The Renaissance Project: Made In Haiti

One step on our road to switching one billion people from cooking with solid fuels to LPG – A Cooking For Life Case Study

LPG
EXCEPTIONAL ENERGY

Haiti is one of the poorest countries in the world. Three-quarters of the population live on the equivalent of US $2 or less a day. The poorest 20% of the population hold less than 1% of the country's total wealth. Therefore, very few people can afford the equipment that a transition to LPG requires.

A successful programme to grow the LPG market in Haiti requires some form of financial support to help end users overcome the first-barrier-costs that make using LPG prohibitive to most Haitians. Following the hurricane Matthew and the damage it caused to the infrastructure and livelihood of the country, the global LPG-industry decided to act.

This case study analyses "The Renaissance Project", its positive effects on Haitian society and environment, as well as the challenges and obstacles that have to be dealt with.

A WLPGA case study for Exceptional Energy
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1. Executive Summary

After the devastating hurricane Mathew in October 2016, which happened to be the most powerful hurricane Haiti had seen in decades, hundreds of thousands of peoples livelihoods were impacted.

As the natural disaster deprived many people of dry wood or charcoal to cook with, they were in need of an alternative fuel and this is where LPG can significantly improve the conditions for the Haitians: it offers a safer, cleaner and less time-consuming alternative to other commonly used fuels.

However, the market situation of LPG and the economic and social framework conditions in Haiti pose a massive obstacle to the large-scale introduction of LPG. While financing the gas itself over a longer period of time is possible, many people cannot afford to invest in the basic essential equipment.

During the 29th World LPG Forum and the 2016 AEGPL Congress in Florence, representatives of the LPG industry decided to become active. A proposal called “The Renaissance Appeal” was launched, to equip 40 schools with efficient LPG stoves and to establish a market in Haiti.

“The Renaissance Project” is not an initiative of the WLPGA itself, but a project of SWITCH S.A., a Haitian-based WLPGA member, with the financial support of stakeholders in the LPG industry.

Cooking with biomass such as wood, charcoal or animal waste produces harmful gases like carbon-monoxide, which are proven to reduce life expectancy significantly.

SWITCH S.A. is an innovative and dynamic commercialisation company aiming at promoting the substitution of wood and charcoal for LPG in Haitian households.

WLPGA collaborated with SWITCH S.A. and acts as the mediator between the donors and key stakeholders. However, conversion to LPG depended on the financial support of the participants of the 2016 World LPG Forum in Florence, Italy.

The goal of the WLPGA is, to promote the popularity and the demand of LPG as an alternative source of clean energy and to help rebuild and improve Haiti’s energy-consumption. In order to do so, 15 companies are financially supporting the conversion of 25 schools.

This financial support facilitates the improvement of the conditions under which meals in schools are prepared as well as the decrease of exposure to toxic gases emitted while cooking over open fire.

The success of the campaign will result in the preservation of thousands of trees per year due to the reduced use of charcoal, improved indoor air-quality and therefore reduced fatalities caused by indoor air pollution.

2. Conditions in Haiti

2.1 Haiti's burden of continuing disasters

Haiti has had to endure many great disasters in the past ten years. The country has yet to recover from the 2010 earthquake and a massive cholera outbreak, caused by seepage of cholera-infected waste from a "Mission des Nations Unies pour la stabilisation en Haïti" (MINUSTAH) peacekeeping station.

The 2010 earthquake was reported to have left up to 316,000 people dead and 1.6 million homeless. Later reports found these numbers to be heavily exaggerated, and estimated the death toll between 46,000 and 85,000. However, Haiti is still struggling with the reconstruction of infrastructure and housing.

October 4th 2016, Hurricane Matthew made landfall near Les Anglais in the south western part of the island, making it the worst hurricane to strike the nation since Hurricane Cleo in 1964. The death toll was approximately 3,000. The storm brought deadly winds and rain which left Haiti with massive damage. Thousands of people were displaced due to damaged infrastructure. Additionally, the number of people infected with cholera continues to spread beyond the control of officials due to continuous flooding after the storm.

The storm also caused damage to health facilities and roads which inhibited medical help and resource distribution. The devastation that Hurricane Matthew caused was unpredictable and left Haiti in a state of emergency and humanitarian catastrophe.

With most of the resources in the country destroyed, Haiti received $120 million in aid from the United Nations.

2.2. Haiti's Government

Since Haiti achieved its independence, it has suffered 32 coups as well as a slave revolution. The repeated interventions of the United States, France and other western countries have left the Haitian government extremely unstable. In January 2011, one year after the earthquake, Oxfam published a report on the status of the recovery. According to the report, relief and recovery were at a standstill due to government inaction. The growth of Haiti's economy slowed to below 2% in 2015 and 2016 due to political uncertainty, which caused foreign, public and private investments to decline. The absence of a regulatory framework inhibits foreign investment and therefore economic development. The energy sector is no exception.

2.3 Haiti's Economy

Despite having a viable tourist industry, Haiti is one of the world's poorest countries and the poorest in the Americas region. Corruption, poor infrastructure, lack of health care and education are among the main contributing factors to this poverty.

The economy shrank due to the 2010 earthquake and the subsequent outbreak of cholera. Haiti ranked 145 of 182 countries in the 2010 United Nations Human Development Index, with 57.3% of the population being deprived in at least three of the HDI's poverty measures.

The World Factbook reported a deficit of skilled labour force, saying *"*more than two-thirds of the labour force does not have formal jobs." Moreover, it is often stated, that three-quarters of the population lives on $2 or less per day. In fact, wealth distribution in Haiti is extremely unequal, with the richest 20% of its population holding more than 64% of its total wealth, while the poorest 20% hold less than 1%.

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WLPGA with its global membership and footprint works to incentivise the growth of LPG markets around the world serving as the backbone, support and catalyst to the improvement of LPG industries.

2.3 Living Conditions

Haiti has an estimated 10.6 million inhabitants, making it the third-largest country in the Caribbean in terms of population. Port-au-Prince, the capital and the biggest city of the island state, has roughly 1.3 million people with a further one million living in the peri-urban sprawl around it.

A significant portion of the urban population live in shanty-towns with the "Cité Soleil" being the biggest of them. Approximately 265,000 people are living in an area of 22 km^2 equalling a population density of 12,154 people per km^2. To compare, New York City, one of the most densely populated cities in the world, has approximately 10,830 people per km^2.

48% of the Haitian people live in cities, 22% in the capital alone. According to the World Bank "…only 11% of people in the Haitian countryside have access to energy compared with 63% in the island's cities. About 16% in rural areas have access to improved sanitation, while 48% in cities do."[3]

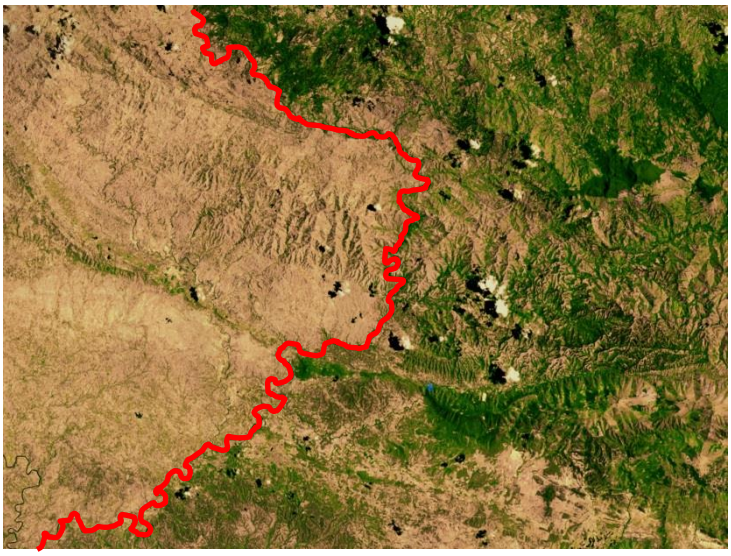
Of even more concern is that these numbers, and therefore inequality, is rising in the rural areas of Haiti, while declining in the cities.

3. The Socioeconomic Impact Of Clean Cook-Stoves In Haiti

3.1 Opportunities for Haiti

Without LPG:
- 30 million trees get logged every year
- More than 4,000 fatalities per year from diseases related to indoor pollution in Haiti alone

With LPG:
- Chance to help the country's forest to recover
- Improved air quality in the cities
- Reduced health risk



Border between Haiti (L) and the Dominican Republic (R) clearly shows severe deforestation in Haiti

3.2 Benefits For Haiti And Its Population

In the past 100 years Haiti has gone through one of the most severe deforestation episodes worldwide. Agriculture and the convenient use of wood as fuel have eaten up the forests of the once rainforest-blanketed country. By 1987 Haiti's forests only covered 6.7 percent of the total landmass. Since then, deforestation has run its course and consumed most of what was left.

A large-scale transition to LPG in Haiti would not only reduce the toxic emissions and fine-dust pollution caused by burning wood and charcoal, but also allow the forests to begin to recover.

Densely populated developing countries are known for their poor air-quality, however in Haiti's Capital Port-au-Prince particulate concentrations have been recorded that consistently exceeded levels the Environmental Protection Agency would deem hazardous. Only India and China reach equal levels of air pollution.

Moreover, after overcoming the first-cost-barrier, LPG is in fact cheaper than charcoal. So again, a large-scale conversion from biomass to cleaner burning LPG, would not only relieve the environment in Haiti, but also reduce the health risk and the expenses for the Haitian population.

4. The Schools

4.1 The Selection Process

During the preparation phase in October, SWITCH was provided with UNICEF's Post Hurricane Matthew school assessment, which was helpful in order to ensure, that the initiative was aimed at the right target.

Furthermore, the UN's World Food Program (WFP) was consulted, as they have experience in food supply for schools in Haiti. The WFP gave SWITCH access to their lists of schools and introduced them to ASEBED (Agence de Secours et Bienfaisance aux Enfants Défavorisés) a relief agency for disadvantaged children and one of their local partners specialised in child protection and education.

With their support, SWITCH was able to identify the schools that are serving the most meals per day, which schools have the existing infrastructure to receive the LPG-Kits and which are fit to ensure the persistence of the conversion.

Eventually, 40 schools emerged as suitable for conversion.

3.2 Benefits for the Schools

Although the number of casualties related to indoor-cooking are mostly caused by home cooking, the conversion of the schools, reduces the exposure of the cooks and staff in the kitchen to the harmful emissions of biomass.

There are on average 350 children per school, who benefit from the conversion. After the project is completed, with all of the 25 schools converted, approximately 8,000 children will receive meals prepared in cleaner conditions with LPG stoves.

The project also has the potential to save hundreds of trees per year, since schools are heavy users of charcoal and wood.

LPG is not only cheaper than charcoal, but also easier to store. Therefore the logistics of the supply are more convenient and easier to implement.

Another advantage is the time saving aspect: a charcoal stove has to be preheated, a time- and fuel-consuming process that becomes obsolete with the switch to a LPG powered stove.

To revolutionise the cooking habits countrywide, it is important to raise awareness of the threat wood fires and charcoal-stoves pose when used indoors. Therefore, SWITCH cooperates with the teachers and principals of the converted schools, to sensitise the children. By teaching them the advantages of LPG and clean cooking, they build the fundation for a charcoal free future in Haiti.

4. Barriers and enablers of the Transition

Barrier 1: The dominant charcoal industry in Haiti and its inhibiting effect on the LPG market

Charcoal is the primary source of energy in Haiti's urban areas, while people tend to use wood in the rural areas. 95% of all Haitians depend on charcoal and wood for everyday cooking. According to the New York Times, charcoal from trees represents 60% of domestic energy production. This implicates the continuous logging of trees by private charcoal burners. 98% of the Haitian part of the island of Hispaniola is deforested; only 2% of the forest remains intact. Consequences of this massive deforestation, which is said to be the worst case of deforestation in the Western Hemisphere, is the destabilisation of the topmost layers of soil, because the roots of trees, which would normally reinforce the soil are simply not there.

The United Nations states that erosion claims an estimated 36 million tons of Haiti's topsoil each year. Areas around Gonaives, in the Department of Artibonite, and parts of Haiti' s northwest are the most badly deforested, leaving dry, brown desert-like mountains.

Border between Haiti (L) and the Dominican Republic (R)

However, since producing charcoal is the only source of income for many people, sustaining their livelihood is their top priority. The consumers in the cities are standing at the end of a long value-chain, which benefits many people.[11] Producing charcoal does not require any special know-how, making it suitable as a source of income for many people in rural areas. It is then transported into the cities, either by trucks or on small boats, where it is sold on charcoal markets. Incentivising a switch from charcoal to LPG is difficult because "Charcoal and firewood production provide much-needed cash income for a significant number of people"[17]

Barrier 2: Lack of purchasing power

This barrier strongly correlates with barrier 1: Switching from charcoal to LPG as the primary source of energy takes effort and investment many people cannot afford. While there are organisations that subsidise the necessary equipment, there are still many people, mostly in the rural areas , who do not benefit from these services.

Therefore, initiating the conversion of public institutions such as schools is a first step in the right direction.

Switching to LPG comes with necessary investments of about $100-150 which, for the 70% of the population who live on less than $2 per day, seems unimaginable. That is, why financial support is crucial for overcoming the first-cost-barrier.

Enabler 1: SWITCH as the driving force

"Passons au vert" – go green. The sentence summarises the ambition of SWITCH and also serves as their slogan: The goal is to establish a durable and profitable mechanism which assures the reliable supply of LPG.

This should enable most households to permanently convert to LPG and therefore improve their quality of life and environment.

The organisation does not typically work with donations, but rather with the help of remittances from the Haitian diaspora, largely based in Florida. The social marketing and manufacturing enterprise has a plan on how to push demand for LPG in Haiti and to persuade the people that LPG is not only cleaner but also cheaper.

Wide-spread accessibility is the key. LPG has to be accessible and affordable for everyone: in order to achieve that, SWITCH cooperates with NGO's such as the World Central Kitchen, that support the campaign financially.

Kalinda Magloire is the Chairwoman and Founder of SWITCH S.A. "The idea behind SWITCH is to meet the most important need –access- through credit, remittances and some subsidies", Kalinda Magloire said . "The state of Haiti cannot tackle the problem. We are introducing a market-based solution." She adds, that Haitians are knowledgeable and generally not reluctant to adopt LPG.

Lack of access appears to be the main issue. SWITCH, in a collaborative initiative, has joined with the government of Haiti and United States Agency for International Development (USAID) to build the "Charcoal Free Villages" programme, which targets 2,750 social and charcoal-independent housing areas.

In different initiatives, SWITCH aimed to provide 8,000 to 12,000 street vendors with stoves manufactured by SWITCH, which were provided below market price and with the option to pay over one year's time.

In order to tackle the cost of LPG-stoves for the poorer part of the Haitian population, SWITCH partnered with a bank to offer green-credits.

Enabler 2: The international LPG industry

The World LPG Forum in Florence provided the necessary platform for SWITCH to advertise its project in front of an audience which is both willing and able to support it financially.

Without such foreign investment, the conversion of the schools would not have been possible.

With donations of $1,000 per school, many companies pledged and volunteered to support the project. Twenty-six representatives of the LPG industry pledged to pay for one or multiple schools.

In return, they will receive a certificate, an acknowledgement of the payment, photographs of the school and pictures of a individual panel at the school, showing which company or organisation paid for the conversion of this particular school. As of April 2017, donations for 25 schools had already been received.

5. The Status-Quo in Schools: Monitoring & Evaluation

5.1 General Numbers

As of June 2017, 22 schools have already been converted from cooking with wood to cooking with LPG.

One hundred women are now working in unpolluted kitchens and decent conditions. These conversions generate a total saving of $7,000 per school year for these 25 schools altogether.

Furthermore, as schools are heavy users of charcoal and firewood, a considerable amount of trees are saved in switching them to LPG stoves. For Haiti, with an annual logging rate of 30 million trees and less than 2% of forest coverage remaining, this is a major step in the right direction.

Due to heavy rainfall and the resulting flashfloods in March and April 2017, the transitioning process came to a halt.

During these floods, the schools were used as shelters for the people whose homes had been swept away.

An assessment of the schools affected by the floods found the situation to be dire: three of the schools in the South Department were inaccessible and the remaining conversions will have to wait until the roads are repaired. SWITCH will then continue work convert the three remaining schools.

5.2 LPG In Schools

Schools in Haiti are appropriate as targets for switching from biomass to LPG. They house large numbers of students during the day and, due to their relatively central locations, they are often put to use as collective shelters and refuge for displaced people, during and after natural calamities.

As direct consequence of this schools in Haiti consume large amounts of biomass and could therefore heavily benefit from a transition to cleaner LPG without the threat of toxic gasses gathering in the premises which are mainly used by children.

With an average consumption of 90kg of LPG per month, schools could prove to be valuable customers for the nascent LPG industry in Haiti.

5.3 Donations

Since the launch of the campaign, SWITCH has received 15 donations for the conversion of one or multiple schools. SWITCH is grateful for the opportunity to convert 25 schools to LPG users and establish a healthy environment for the people in the schools. The companies above showed generosity and engagement to a project entirely new to them and therefore contributed to making Haiti a greener country.

The $1,000 donations per school comprise the following costs:

• Two commercial stoves with two high debit burners	US$ 300
• Two full non-branded cylinders (100 pounds)	US$ 235
• Accessories for installation, wires and safety	US$ 75
• Painting and minor improvements in the kitchens	US$ 215
• Transportation of stoves and tanks	US$ 75
• Lodging and food for technicians on-site	US$ 100

6. The Renaissance Projects Impact on The LPG Market in Haiti

6.1 The LPG market situation in Haiti

Haiti and the Dominican Republic both have a population of around 10.5 million, but Haiti consumes only about 40,000 tons of LPG per year— the neighbouring Dominican Republic consumes 825,000 tons in 2015.

While having approximately the same population, the Dominican Republic imports one million tons of LPG per year, whereas Haiti imports only 28,000 tons.

Two million households, therefore 95% of all households in Haiti, cook exclusively with charcoal. Haiti is the only country in the Americas with a LPG market penetration of less than 5%, which is an indicator for the potential of a large scale switch to LPG.

As the usage of LPG is low, the available network of distributors and storage capacity is scarce, but as Kalinda Magloire says: “There are hurdles, but we have successfully completed the charcoal free village projects in the most remote areas of Haiti, always finding ways to deliver LPG” .

Furthermore, she mentions, that stable imports are already available from the United States or Trinidad and Tobago, but to make the import profitable, the demand of LPG has to be pushed.

6.2 Projected market development

With an average consumption of 90 Kg per month, schools can prove not only to be valuable customers, but, since they are an untapped market, they are a great base for the targeted countrywide acquisition of LPG as the primary cooking-fuel.

The conversion of 4,000 schools could increase the national LPG market significantly by up to 10%. Not only the numerical effects should be considered, but also the potential change in mentality this project could cause: positive experience with clean, LPG powered cook stoves could persuade many people to switch. Children in the converted schools could become next customers.

Equipping schools with LPG cook stoves is the first step in the right direction.

“Currently, a household gathers two cans of charcoal a day, with mothers, ever at the forefront of domestic cooking, and their children walking long distances collect charcoal. For one day’s cooking, the cost is $1.50. LPG use, conversely, costs $1 a day, so potential savings of $175 a year are possible.”[13]

7. FAQ About "The Renaissance Project"

The following questions were answered by Kalinda Magloire. As the manager of the project in Haiti, Kalinda has the in-depth knowledge of all aspects and the background of the project.

The questions are helpful for further understanding of this case study, but also to understand the motivation behind the idea to equip schools with LPG stoves.

1. **How does the school system in Haiti work? Are all of the schools private? Do the children have to pay for school?**
   It is estimated that 80% of the education offered in Haiti is provided by the private sector. Most private school do not have canteen, hence no heavy duty cooking. In both systems the children pay to be able to attend school. However, the private schools are more expensive.

2. **Are the schools only serving meals to children, or also other people, such as displaced people from the hurricane?**
   Immediately after the hurricane some schools were used as shelters, but by the time we started to intervene, it was already strictly for school children.

3. **How was the ranking of the schools done? What did you take into consideration?**
   We did not do a ranking per se. To select the schools, we requested UNICEF's post earthquake assessment with the list of schools in need. We combined that information with key inputs from the World Food Program, the institution leading the canteen effort in Haiti. WFP actually suggested we work with ASEBED, an organisation with a proven track record in that sector.

4. **How does the LPG market and the distribution network in Haiti work? Are there large companies or small retailers?**
   The market in Haiti is an extremely early stage market and has a LPG penetration of less than 5%.

5. **In one of SWITCHs intermediate reports it says: "These conversions constitute a global savings of $7,000 for nine months (school year) for these 25 schools". Does that mean, each school saves $7000 per year, or all together 25 schools save $7,000?**
   The savings is for the 25 schools altogether.

6. **If there's so much saving in switching to LPG, could the schools take a credit to finance the equipment and pay it back from the saved money?**
   Credit access is very limited. Furthermore, most schools with canteens providing a free meal, (which is a key criteria for conversion) are public schools. Banking institutions are very hesitant to provide loans to such institutions, notably because it is not clear what their "responsibility" and "formal" entity is.

7. **How many lives do you estimate are saved by converting 25 schools to LPG considering that there are about 4,000 fatalities a year caused by the long term effects of indoor pollution in Haiti?** These numbers do not really apply to the school context. The 4,000 fatalities are more related to home cooking, where mothers with their children inhale the fumes during the cooking. The conversion specifically saves trees as these kitchens are heavy users of charcoal and also improve health of the cooks (3 to 4 per schools) by providing them a clean environment.

8. **Is there profit in selling LPG to schools in Haiti? Will SWITCH make money from selling LPG to schools in the next few years, or how will the market develop?**
   Yes there is. To be more specific, there will be when the numbers of converted schools will be more significant. SWITCH is not distributing in Les Cayes (South Department), therefore we do not make money there. The south was hit by the hurricane, and something needed to be done. We just arranged for the distributors in the south to take care of the converted schools in that region.

9. **Before the conversion, did the schools use wood or charcoal or other fuels? Was it bought or collected by the children?**
   All of the schools were either using charcoal or wood. It was mostly bought, not gathered.

10. **Did the schools serve as shelters after the hurricane in 2016? Are people other than children still dependent on the schools for shelter?**
    Yes the schools served as shelters right after the hurricane. They are now back to serving a strictly educational purpose.

11. **Why was the hurricane the reason for the renaissance project?**
    Right after the hurricane SWITCH received many calls for help from organisations providing relief in the south, to provide LPG cook-stoves in order to better serve the displaced and vulnerable populations. The school were among the hubs to provide the relief. Right after the hurricane, after days of rain and flooding, there was no dry wood to cook. This was temporary, however, the hurricane still destroyed a significant part of the tree coverage of this already vulnerable region. Moreover, the hurricane highlighted the vulnerability of the country, and with Haiti being the only country in the hemisphere with very low penetration of clean cooking , it was a way to help and sensitise at the same time.

12. **Could the schools have been converted without the financial support of the LPG industry?**
    No. Other institutions such as WFP (World Food Program) are looking to finance a large scale school conversion program but nothing has started yet.

13. **Are the Haitians hesitant about LPG or would they switch, if access and purchasing power were there?**
    As in other countries, we believe Haitians want to convert to LPG. Whenever a household increases its revenue level, the family usually converts to LPG. Payment facility is key. People do not have the money to pay for the equipment (stove and cylinder) in one instalment. If they find the credit, they are then able to save on the fuel as charcoal is more expensive than LPG.

14. **What exactly was the procedure during the 2017 World LPG Forum in Florence?**
    During the Gala Dinner, the project was presented by WLPGA members and a pledge sheet was circulated. We later collected the pledges and I reached out by email to the people who have pledged. Initially, the goal was to find pledges for 40 schools.

15. **Do you think, the children in the converted schools will learn, that LPG is a good and cleaner source of energy than charcoal? Does the project have a positive influence on them and their future habits?**
    Additional to converting the schools primary form of cooking, we have discussed with the school principals on the need to sensitise the children. With the help of teachers and the cooks we aim to raise awareness among them.

8. Conclusion

The rather spontaneous idea to launch a charitable project presented during the 29th World LPG Forum in Florence turned out to be a success for SWITCH, WLPGA and its global membership. But by far the largest beneficiaries are the children and people benefiting from clean cooking in their schools.

The campaign has come a long way but is not yet finished: due to flooding and bad weather, the conversion of the remaining schools has been delayed and some administrative work is yet to be done.

However, SWITCH's team are working hard and putting the donated money to good use. It is encouraging to see how many of the WLPGA's members stepped up when presented with the opportunity to make a difference.

WLPGA is happy to see that it's members contribute to make Haiti a greener, healthier place.

9. What Next?

Besides working on switching schools to LPG, SWITCH is increasing the number of people who use LPG instead of charcoal for home cooking in Haiti. They do that by convincing Haitians living abroad, to finance the necessary equipment for their families living in Haiti. That is a crucial step, because to raise demand for LPG, accessibility and equipment are the most important requirements. If these are donated, the hardest part is accomplished.

Once the demand of LPG has increased to a certain level, the distribution network and the storage facilities will get to the limit of their capacity. For this reason, storage and transportation infrastructure in Haiti must be improved. However, since the attractiveness of selling a product increases with the demand for the particular product, the number of actors in the LPG market in Haiti are expected to rise, improving the supply and the distribution network simultaneously. This is important, since it could create new jobs for the people which are still dependent on producing and selling charcoal.

Education is a further important point: not only children, but also the adult part of the population need to be taught about energy, the dangers of cooking with wood and charcoal and the advantages of LPG. Only then the transition to cleaner energy can be put through successfully.

Deforestation needs to be tackled on more than one front. This could be done by establishing national-parks and protected zones, to enable the recovery of the remaining forest.

The government has set up a roadmap to rebuilding a cleaner, safer and better energy sector by introducing renewable energies and concluding contracts with local energy providers.

A great deal remains to be done but Haiti is heading into the right direction: several NGOs and companies are involved in projects targeting the substitution of charcoal for cleaner and environmentally friendly energy sources. But it is important that Haiti itself starts to take initiative. SWITCH, Haitian based and led by Haitians, is one example.

A case study by Julian Scharr

10. Acknowledgments

1. *"Haiti". The World Factbook. Central Intelligence Agency.*
2. *"Country profile: Haiti". BBC News. 19 January 2010. Retrieved 2017-04-26.*
3. *"While living conditions in Port-au-Prince are improving Haiti countryside remains very poor"*worldbank.org 11. July 2014
4. *"Hard to Breathe - Tufts researchers raise alarm about air pollution levels in Haiti", Gail Bambrick , April 22, 2014*
5. *"Hoping for change in Haiti's Cité-Soleil". Revol, Didier, International Red Cross. Retrieved 2017-04-26*
6. *"Major earthquake off Haiti causes hospital to collapse – Telegraph". London: telegraph.co.uk. 2010-01-12. Retrieved 2017-04-26.*
7. *„Piloting improved cookstoves in India".Lewis JJ, Bhojvaid V, Brooks N, Das I, Jeuland MA, Patange O, Pattanayak SK.J Health Commun. 2015;20 Suppl 1:28-42. doi: 10.1080/10810730.2014.994243.*
8. *„Who adopts improved fuels and cookstoves? A systematic review".Lewis JJ, Pattanayak SK.Environ Health Perspect. 2012 May*
9. *"Biogas Stoves Reduce Firewood Use, Household Air Pollution, and Hospital Visits in Odisha, India".Lewis JJ, Hollingsworth JW, Chartier RT, Cooper EM, Foster WM, Gomes GL, Kussin PS, MacInnis JJ, Padhi BK, Panigrahi P, Rodes CE, Ryde IT, Singha AK, Stapleton HM, Thornburg J, Young CJ, Meyer JN, Pattanayak SK.Environ Sci Technol. 2017 Jan 3;51(1):560-569. doi: 10.1021/acs.est.6b02466. Epub 2016 Dec.*
10. *"Charting Charcoal in Haiti: Estimating and Understanding Annual Charcoal Production and Consumption at the National Level in Haiti"- July 22, 2016 by Andrew Tarter*
11. *"A year of indecision leaves Haiti's recovery at a standstill" Oxfam International, 5. Mai 2017*
12. *"Creating Market-Based Opportunities for Clean Cooking" , John Needham, Butane-Propane News, April 2015*
13. *„Haiti Sustainable Energy Roadmap" Matthew Lucky, Katie Auth, Alexander Ochs, Xing Fu-Bertaux, Michael Weber, Mark Konold, Jiemei Lu, 2014 Worldwatch Institute, Washington, D.C.*
14. *"LPG: a weapon against Haitian deforestation", Matt ScotlandArgus LPG World, Volume XXIII, 4, 14 February 2017*
15. *"SWITCH and WCK joint activities for school programm", World Central Kitchen*
16. "*Haiti South Department Forest Energy Supply Chains", UNEP Haiti, September 2016*

Data and information contained in this case study come from a variety of sources, including official agencies, original research and analysis conducted by WLPGA personnel, proprietary sources maintained by the WLPGA and other contacts.

The primary source is SWITCH S.A., supplemented with information from other official agencies and research. WLPGA aims to ensure that the information and data contained in this case study are reliable and have been validated, but difficulties in obtaining information on opaque and sensitive material should be noted by the reader.

Throughout this case study, all references to tonnes (t) are to metric tonnes. All weights are given in tonnes, unless explicitly stated in the text. All references to dollar are to US dollar. Currency conversions have been made either at current or relevant historical exchange rates , as required by the context.

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