directly linked to an increased severity of respiratory infections in children, with the risk of pneumonia being increased by a factor of 1,8 (Perez-Padilla et al., 2010, p. 1083).

The World Health Organization reported in 2009 that little progress has been made in reducing child mortality from pneumonia in children under the age of five years old. It is stated that in the developing world approximately 155 million clinical pneumonia episodes and 2 million deaths occur annually. Among the factors that put children at risk of developing pneumonia is indoor air pollution from cooking fires using solid fuels. Additional factors include suboptimal breastfeeding, lack of immunization and malnutrition (Niessen et al., 2009).

This confirms the dire need for clean cooking stoves.

4.2 Unemployment in the Developing World

Unemployment in the developing world is a huge problem, but at the same time difficult to quantify accurately due to the informal market and undeclared trade, hence official statistics are often skewed. Moreover depending on which economical definition one applies to calculate unemployment the statistic can easily be manipulated up or down for the respective audience. In order to provide the reader with an idea of the level of unemployment, the CIA World Factbook was used to retrieve unemployment figures, shown in figure 3, for the countries that the WorldStove Five-Step Programs are active in.

| Country | Unemployment in Percentage | Date of Statistic |
|------------------------------|----------------------------|-----------------------------|
| Burkina Faso | 77% | 2004 |
| Rwanda | Not available | |
| Democratic Republic of Congo | Not available | |
| Ghana | 11% | 2000 estimate |
| Togo | Not available | |
| Senegal | 48% | 2007 estimate |
| Afghanistan | 35% | 2008 estimate |
| Uganda | Not available | |
| Haiti | Greater than 65% | No records since earthquake |
| Columbia | 12% | 2009 estimate |
| Ecuador | 8,5% | 2009 estimate |
| Mongolia | 2,8% | 2008 |

Figure 3: Unemployment Figures for Countries WorldStove is active in
Adapted from (CIA_World_Factbook, 2010)

This confirms the need for employment generating enterprises.

4.3 Deforestation in the Developing World

Despite the rate of deforestation worldwide decreasing according to 2010 Global Forest Resources Assessment conducted by the Food and Agriculture Organization of the United Nations, where the rate has dropped to 13 million hectares per year during the period 2000 to 2010 versus the previous 16 million hectares per year in the period 1990 to 2000 (FAO, 2010). Africa had an alarmingly high loss of forests in the region of 3,4 million hectares in the period 2000 to 2010(FAO, 2010). With BBC News reporting that the rate of deforestation in Africa was at a rate 4 times faster than the world average (BBC_News, 2009).

This confirms the need for biomass stoves that do not use wood or charcoal.

5 Data Analysis

In this section the WorldStove Five-Step program will be examined in more detail, and the social value creation opportunities will be incorporated.

5.1 Step 1: Establishing the local Stove Hub

The local group who establish the Stove Hub, will introduce, demonstrate, manufacture and maintain the five step program. In addition, a small hand powered briquette mill will be used for the initial pelletization of the biomass during the initial operations (WorldStove, 2009b, p. 2). WorldStove provides three Biucci and twenty Beaner stoves plus a small briquette press, free of charge (Bates, 2010, p. 135). The Biucci are large cooking stoves designed for institutional cooking or mass catering, like for example that would be found in schools, hospitals or refugee camp kitchens, where large quantities of food need to be prepared. The three Biucci stoves together with the twenty Beaner stoves are intended to be used to demonstrate and disseminate information in the local community about these clean cooking biomass stoves, which all use the pyrolytic burning technique (WorldStove, 2009a).

“Encouraging entrepreneurship has been found to help restore a philosophy of self-help, generate social capital and promote empowerment, independence and skills development.” (Haugh, 2006, p. 182). The social impacts of increases in independence, confidence, empowerment, community unity and trust-base in the community has a positive knock-on effect within the community and increases the optimistic sentiment and future business confidence levels in the community (Haugh, 2006, pp. 196-199).

Haugh (2006, p. 199) refers to an example provided by Amin, Cameron and Hudson in a study of the impact of a social enterprise on participants in it, by doing interviews before the establishment of the social enterprise where participants expressed “bitter [sentiments] and perceived themselves as victims” and then three years later the same participants were interviewed and their sentiment had changed to being “positive and forward looking”. This is a supporting piece of qualitative information for the Five-Step program and its core value of local job creation.

5.2 Step 2: Build a factory for stove assembly

Once the Stove Hub has demonstrated availability of all materials necessary to complete construction of 500 stoves, WorldStove will arrange for the first 500 critical compo-

nents, necessary tools and a small pellet press to kick start the program (WorldStove, 2009b, p. 3). At this stage the Stove Hub will be assembling LuciaStoves which have been designed to be shipped as flat precision precut pieces of metal sheeting and assembled locally by the Stove Hub. While demonstrating the newest design of the Lucia Stove at the Globe Forum in Stockholm in July 2010 Nathaniel Mulcahy likened the assembly process of the LuciaStove from the precision precut sheet metal pieces to origami, as all pieces can be bent into shape using simple tools (GlobeForum, 2010). The sale of the assembled stoves provides the Stove Hub with cash flow to enable it to become self-sustaining and perpetuating (Mulcahy, 2010).

Stove Hubs contribute to local economic development and have knock-on effects through encouraging the addition of new enterprises to the economy resulting in further employment, income growth and increases in tax revenue for local authorities. Indirect economic outcomes of established Stove Hubs include raised skill levels of the local population and the increased circulation of money locally. Social benefits arise from the improvement in the supply of cooking fuel and access to clean cooking for the local community (Haugh, 2006, p. 182). The creation of new local enterprises also shows motivation effects; exposing people to enterprise opportunities, while building trust-based networks within the communities through collaboration. Moreover the amount of interaction and transactions in the community increases and an empowering effect is created within the community which exerts greater levels of self-determination and control amongst community members (Haugh, 2006, p. 182).

5.3 Step 3: Scaling Operations Up

When the Stove Hub has demonstrated orders for stoves, fuel or has established a reliable demand for stoves, then a large pellet press which can produce 600kg per hour, will be provided or purchased (WorldStove, 2009b, p. 3). At this stage additional buildings or sheds will be required for biomass storage and drying as well as storage of the pelletized biomass (Mulcahy, 2010).

5.4 Step 4: Biochar Collection and Fuel Supplies

To enable the Stove Hub to be able to grade Biochar, a small lab is established which allows for weighing, cataloging and grading of the biochar produced by the local community with their LuciaStoves (WorldStove, 2009b, p. 3). To enter the measurable Carbon Credit program (Measurable_Offsets, 2010) the Stove Hub needs to have accurate

bookkeeping, so as to stand up to inspection and verification of the quantity and quality of biochar produced (WorldStove, 2009b, p. 3). The grading of the biochar also allows for it to be appropriately applied as a soil amendment to increase the fertility of the local soils (WorldStove, 2009b). As Nathaniel Mulcahy explains during the Globe Forum in Stockholm, artificial chemical fertilizers have extremely prescriptive application instructions that the farmers need to follow in order to achieve the yields possible with the artificial chemical fertilizers, and the same prescriptive instructions and guidelines need to be developed for biochar application to ensure that the improved crop yields can be achieved. To achieve these guidelines he applauds the current field tests being done (Löfberg, 2010) and calls for more research into the application of biochar as well (GlobeForum, 2010).

A number of methods of fuel supply acquisition for the owners of the LuciaStoves are suggested. Simply purchasing the pellets is an option or alternatively a barter or community cooperative exchange, like for example 2 kg of biomass is exchanged for 1 kg of pellets can be established with the Stove Hub. It is important in all these arrangements that the costs of producing the pellets are covered to ensure the financial viability of the Stove Hub (WorldStove, 2009b).

5.5 Step 5: Reforestation and soil restoration programs

Once the Stove Hub has collected 5 tons of biochar, WorldStove will help the Stove Hub develop reforestation and soil restoration programs (WorldStove, 2009b, p. 4). These programs will be done in conjunction with partners of WorldStove such as the International Biochar Initiative and local organizations involved in reforestation and soil restoration (GlobeForum, 2010).

The direct and indirect social outcomes from Haugh's (2006, 196-197) Outcome Indicator framework, have been used to build the analysis in this section.

| Outcomes | Individual | Enterprise | Community | Region |
|------------------------|---|---|--|---|
| Direct Social | Increased access to services | Creation of cultural identity of the enterprise | Provision of services | Provision of services |
| | Improved quality of life | | Contribution to social capital | Contribution to social capital |
| Indirect Social | Increased; confidence, independence, satisfaction, empowerment, self-esteem, networks | Opportunity for social interaction | Community Vibrancy; independence, empowerment, self-determination, cooperation, social interaction | Regional vibrancy |
| | | Organizational networks | Involvement of community in activities | Increased attractiveness as a place to live, work and visit |
| | | Inter-organizational trust | | |

Table 1: Social Outcomes of Entrepreneurship.**Taken from (Haugh, 2006, p. 196)**

As the direct social outcomes for individuals have been linked to the establishment of a Stove Hub and through the usage of a LuciaStove. The Enterprise outcomes are achieved as the Stove Hub is locally owned and run. The Community and Region outcomes are serviced through the provision of clean cooking and improved health of the communities in the region. It can be argued that the individual indirect outcomes will also be achieved through the encouragement of local micro-entrepreneurs to start Stove Hubs, but more empirical research would be required to verify this. The fact that the Lucia stove is adapted to the local cooking habits and traditions will allow for the achievement of the indirect community and region outcomes. Finally with the establishment of more Stove Hubs in neighboring communities the indirect enterprise outcome could also be achieved.

6 Conclusion

Future research most definitely needs to be undertaken to conduct a full SROI analysis and the social value-creation outcomes presented in this paper should assist that analysis. Further empirical research to confirm some of the indirect social value creation outcomes is also required. A case study on the development of an established stove hub would also prove valuable for social enterprise research and also for WorldStove's future endeavours.

In conclusion a number of social value-creation examples have been illustrated in this research paper with linkages back to theoretical social entrepreneurial metric development literature. It has been shown that the WorldStove Five-Step Program has an approach that when successfully implemented in each respective established stove hub, by the local owner and operator, that the three core goals namely; to improve the health of stove users; to improve environmental conditions; to create local jobs (WorldStove, 2009b, p. 2) will be achieved.

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Appendix

Notes from an informal discussion with Per Löfberg

Strategy Consultant of Vagga till Vagga (Cradle to Cradle Sweden)

Location: Malmö, Sweden

Date: 13th October 2010

Approximate duration: 1 hour 30 minutes

Interviewers: Charles-Edward Jackson, Sofia Vilá and Trevor Surridge

Introduction of the team, the research project idea and task assigned i.e. the research paper took place prior to the noted questions and answers below.

Question (Q): What is Cradle to Cradle Sweden's relationship with WorldStove?

Answer (A): Cradle to Cradle Sweden is currently negotiating and working out the details with WorldStove to become a representative of WorldStove in Sweden and thereafter have the right to sell some of WorldStove's products in the Swedish market. Currently the relationship is based on trust, but formalization of the relationship will be forthcoming in the next few weeks, as it is important to know how we [Cradle to Cradle Sweden] are to formally represent the relationship, when speaking to external organizations as a WorldStove representative.

Q: Is the motivation to form this relationship with WorldStove a personal one or is the entire Cradle to Cradle organization wanting to form a partnership with WorldStove?

A: The partnership will be between Vagga till Vagga and WorldStove, ...

My colleague Mathuis [] in Stockholm, was the first to hear about WorldStove and he began thinking how the whole Biochar possibilities fit into the Cradle to Cradle perspective. He made a very clear connection, as in Cradle to Cradle, waste = food and hence everything is seen as a nutrient. He extended this view to Carbon, which is looked upon as problematic, but there is nothing wrong with Carbon in itself, it is just in the wrong place. The carbon should be in the earth [soil] as that is where it does good.

...Vagga till Vagga has a slightly different relationship with Cradle to Cradle in Germany, whereby Vugge til Vugge [Cradle to Cradle Denmark] is formally a branch of EPEA and part owned by EPEA, Vagga till Vagga [Cradle to Cradle Sweden] is completely independent and a satellite partner. Which means we represent EPEA and function as a sales channel for their expertise and consultancy services in the projects that we are involved in, but they do not own us and do not control what we do. We have chosen this structure as we feel that we have a somewhat different style of working in that the Swedish business culture is different from that of the German business culture. Germans like a top down control and Swedes like consensus. In addition, by being independent we as Vagga till Vagga have the flexibility to get involved with organizations such as WorldStove.

We also work closely with an organization called The Globe Forum, was started by one of the founding members of Skype, and believe in community based solutions. We have been working with them to build an innovation platform which has been moving more and more towards "green" innovation. The aim is to build something like linked-in or facebook, but for sustainable innovation. Where innovators can be easily seen and can connect and get into contact with each other, clients, cities and governments. To act as a virtual meeting and market place platform, which is then supported by large conferences that The Globe Forum holds, they have had one in Stockholm, Gdansk and the next one being in Dublin on the 17 to 19th November 2010.

Through Globe Forum we met an organization in Bangladesh called The Bright Green Energy Foundation, which is run by a man named Dupal [did not hear last name], the right hand man of Muhammad Yunus [the founder of the Grameen Bank]. The Bright Green Energy Foundation's goal is to electrify rural Bangladesh, through solar cells and panels. And they have a huge distribution network, with about trained 1000 female technicians to install solar cells. When we met them and heard about their work and knew WorldStove and their work, we realized that if we could get the two organizations talking there could be huge potential in a partnership. As if such a program could sell carbon credits in the carbon market to support the financial viability of it, and The Bright Green Energy Foundation bought stoves from WorldStove and set up Stove Hubs in Bangladesh, a potential of 50 million stoves could be used in Bangladesh, when the population size, amount of agriculture residue is all taken into account. Such a program could have a big positive impact. This is still in the planning stage and dream stage, but this is the direction in which we are thinking.

Q: Does this fit into the Cradle to Cradle concept, where waste = food, cause you burn biomass that produces the bi-product from the burning process, biochar, which goes into the soil and produces food, cause it increase soil fertility, have I understood this correctly?

A: Yes exactly, and most of the carbon stays in the soil and so it becomes a carbon sink. Such stove programs can have a large impact in sequestering carbon, as if there were a million stoves

in use every day, they would produce accumulatively a lot of biochar. And there is the associated health and economic benefits as well as not needing to cut down trees for firewood.

Q: Quantifying the carbon credit is always difficult in the case of trees not cut down versus trees being newly planted, your thoughts?

A: It is difficult, but possible. It is planned to have carbon credits or verified emission reductions (VERs) available for sale to participants of the COP16 in Cancun to offset their carbon footprint and will be sold by UNCCD to support stove programs.

Q: With respect to a Pilot Program, from beginning to end, would you be able to give us an idea of what process take place in a developing nation setting?

A: Well I have not personally been involved in a Pilot Program yet, but from what I do know. The first thing that needs to exist is a local recipient or local institution that will take charge of the Stove Hub. And then financing of the pilot program, which is in the region of €25 000, needs to be sourced. As a pilot program means that WorldStove sends a team to the respective country, where they look at a couple of things; what kind of fuels are available; what kind of institution would they be working with locally and how they are functioning locally; what are the local cooking habits; and then I am not sure if it is done in the pilot program stage, but also what kind of agriculture could the biochar support. So the main things to look at are the available fuels and the cooking habits.

Q: Who is actually doing all of this?

A: That would be the team from WorldStove.

Q: Does WorldStove choose these institutions?

A: No the institutions approach WorldStove and in the Senegal example the government approached WorldStove and wanted a stove program, and I assume chose the respective institution to run the program.

Q: So it is social entrepreneurs and institutions that take the initiative and approach WorldStove and not WorldStove seeking out possible projects?

A: I think in Haiti, WorldStove got involved as it was needed and they felt so strongly about helping after the disaster. WorldStove initially started on their own and the received help while on the ground at a later stage.

Q: Do you know how large WorldStove is, in terms of employees?

A: No exactly, there are 10 to 15 people working at WorldStove and they will grow. They recently hired another person and invested in new machinery. They recently got a machine that can produce 8000 stoves in 40 hours.

Q: What are the differences between the LuciaStove and other clean cooking stoves?

A: There are other clean cooking stoves available, one famous one is called the Rocket Stove, but it uses wood as fuel. So I would say that the LuciaStove is fairly unique as you can not burn wood or charcoal in it, which is the whole point, as it burns pelletized biomass. And the fact that the LuciaStove can be adapted to the local cooking habits, as was done with the adaptation of the LuciaStove for Mongolia. Where sheep droppings are used as the primary fuel. In addition, the stoves need to be adapted to different temperatures and cooking times, as people cook in very different ways around the world. There are also other customs that need to be respected, I

forget in which country it was, but woman met around the fire and socialized around the fire, while feeding it with firewood. And these types of customs that are part of the peoples' daily routines and social environment need to be respected.

This is an important lesson to learn to adapt the stoves to suit the peoples' cooking habits and customs. As when they were in Haiti, they had 30 stoves during the pilot out in the field there and came back after a month of two, and they could not even find them, and then they found two and they were being used as flower pots. And then they hired an anthropologist and realized that you cannot try to adapt people after the stove but rather should adapt the stove after the people. And they started to do that.

Q: How long are these pilot programs?

A: Usually a couple of weeks, I believe.

Q: And the role of the pilot project is to identify the local NGOs and organizations?

A: Well the an important role is to actually begin to cook with people to show how the stoves work and to understand how they cook. So that enthusiasm is created and people realize the savings that can be made on firewood and time and then begin to want a stove as well.

Q: These hand presses for the pelletization are these to be in each household or a central locations?

A: No these need to be in a central place, namely the Stove Hub. As you need to have a place for assembly of the stoves and storage of the biomass.

Q: Do you know the cost of the LuciaStove in comparison to other stoves?

A: I am not sure about other stoves. The LuciaStove is basically shipped as sheets of metal, that can be bent in a similar type fashion to origami and today they cost around €35, but with the new production capacity, they hope to decrease the cost to around €20.

Q: When the stove hubs get big enough, besides the two components that require the high technology precision cutting, the.....

A: Those two components are not needed anymore, with the Origami LuciaStove. As all the components can be bent and folded out of the precut flat sheets of metal. The previous LuciaStove had the two high tech components, but this is a new development in design and will bring down the price of the stoves further.

Q: So there are no more specialized components?

A: Not anymore, you do not need an injections molder or laser cutter anymore.

Q: Has there been a drop in the efficiency of the new design.

A: I am not entirely sure, there may be a slight decrease in efficiency, but the price reduction is a crucial factor in developing nations.

Q: So is production ultimately aimed to be located locally when the demand is large enough?

A: Yes the ultimate goal is to have the LuciaStoves produced locally.

Q: Currently all production is based in Italy?

A: Yes that's right. The way that it is designed is just so simple, as it is simply sheets of metal, which are then assembled locally. This allows for easy and cheap shipping as the sheets of metal are flat and this is where the ingenuity lies. This Nathaniel has managed to achieve as he has a mass production background from his previous work experiences.

Q: Besides the LuciaStove WorldStove produces other stoves as well?

A: Yes they have larger stoves for institutions and other stoves too. Recently they have developed a PQ stove, not sure why it is called that, and this can actually produce electricity.

Q: Which market would that be aimed at?

A: I am not sure to be honest.

Q: Are you involved in the Mali WorldStove project?

A: Currently Vagga till Vagga is not involved in any stove programs, but we have great interest in Mali and West Africa with a network of six West African countries, that are now approaching the Danish Foreign ministry and other organizations. And they want to support small and medium enterprises that wish to produce energy in the country side, as all the aid work has left them out. And these small business need support and the LuciaStove program would fit in perfectly and these small businesses need to start happening. In West Africa south of the Sahara it is just a mess and problematic [economically and socially, due to the high level of poverty].

Q: So the production of the LuciaStoves locally and setting up of hubs, maintenance and son on would be the small business, business?

A: Yes exactly.

Q: And the carbon credit angle provides another source of income, which then makes them sustainable and able to survive long term?

A: Yes.

Q: So they would generate income from selling pelletized biomass versus selling charcoal?

A: Yes for example as well as selling the stoves obviously. And here they could perhaps connect to a micro-finance institution to finance the stove purchases for people. And there is a business case there as people actually spend quite a lot of the little money they have on fuel today.

Q: Will initial areas of focus be those where firewood is scarce?

A: Yes, drier areas would be more suitable for initial focus.

Q: There has been some critic of biochar by BioFuelWatch for example, who believe that promoting biochar production is not a good idea, as people will begin burning everything and changing it to biochar. They also use charcoal and biochar interchangeable, which I understand to be incorrect, so how do you think the distinction should be made to people in Asia and Africa and other developing nations between biochar and charcoal, as both look so similar?

A: That is difficult, it needs to be demonstrated that the biochar will increase soil fertility, as seeing is believing. Although people could burn biochar in a similar fashion to charcoal, but through education it can be shown that the biochar does much more good when placed back into the soil.

In the developed world, like Sweden for example, the people working to promote biochar, believe that the farmers are going to be the engine behind widespread adoption of its use.

Q: Does biochar alone improve soil fertility?

A: If you just add the char to the soil, then the yields will actually go down in the first season, as the char soaks up moisture. So you need to soak it in urine or mix it with other moist soil or compost to avoid this. As it [biochar] is simply the structure of carbon with very fine pores, hence it soaks up moisture to begin with and then as microbes start to live there the interaction between the microbial life and the soil and the plants begins to increase. I think that if you prime the biochar by mixing it with compost and urine you will not see this decrease in yield in the first year. It is important to apply the biochar correctly to avoid yield drops.

Another issue is that of land ownership, as if you own a piece of land it is in your best interests to build good soils, but if you do not own the land and are not sure if you will still be on it the next year there is no motivation to do the extra work and add things to build the soils. Then maybe you would turn to artificial fertilizers which involve less work.

BioAgridor here in Sweden has finished trials with biochar, off the east coast, where the soils are very bad, where they had lots where they put 1, and then 2 and then 3 kilograms per square meter of biochar. The resulting growth of the plants was almost a linear progression with like 10, 20 and 30% increase in the various lots [approximately].

Q: For our research there are different angles that the team are interested in, like the alliances angle, can you answer anything in that direction?

A: I can give you Nathaniel's email address and you can try and contact him, I am not sure if he will have time to reply to you. And the International Biochar Initiative would be a good organization that is pretty approachable and could give you a good overview of how WorldStove fits into the biochar picture.

Interview Notes from a Skype discussion with Nathaniel Mulcahy

Founder of WorldStove LLC

Location: Nathaniel in Italy and Trevor in Copenhagen

Date: 4th November 2010

Approximate duration: 40 minutes

Interviewer: Trevor Surridge

please note that some parts have been purposefully omitted confidentiality reasons

After introductory pleasantries the interview begun;

Nathaniel Mulcahy (N): what is the scope of your research paper?

Trevor Surridge(T): we are writing it for a social entrepreneurship class and we were asked to try and find an organization that had something to do with social entrepreneurship or social enterprises.

N: that is exclusively what we do. One short definition for social entrepreneurs is that the turn-around time before starting to make a profit for social entrepreneurs versus regular entrepreneurial existences is much longer, so much longer that when I went to go and try pay my taxes for the first 8 years the government and my tax consultant asked me “why are you not classifying yourself as a Non-Profit, because you are clearly not making any”. Many people ask “Why be a social entrepreneur when you could be a Non-Profit, where you could take advantage of the many tax deductions”. There are many good reasons;

1. I work in 11 countries and the time it takes to get registered as a business versus getting registered as a non-Profit is dramatically shorter.
2. The money that I put into set up the business, I do not own the business all the businesses are locally owned, and I just put in money to help start-up, the cost of the permits to get registered as a Non-Profit equal or exceed the costs of setting up the business

T: so that is a competitive advantage then...

N: ...the other reason is that the local businesses need this [to be registered as a business] to make a profit. As WorldStoves main objective is not making stoves even though we are called WorldStove our absolute main purpose is to create local jobs that are self-sustaining and self-perpetuating. To do that we essentially make tiny factories where ever we go. Our smallest factory is in Burkina Faso it is also our oldest factory, it will be going almost 4 years now, they just make 500 stoves a year, just a small amount, but it is consistent and steady and it is self-sustaining, they have never received not even 1 Euro of aid.

T: excellent, from an outsiders perspective it is difficult to understand and gauge exactly how WorldStove is structured from a human resources slash organizational perspective, from what I gather from the website, you do pilot studies to gauge the feasibility of the respective country along with the local partner and then facilitate with knowledge the establishment of stove hubs in the countries, but how is WorldStove structured from an organizational perspective?

N: very easy to explain, we are essentially two offices [one in Italy and one in the United States] and three large manufacturing facilities. We have a core group of 9 people, then we have representatives which are now coming on-board in different countries. But the representatives do not count as such as the core group, which could be seen not as board members but rather as a co-

operative [the core group of 9]. Each of the 9 members importantly has non overlapping skill sets, this is extremely important. For example the closest overlap is between me [Nathaniel] and Mr *Service* who are both engineers, but his engineering specialty is very different to my engineering specialty. Other than that there is no overlap. We have people that specialize in economics, micro economic development, experts in Micro- finance, forestry, soil sciences and carbon trading.

The point is by not having overlapping skills we do not step on each others toes, but it makes it very easy when a task comes to say which member has to do what.

T: with your [WorldStove] current workload and growth are the 9 members coping?

N: ja, I think the only one which is really stressing out is me, because I have to approve or disapprove new projects and that takes a lot of time, but for the most part the fact that we don't act as a large multi- national factory, we act as a facilitator to help small factories start, that everytime it is the same cookie cutter thing, we go in, only after we have done the pilot program and then between the pilot program and starting the business the local partner is required to provide, a specific list of things, tools, buildings, personal, once we see that they have everything necessary to go forward then one of and up to four of our team members go there and get the whole thing started. So it is really becoming much much more linear. The start-up [of WorldStove] with product development which was almost a decade ago was very hard. But now that we have a series of very well defined products that have all passed life testing, that have all gone through the same procedure that I used to apply when I was a Director at Emerson, when I was the Director of Research and Development at Emerson, we had very strict approaches to new product development, and what I did, and I saw this as being one of the real weaknesses in a lot of the social enterprises things, is very few of the social enterprise people view it the way you should view large scale industry. So I applied my background from large scale industry to social enterprise. Where every product is not designed just to be a nice stove, but designed specifically so that you can produce a million stoves at a time. Or as the "P" says we have designed it so we can produce 15 million stoves a year if necessary. That is our absolute top production rate, we can not do more than that right now. At that rate that is still not so bad.

T: if your can capture a market size or that amount of people to absorb that amount of stoves then you are doing exceptionally well!

N: ... there are 2,5 billion people who cook on three rock stoves every day!

T: from reading I have seen that there are other clean cooking stoves out there and although they do not work in the same fashion as the Lucia Stove, media has a tendency to lump all clean cooking stoves together, do you have a strategy to communicate the Lucia Stove's differentiation and how

N: I can give you a sneak preview of an unfinished video that communicates that well, cause in my spare time I enjoy putting together little videos...

T: yeah I have watched quite a few of you videos on youtube

N: ...it is remarkable how much these little videos do to assist the business, because we are in a modern world, and what social entrepreneurs need to understand is that this is no longer the 1900s, and unless you use all the tools that are available to you, you are not going to communicate to the people who most need it. Twitter I mean it is a task to remember to do at least two or three tweets a day, it is a task to do the Facebook updates, but it is absolutely, fundamental. The video is not finished yet, so please do not forward it to anyone...

T: no worries, it will be treated in confidence

N: Let me give you another piece of information which helps us differentiate us from other stoves. We are the only worlds carbon negative certified stove. Which means that we are now a recognized carbon offset.

T: excellent, that is very very valuable

N: Trevor, I can tell you it is a double edged sword, because while it is meant, what this means is, since we pledge 100% of all the carbon credits earned to the individual hubs, we keep none of them, absolutely zero, for one people say again, “why are you not a non-Profit” the answer is by doing it this way it allows the individual stove hubs to be self-sustaining faster. That's the objective.

T: you yourself and WorldStove need to make money to sustain your operations, and if it is not through the Lucia Stove program, how do you generate income?

N: We do generate income. We are certainly growing, but let me answer your question about how we actually make our profit. Which I think is a key question, as a social business is certainly not going to work unless you actually make an income off of it. Now there is income that comes into world Stove, 80% of and this is answering your last question at the same time, 80% to 90% of the entrants which come into World Stove go into facility expansion and equipment development. So everyone who is in our small team we get very very small salaries. We do not make the money that comes in we get a small percentage of that. My monthly salary is something that is rather shockingly low. But I am pleased with it, as it means that the majority of the money is going into expanding the production facilities. I mean up until recently we were only able to make a few hundred stoves a day, by expanding the production techniques and modernizing our equipment, we can now make 10 000 in a day, which just two weeks ago was 8000 every 40 hours. So we have gone from a couple hundred a day to 8000 in 40 hours to 10000 a day.

T: And are you producing at that capacity, is the demand there?

N: Occasionally we produce at that capacity, so what happens then, I follow very carefully the metal costs, for example in January Stainless Steel cost €3,40 per kilo, and for the past five years every October there has been a dip in the cost of Stainless Steel, where I was able to get it for just under €2,00 a kilo. So I pre-purchased an enormous quantity of it, and quickly ran through the production rate that I needed. Because if you produce only a few hundred stoves, the highest cost of production is the setting up of the machines. Once that is done every extra set of hundred stoves that you do drives the set up costs down, if you pass 4000 stoves the set up cost becomes null, so at that point the final cost of the stove starts to drop as well. So then I am able to reduce the final cost of the stove by as much as 40% by doing the economy of mass. Which is what all other stove programs do not take into consideration. They look at it artisianally, so what we have done is we have done a hybrid, we are the hybrid company, which is half very modern production and half artisianal. So by doing the large scale production we can keep the quality very very high and keep the costs low, while at the same time still ensuring the creation of 1000s of artisianal jobs, assembling the stoves locally. To give you an idea of the other added importance of that, if I were to make, now you saw the picture of the one Lucia Stove, the red one made in Haitii?

T: yeah

N: We did this just as a demonstration as people said why should we buy pre-cut metal bits from the outside and bring them in when we could make them all here. We got our most skilled metal workers to do it, the end result was a stove which had 30% lower efficiency, 40% worse emissions, and cost 10 times the cost of the pre-cut stoves. Because labour became the highest factor not materials at that point.

So by doing it this way we can provide the ideal harmony between mass industrial and artisanal. And so it is a completely new model and we are getting a lot of praise for it, because it meets both the individual small, I mean if you think about it in Ghana the small factory is in a village the size of 300 families. You know, miniscule, and if they were to produce stoves there, or the when in Burkina or Haiti, they would never be able to produce them for as lower cost or as higher quality as we do by going large scale. But at the same time we are doing all the savings of shipping because we, by sending in pre-cut bits we don't pay import taxes because we are not sending a finished product, we are sending raw materials. We also save on shipping cost by volume because in a stack that is 10cm high I can send 50 stoves. For the cost of say the Stove-Tex stove or the Apa Metro Stove, for the cost of shipping 2 of those I can ship 50 [LuciaStoves].

T: there you go that is where your model out strips other models

N: I think the reason we outstrip them is because we create local jobs. And cut the ties to permanent need for aide. Because if you make a stove in China and sell it in Africa, people will need supplements to buy it.

T: As time is running out I just want you to touch on two other areas, one would be if we could get a possible contact with someone that has been involved in a past project of yours, as one of the group members wants to write on a pilot project, so if it were at all possible to talk to someone that has been involved in one, that would be great.

N: I would be very happy to do that, I will put you in touch with, I think I know exactly the right person to put you in touch with, she is, for one her English is excellent, so you do not have to learn any Swahili, and she also is just an absolutely lovely person, and so let me ask her first just out of privacy issues and if she is ok with me giving you her direct contact information, then I will do so.

T: Excellent, thank you. How does the funding of the Pilot projects work, as I understand the funding for the pilot project is driven by the person who wants the pilot project

N: Not always, there are a couple of models that happen, now that we are carbon offset certified and because we pledge 100% of the carbon credits to the local stove hub owners, a lot of hub owners will pre-sell their carbon credits to somebody to self-finance their pilot programs and stove hubs.

T: We saw in the news during the last month or two, the huge amount of money being pledged to clean cooking stoves by the US administration and then...

N: 52 million and then the more than doubling it from the Shell Foundation

T: is any of that funding accessible to WorldStove for grant purposes or...

N: ...I am sure it would be, it is quite possible, but realistically I have much more faith in small business, than I do in big business. In 4 months in Haiti I saw the only real good being done by the small groups, the large groups used money at a tremendous rate and got nothing done. So I am sure that the 52 million that Hillary Clinton promised, is certainly going to spark quite a lot of feeding frenzies. Without being to cynical, the United States has pledged 1,1 billion to help Haiti and not on penny of that has yet been delivered.

T: Yeah that is always what I too worry about when discussing such things, the money gets pledged, but when does it actually arrive...

N: ...yes, so if that money arrives we would be happy to use it in a positive way, but we are certainly not going to spend time looking after it [pursuing the pledged money]. As what I can do in one day is more productive than an entire week of grant writing will ever do. So I would rather get things done than run around to foundations with my hand held out, and so far I am in my tenth year of the stove business and I have never received a grant or foundation funding of any form.

T: ...to start a hub would a person just have to follow the guidelines and procedures that are online on your website

N: Absolutely and we schedule them on a first paid first funds / comes basis, so as soon as your pilot program is ready you have a location, you have a local partner, you have permits because in some countries you will be required to have permits, once that is all in place, we will schedule your program and get it started.

T: is it only one program per country or the more the better

N: no no, as many as you want, especially again cause you have to think about the environmental impact. The advantage of biomass is its low cost, the disadvantage of it is its low value, when you exceed 50km you have gone beyond the value of the biomass. As long as you are within a 50km radius of someone else there is no conflict there, and the business can continue very nicely. As long as you are in the country and you coordinate with the other stove hubs and you come up with a country wide price, then we are ok with it.

T: lastly is WorldStove hiring in the future

N: If you are prepared to stay for some time in a location, then we would be interested, we will also be looking for someone early next year to follow up on some of our field work. So if you are prepared to travel a lot then there are opportunities as well.

Time ran low and interview was brought to an end, with an offer from Nathaniel at the end of the interview of:

N: When your paper is done, if you would like we could put a copy of it in the download section on the WorldStove website.