



Smart Villages in Haiti: Report from Haiti's Energy Week



Workshop Report 30

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Smart Villages

We aim to provide policymakers, donors, and development agencies concerned with rural energy access with new insights on the real barriers to energy access in villages in developing countries—technological, financial and political and how they can be overcome. We have chosen to focus on remote off-grid villages, where local solutions (home- or institution-based systems and mini-grids) are both more realistic and cheaper than national grid extension. Our concern is to ensure that energy access results in development and the creation of "smart villages" in which many of the benefits of life in modern societies are available to rural communities.

www.e4sv.org | info@e4sv.org | @e4SmartVillages

CMEDT - Smart Villages Initiative, c/o Trinity College, Cambridge, CB2 1TQ

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CONTENTS

Introduction	4
Inauguration of the workshop	
Welcome address	5
The Smart Villages Initiative	5
Approaches to smart villages and energy	5

Morning session

Resilience: Adaptation or transformation?	7
Discussion	7
Financing energy resilience in rural areas	8
Hybrid Autonomous Energy Systems	8
Waste to Energy conversion in Arcahaie	8
Energy needs in rural Haiti and options for meeting them	9

Afternoon session

Annex 1: Agenda	15
Conclusion	14
Land improvements, competitiveness and quality of life in rural areas	13
Territory, mobility and rural development	
Smart mobility	12
Supporting rural development with energy efficiency and resilience	11
Accessibility and mobility	11
Energy for Infrastructure and Services	11
Micama Soley Energy Entrepreneurship	
SIGORA Haiti: The Green Utility	10

INTRODUCTION

In January 2017, Smart Villages and the Observatoire de l'Energie en Haïti (OBSERVEH) joined together in the context of "Energy Week", organised by OBSERVEH at the Inter-American Development Bank (IDB). This collaboration originated from the participation of OBSERVEH in the regional Smart Villages workshop on offgrid energy held in the Dominican Republic in November 2016. Convinced that decentralised rural energy could be a good method to electrify and stimulate development in the most remote places of Haiti, OBSERVEH decided to organise "Energy Week" to promote the smart management of energy and transport in Haiti. The whole event covered four days 24-27 January 2017—this report focuses solely on Tuesday, 24 January 2017, and a workshop held focusing on the concept of "smart villages". OBSERVEH gathered together the public and private sector in Haiti as well as international experts with an interest in energy and transport around the theme. The objective of this approach coincides with OBSERVEH's priority: energy education.



Solar street lighting outside Port au Prince.

INAUGURATION OF THE WORKSHOP

Welcome address

Ing. Wilson Edouard, Secretary of State for Transport, Haiti

Ing. Wilson Edouard encouraged a debate about 'smart villages' and how they might be able to contribute to Haiti. Key issues currently facing Haiti include: access to water and electricity; reducing migration from rural areas to cities; offering access to quality internet access; providing sources of renewable energy; and the independence and resilience of villages. He noted that none of these goals can be achieved without access to electricity. Haiti will need to consider what is 'smart' in its context and how to utilise resources in a smart manner.

The Smart Villages Initiative Bernie Jones, Smart Villages

1.1 billion people globally do not have access to electricity, while 3 billion people are cooking on dangerous appliances. There are 4.3 million deaths per year as a result of indoor air pollution and related illnesses. As part of the Sustainable Development Goals (SDGs), Goal 7 commits to "ensure access to affordable, reliable, sustainable and modern energy for all". Many of these 17 goals will also require energy to be successful.

While the concept of "smart cities" is well known, half the world population and 70% of poor do not live in cities. Thus there is a need for the concept of "smart villages." Though smart cities may rely on high-tech infrastructure, smart villages will take a variety of forms depending on their context. Features all smart villages should have in common, however, include energy and ICT access, access to health, education, improved livelihoods, and participation in democratic processes. It is this combination of technology, productive use of energy and innovative provision of remote community services (like healthcare and education) that combine to make the "Smart Villages" concept. The Smart Villages Initiative has organized six regional engagement programmes across the world. Each regional programme includes an opening regional workshop, topical or national workshops, and a closing workshop for the region.

In Haiti and other islands in the Caribbean, the need is not just for energy access. Communities and villages need to be more resilient to natural disasters and other socioeconomic shocks such as internal conflict, fuel price fluctuations etc. Off-grid energy and innovative use of energy to provide decentralized services such as healthcare and education can help can help communities to recover from disasters and crises to an extent. It is not without limitations, however, as it tends to be more expensive for consumers than the grid. However, in areas where there is no grid, or the grid is unreliable, decentralized energy can be the best solution. Pay-as-you-go (PAYG) solutions have proven effective in other countries and might be a good solution in Haiti.

Approaches to smart villages and energy

Pedro Garcia Toquero, Engineer, MBA, and Founding Member of OBSERVEH

There are different conceptions of smart villages from different places. In Haiti, a conceptualisation of what a smart village is will be necessary. The role of OBSERVEH is to push new solutions to Haiti's energy needs. Haitian leaders also need to analyse and think about energy and competitiveness and include transport.

Four mayors are present for Energy Week. It is important to ask how the concept of smart villages can improve the lives of the citizens in these villages and the improve conditions of their lives. How do mayors think this concept can help improve conditions of life in villages? We'll see at the end of the day if what they say corresponds with what we hear today.

Pedro Garcia Toquero then encouraged audience participation and invited them to suggest the elements that they believe that will be important in smart villages in Haiti. The responses included:

- How concept can help children, including energy for distance education
- Better distribution of energy
- Improve health systems
- Improve both social and physical security
- Decentralisation
- Access to technology
- Developing entrepreneurs
- Improving competitiveness
- Good energy management
- Improving relationships in the community and encouraging people to stay
- Access to training

According to Pedro Garcia Toquero, these are concepts that should be taken into account when

thinking about smart villages. He then noted that energy is necessary to have access to technology, whether phones and phone charging, computers, etc. In terms of actors, smart villages require the participation of the public sector, private sector, mayors and other community leaders, and service providers. Energy can also allow smart villages to connect to small, medium, and large cities to decrease their isolation and remoteness. Moreover, villages can be engines for economic growth, even if they are far from Port-au-Prince, thanks to the internet. But to achieve these goals, it is evident that the provision of energy access and the distribution of improved cookstoves will be essential first steps.

As mentioned in the previous presentation, the options for rural electrification—besides grid extension—tend to be more expensive. These include pico lighting solutions, solar home systems, and micro- and mini-grids. However, though they are a bit more expensive, it can be complicated to create grids. Decentralised solutions are much more flexible than the traditional grid and can be put in place quickly.

In terms of the objectives for implementing smart villages in Haiti, clear objectives will be necessary. When there are long-term objectives, you need some more short-term objectives that allow one to observe progress and to make improvements along the way. It is important to ensure that the villages are autonomous and to adapt to the types of energy available locally, whether biomass, solar, wind, or hydroelectric solutions, etc.

MORNING SESSION

Resilience: Adaptation or transformation?

Ana Belio, Executive Director, OBSERVEH

Ana Belio began her presentation by remarking that the meaning of "resilience" currently varies depending on the sector—public institutions will have a different concept of resilience than a physicist or an engineer. Therefore, a holistic concept of resilience is necessary that captures these varying meanings. In her talk, she will use the concept of resilience in the holistic sense. There is resilience at personal level, and there is also community and organisational resilience. If a person, community, or organisation is resilient, when a catastrophe occurs, the conditions should eventually be better than before the event—otherwise, there is not resilience.

Ana Belio emphasised that resilience should not be conceptualised as solely individual. She then noted that resilience does not mean that people and communities will avoid risks; there will always be risks but resilience can ensure that people and communities recover effectively. She gave the examples of resilient individuals, such as Anne Frank in the Netherlands during the Second World war and people who lived in concentration camps during this period. She also noted that many people in Haiti have also shown resilience in the face of disasters and other challenges they have faced. At the individual level, with resilience, each person can influence her environment and to modify her own perspective by re-framing what occurred.

At the same time, individual resilience must be connected to promoting community resilience. She noted that indeed, resilience must have three levels beyond the individual: family, community, and society. At the community level, one should ensure that there is self-management and that the community is independent in how it deals with its challenges. When there is a challenge for an individual, they should try to help find a solution not only for themselves but also for other people. A resilient person believes there is always a solution. They are able to analyse why a situation came about and how to address a problem. Resilient requires the following traits: introspection; independence; ability to create relationships; initiative; humour; creativity; intelligence; and morality.

It is clear that to create resilient individuals and communities, the Ministry of Education must be involved because the development of resilience begins when people are children. At the same time, people can become resilient at any time in their life; they are not born with it. She closed by noting that factors that promote resilience include:

- A capacity for reflection
- Intellectual capabilities
- Not being ego-driven and individualistic
- To have the support of people one can rely on, whether parents, family, professor, a priest, a friend

Discussion

During the discussion, an audience member asked whether there is a difference between the resilience of a community and the resilience of an individual within a community? Ana Belio responded that the answer is no: the community is composed of individuals, and if no one is resilient, the community can't be resilient either.

Another participant asked whether resilience can be a result of a certain culture or collective state of mind. Ana Belio respond that it is created together, though some individuals may be predisposed to be resilient. It is also a question of whether leaders encourage resilience to be developed through education. There must also be support at the grassroots level and in families—it needs both top down and bottom up encouragement.

Financing energy resilience in rural areas

Pierre Kenol Thys, Interamerican Development Bank

Pierre Kenol Thys focused on financing energy resilience in rural areas of Haiti. He is encouraged policymakers and other leaders to prioritise energy resilience initiatives to ensure that future earthquakes and disasters will not devastate Haiti as much as the recent one. He described the institutional structures responsible for the provision of energy in Haiti, as well as reporting on their commercial performance. The national electricity utility, he noted, is currently typically supplying between two and three times the amount of energy that it is able to bill for, and furthermore is only able to collect around 75% of charges billed to consumers.

He noted that 7 million people in Haiti do not have access to electricity out of a total population of 11 million, compared to 23 million without access across all of Latin America: the need in Haiti is therefore extremely significant not just in a national but also in a regional context. This results in Haiti having an average per capita electricity consumption of just 50kWh - one of the lowest in the world. He noted that most communities are more than two kilometres from the grid in Haiti, which means decentralised solutions are likely to be their best options. Haiti's geography and natural resources however, give it great possibility for multiple sustainable energy choices - solar, wind, conventional and mini-hydro as well as biomass.

Hybrid Autonomous Back-up Integrated Compact (ABIC) system Jean Michel Durosca, ObservEH / IDNA

Jean Michel Durosca began by describing how a smart and modern village can have autonomous decentralised energy access. An autonomous back-up integrated compact (ABIC) system, a hybrid micro-grid, can be managed in a 'smart' and efficient way to produce solar photovoltaic (PV) energy. He shared the schematics and performance of such systems, which can be controlled and managed at a distance.

They have used this technology in Benin, in close collaboration with the local community, to install a system that produces 35 kWp from solar PV, 25 kVA via diesel, and requires minimal maintenance. The quality of components is key, so for this installation they have used the most reliable technologies internationally, for example from companies such as Kohler and SMA, to create this hybrid micro-grid. The Benin installation provides electricity to 75 homes with 10 people per home. It can also provide electricity for community services, such as schools, and health centres. Dr Durosca suggested that this is precisely the sort of technology that might be appropriate in rural communities in Haiti.

Experimental waste to energy project in Arcahaie

Joel Ducasse, Foundation of Solidarity

Joel Ducasse represented the Foundation of Solidarity farming NGO in the community of Arcahaie, Haiti. They are using a composting technique to convert waste to energy, using Hermetia blackfly larvae. With 150 kilos of waste and on a surface of 10 square metres, these larvae convert the agricultural waste into viable compost, and their own biomass can in turn be used for energy, most effectively by conversion into biodiesel. Since many other biomass-energy conversion processes can be quite inefficient, this may be a useful technique to use on remote agricultural communities. Further work is required to determine the sustainability and practicability of this approach, and potential for taking it to scale.

Energy needs in rural Haiti and options for meeting them Paolo Chilosi, Consejo Economico Binacional Quisqueya

Paolo Chilosi noted that the rural population of Haiti makes up 50% of the total population. They typically live in distant and isolated areas and earn little money. The absence of electricity is one of the main problems for these citizens. Investment is necessary but the costs of connection to the grid is prohibitive. Cooking remains one of the core needs of these rural residents: most still cook with wood, other fuels, such as charcoal, are only used during the rainy season. For lighting, they may use candles or kerosene lamps, but solar lanterns would be safer and better, and they could pay the \$20-25 investment in 5-8 months with the savings from no longer using kerosene. Other important uses of energy include telephone charging, radios, fans, televisions, refrigeration, and water pumping.

The goal is to find a way to deliver electricity and improved cooking to the rural population. The vision is to develop a sustainable industrial ecosystem that will be able to provide for these needs in rural Haiti. That means that businesses, risk management programmes, micro-credit and financing, and regulations will need to be developed in Haiti.



Panel of rural Mayors discussing their energy and development ambitions.

AFTERNOON SESSION

SIGORA Haiti: The Green Utility Andrew Lebowitz, SIGORA Haiti

Today, energy in Haiti is unreliable, fossil fuel-based, and priced unsustainably. SIGORA's mission is to ensure energy access for all of Haiti. SIGORA produces and markets electricity in the northwest department, from sustainable sources, including solar and wind, through an independent grid infrastructure. They offer prepaid electricity to their clients as well as anti-theft protection using smart meters. They currently have 11km of transmission lines, and intend for their grid to reach several cities, with a total population of 136,000 people. At the staff level, 95% are Haitians and trained by the company, and 233 jobs have been created.

Micama Soley, a division of SAFICO Naomi Adamson, SAFICO

Naomi Adamson described the types of decentralised electricity that are available, including solar home systems, pico products, and mini-grids. She then described their advantages and disadvantages of grid connection versus decentralised electricity options, such as mini-grids, solar home systems, and solar lighting. Grid connections may appear cheaper to consumers, but they will take far longer to arrive; decentralised options may be relatively more expensive, but they are more flexible options and can be installed in a very short amount of time, particularly solar home systems. Lamps only provide light and can also be stolen easily. In their view, solar home systems are often the best option as they provide consumers with choices as they choose to invest more in their energy needs.

Naomi Adamson introduced 'Micama Soley', a division of the company SAFICO. This division has trained over 1,400 women to sell solar lanterns, and over 140,000 solar lanterns have been sold by them in Haiti. Their pico-solar products are high quality with international certifications from the World Bank and a two-year guarantee;



Andrew Lebowitz and Naomi Adamson discuss energy entrepreneurship in Haiti.

this is important as there are many poor quality lamps on the market.

BME Energy for Infrastructure and Services projects

Marc-Andre Chrysostome, Energy Unit Office (BME)

The Energy Unit Office (BME) was created in 2012 with the PRELEN project funded by the World Bank. Its mission is providing energy for community infrastructure. One of their main activities is providing street lighting for neighbourhoods under reconstruction. Their primary objective as an office is to reform the energy sector and make proposals for new approaches. He manages several other projects:

- The electrification project for 50 schools per department as well as the Northern Historical Park with a budget of US\$1.36m.
- The SREP project to finance the development of Renewable Energy, a grant of US\$23 million was allocated to it to prepare the project document.
- The Clean Technology Fund (CTF) project for private sector funding for technical support of up to US\$12 million.
- The inaugural project of the State's first photovoltaic power plant on the roof of the Triomphe Ciné at the Champ de Mars.

He noted that solar and wind energy still have problems as they do not always provide continuous energy; that is why people continue to rely on diesel generators. In terms of grids, there are seven interconnected grids in Haiti. But what they currently need is a single and comprehensive national grid, and this has been proposed to the government.

Accessibility and mobility Francesc Robuste, Professor of Transportation at Polytechnic University of Catalunya, Barcelona

Prof Robuste began by recalling how transportation systems, even though they may physically exist outside a community, are critical components of those communities and their development, as a mechanism for permitting economic activity with the outside world, enriching society by permitting external access as well as other psychological and sociological impacts. Development of transportation infrastructure should therefore be seen as a critical component of development. As with energy access more generally, successful use and creation of such transportation infrastructure involves a complex interplay between stakeholders, users, technology, culture and environment, and issues of user behavior are also important.

The majority of research and thinking on sustainable transport systems has been done with urban use in mind, but such systems are equally important in rural settings in the developing world. Giving several examples of how modern, sustainable transportation infrastructure has been planned in cities around the world, Prof Robuste suggested how both rural and urban transport infrastructures in Haiti could be planned along the "Barcelona model" of mobility for safety, sustainability, social equity, efficiency and consensus.

Supporting rural development with energy efficiency and reinforcing energy resilience

Gabriel Hernandez, OBSERVEH and Senior Energy Consultant

Gabriel Hernandez emphasised the need to energise rural areas. These areas typically rely on agriculture and tourism for income. Often, there is a great deal of social exclusion and the population is very dispersed. Regarding the use of energy in rural areas, primary uses include cooking, lighting, and refrigeration but in order

to foster meaningful progress, productive uses are also important. These include agriculture and agro-industries and other value addition processes that require energy. Community level benefits, such as social services and communication in general also require energy. Regarding rural electrification, there are a multitude of different solutions available worldwide, not all of which have yet been trialed or introduced to Haiti. Interconnected systems and independent systems, mini-hydro and solar installations are important as well as improved cookstoves. Mr Hernandez shared several successful examples of systems in Paraguay, Bolivia, and Guyana. These were often for small numbers of people-50 to 75 families-and were implemented with the help of local NGOs and took into account the communities' needs for productive uses of energy, such as irrigation and refrigeration. Best practice in rural energy access, however, is for installations and systems to be sustainable, so an NGO route is not necessarily the most appropriate.

Smart mobility Reginald Noel

Reginald Noel began his presentation by describing the concept of a 'smart city': it integrates social, cultural, and environmental elements to respond to the needs of citizens and also allows of the participation of governments and citizens, often though the use of ICT. Characteristics of a smart city include: a smart economy, environment, lifestyle, and built environment. It also includes smart mobility, including roads, railroads, and waterways. The objective is that people and merchandise can move throughout the city in the most optimal fashion that also respects the environment. Transport should rely primarily on renewable energy because it represents 20% of the energy that is consumed in a city. This is less relevant in a smart village but nevertheless, successful rural development should also contain an element of developing s sustainable transportation infrastructure around the community, for example for the transport and marketing of agricultural goods, access for tourists etc. Lessons can therefore be learned from smart cities and applied in smart villages.

Territory, mobility and rural development Marc Raynal

Marc Raynal presented a future vision for rural Haiti, suggesting that it would incorporate several important changes. First of all, rural areas will be less remote in the future because transportation and infrastructure will be improved and better connect these now-remote areas. He contrasted demographics and infrastructure approaches in rural provinces of Haiti and France. The benefits of such infrastructure are not just economic, but also social ("de-enclaving" remote communities), improving security, climate resilience and ability of communities to recover after natural disasters. In addition, remote rural communities like those in Haiti could provide a driving force for the development of non-standard locally-appropriate transportation infrastructure, including such solutions as overhead cable transport etc. In terms of transport, Marc Raynal highlighted that Haiti's roads are primarily secondary and tertiary roads; there are many enclaves throughout rural Haiti and transportation is challenging. The priority must be to connect these disconnected areas.

He also noted that 'low-tech' locally appropriate technologies can be applied more effectively in certain circumstances to respond to energy needs on a more sustainable and affordable basis, especially for cooking. Better management of regional water resources will also permit wider use and installation of hydroelectricity to meet energy needs in many rural areas. Agriculture that respects watershed areas and water resources also needs to be developed. Lastly, fishing and other types of agricultural work can be mechanised.

Land improvements, competitiveness and quality of life in rural areas Philippe Olivier

Land improvements include ways of developing rural territories, protecting nature, and transforming agriculture. Land improvements include rural engineering; the conditions of production and work; the conditions of agricultural mechanization; the modernization of rural buildings; the competitiveness of agriculture; the quality of living areas and landscape. Dr Olivier discussed the consolidation of parcels of land, initiated by either the public or private sector, as a means of lowering the costs of production and to facilitate agricultural operations. He described rural engineering, particularly agricultural hydraulics and agricultural mechanization and called for a re-evaluation of rural areas, taking land improvements as the way forward, with particular attention to environmental issues. These improvements promote sustainable agricultural development, care for rural landscapes and ecological objectives, and the support to projects that focus on adding value to agricultural products.

Dr Olivier closed by raising questions about the limitations of growth. He questioned the promotion of micro-credit and banks and instead advocated bartering systems or other types of association systems, such as local exchange systems and local currency alternatives. There is a tension between localization and globalization that may not be resolved, and he questioned the idea of "progress" as a good in its own right. He also noted that subsidiarity is an important principle, and that communities have the right to "possess and administer in common matters useful and necessary to their conservation and development", as noted by German philosopher Johannes Althusius. In his view, a smart village should be one where solutions and decisions are also made locally.

CONCLUSION

At the end of the day, four mayors from across Haiti commented on the day's presentations and gave their views on the situations for energy in their communities. The consensus among the mayors was that energy access—both for electricity and cooking—remains a challenge in their communities. However, they were optimistic that things could change with the collaboration between both public and private sectors. One of the chief limitations in Haiti is that few private sector actors are actively working on energy. Haiti will need to invest in energy going forward and make additional efforts to attract businesses to operate there. Marc Antoine Archer noted that this year, if no decision is made by the government about energy, the consequences will be serious: there will be a 10-year set back. He concluded that this week of energy has helped to develop a strong awareness that Haitians must take charge of the destiny of their country. If development is to begin, the problems of energy must first be solved, which is central to all activities.

He thanked all those who contributed to the achievement of this energy week and wished to see them all again shortly for another energy event.



Workshop hosts, Dr Ana Belio and Dr Marc Antoine Archer of ObservEH.

ANNEX 1: AGENDA

9.00: Inauguration of the workshop

Welcome address, Ing. Wilson Edouard, Secretaire of State for Transport, Haiti

The Smart Villages Initiative, Bernie Jones, Smart Villages

Approaches to smart villages and energy, Pedro Garcia Toquero, Engineer, MBA, and Founding Member of OBSERVEH

10.00: Morning Session

Resilience: Adaptation or transformation?, Ana Belio, OBSERVEH

Discussion

Financing energy resilience in rural areas, Pierre Kenol Thys, Interamerican Development Bank

Hybrid Autonomous Back-up Integrated Compact (ABIC), Jean Michel Durosca, OBSERVEH/ IDNA

Foundation of Solidarity, Arcahaie, Joel Ducasse, Foundation of Solidarity, Arcahaie

Energy needs in rural Haiti and options for meeting them, Paolo Chilosi, Consejo Economico Binacional Quisqueya

13.00 – 14.00 Lunch

14.30: Afternoon session

SIGORA Haiti: The Green Utility, A Lebowitz, SIGORA Haiti

Micama Soley, a division of SAFICO, Naomi Adamson, SAFICO

Energy Unit Office (BME), Marc-Andre Chrysostome, Energy Unit Office (BME)

Accessibility and mobility, Francesc Robuste, Professor of Transportation at Politechnic University of Catalunya, Barcelona

Supporting rural development with energy efficiency and reinforcing energy resilience, Gabriel Hernandez, OBSERVEH and Energy Consultant

Smart mobility, Reginald Noel

Territory, mobility, and rural development, Marc Raynal

Land improvements, competitiveness and quality of life in rural areas, Philippe Olivier

17.00: Conclusion





SMART VILLAGES New thinking for off-grid communities worldwide

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