A guide to the Delivery Models applied by

Wind Empowerment member organizations

Kickstarter Project Final Report

Delivery Models Working Group

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Executive Summary

Renewable energy systems in rural areas can be considered as socio-technical systems, where a variety of dimensions (technical, economic, social, environmental, cultural, institutional) contribute to the sustainability of the system. With this view, it is clear that when a new project is designed, a methodology is needed in order to effectively address these dimensions, i.e. a Delivery Model (DM).

Although important work has already been done on the subject of delivery models for sustainable renewable energy projects in rural areas, it still remains a concept under definition and specific guidelines are not available. Under these circumstances, the purpose of this work was to investigate, systematize and analyze different delivery models used by Wind Empowerment (WE) organizations when implementing electrification projects with locally manufactured small wind turbines.

The first step of this study was to identify variables contained in the concept of delivery models and appropriate to characterize small wind turbine projects for rural electrification. The identified DM variables (General description of project & General approach, Enabling environment, Ownership & Management, Training, Operation & Maintenance, Financing, Local socio-economic impacts, Dissemination & Scaling Up) were the framework to develop a set of questions that were then used as interview guidelines to conduct personal interviews with WE member organizations.

In total, interviews with 13 interviewees were conducted, about their experience in 19 projects of electrification with small wind turbines, in 11 countries. Three of these projects were not implemented by WE organizations, but were public policy projects. The reason they were included in the user survey was to investigate similarities and differences between the small scale WE projects and large scale public projects and to examine how these experiences can contribute to each other.

The collected experiences were then dismantled into the DM variables and thus translated into delivery models. Moreover, the way each experience addressed the different variables was assessed so that best practices and lessons learnt were collected.

Eventually, the delivery models of the collected experiences were presented in the form of a guide, which can be used when designing projects with locally manufactured small wind turbines. To identify which delivery model is more appropriate, the initial conditions and the objective of a new project can be compared with those of the available projects in the guide.

It was decided that the initial conditions that should be defined refer to: (a) whether the implementing organization is located in the same country where the wind turbine(s) will be installed, (b) whether the location is remote and/or off-grid and (c) to what extent the beneficiaries have the technical and financial capacity to support the project. Therefore, similarities in the initial conditions of projects might allow the employment of the same delivery model with similar results.

In addition, the outcomes of the survey were summarized and conclusions were made about how each DM variable can be addressed. Some remarkable success factors to be highlighted for each variable are the following:

- "**General approach**": Making an initial community diagnosis, finding local partnerships (for projects in foreign countries), choosing an appropriate location which satisfies specific criteria, making a good sizing of the system, having a multidisciplinary team of people with various backgrounds, encouraging people to be active and self-sufficient during all phases of the project
- "**Enabling environmen**t": Choosing an appropriate technology for which components and materials can be found locally, engaging a local engineer or technician to help when shopping the materials (for projects in foreign countries)
- "**Ownership & Management**": Establishing a proper way of community ownership which respects the traditional organizational structure that is already familiar to the community, establishing a formalised management model with specific roles and responsibilities
- "**Training**": Choosing participants who either have an engineering background or technical experience (with the view that they will support the project afterwards), running the training course at a University which is close to the installation site, selecting as participants people who will continue living in (or close to) the community, selecting at least 2-3 more competent people and making sure that they are able to take care of the system, conducting multiple trainings if necessary, making sure that the community can be at least able to take the turbine down and perform an initial diagnosis of the problem, encouraging and enabling people who participate in the workshops to become teachers themselves.
- "**Operation & Maintenance**": Finding a local entity close to the community to monitor the system and support the maintenance process (for projects in foreign countries), getting feedback from failures through a logbook or an online database, establishing a proper payment system if the operating costs are not externally financed, encouraging people to be active in maintenance and do maintenance together.
- "**Financing**": Providing the training course for free to the people who are going to be responsible for the maintenance but charging external participants normally, fundraising so that people who design and implement the project can be paid for their work, learning how to write a good proposal to apply for funds
- "**Local socio-economic impacts**": Choosing to electrify a place that is visited and used by many people to increase the potential impact of the project, identifying potential productive uses of energy in the area (with the help of local networks and institutions)
- "**Dissemination & Scaling Up**": Conducting a market assessment before attempting to scale up a project in a country, ensuring funds are available so that people's work can be paid (as voluntary job can't support a large number of projects)

Finally, the three public policy cases were examined and they were compared with each other using the variables of General approach, Training and Maintenance. It was understood that similar methodologies apply also for larger scale public policy projects and some lessons learnt from these experiences can also contribute to the sustainability of small-scale projects and vise-versa.

Contents

List of Abbreviations

DM	Delivery Models
ILWP	I-love-Windpower
PA	Practical Action
RECS	Renewable Energy Cooperative Society
SWT	Small Wind Turbine
WE	Wind Empowerment

Introduction

For a long time, projects of rural electrification with renewable energy were assessed as a success or a failure predominantly from a technical dimension.

For example, if a wind turbine was out of operation because of a broken blade or problems in the electrical circuit, solutions tended to focus on making more resilient blades or building simpler and more reliable electrical circuits.

It has been shown in other studies [1] though, that many installations were not functional despite having thoroughly considered the technical dimensions of systems. That is, despite the use of efficient technology, a system could be out of operation for long periods due to several other barriers, such as lack of local knowledge about the maintenance of the wind turbine or lack of sufficient funds to cover costs towards the various entities involved in the management system, or by the mere fact that no parts were available from suppliers in a timely manner.

This gives rise to an understanding of renewable energy systems in rural areas as socio-technical systems; as complex and dynamic systems where technical, economic, social, cultural, environmental and institutional dimensions, all contribute to the operation of the system, on different scales.

The ability to address all these issues dynamically determines the overall success of a project and, eventually, its sustainability in a holistic manner; in other words, the ability of the project to be functional overtime and to disseminate, scale up and reproduce itself.

The concept of Delivery Models

To address the complex, multi-aspect issue of sustainability of rural renewable energy systems, the concept of Delivery Models has emerged. The term is variously used in different contexts and a consistent definition is yet to be established. Attempts to define a project's delivery model could be:

"The set of actions that are taken during all phases of a project to achieve its sustainability in a specific context" or

"The methodology with which a project attempts to achieve sustainability and scale up in a specific context by addressing the different variables that contribute to it".

Objective and Methodology

The objective of this work was to investigate, systematize and analyze different delivery models used by WE organizations when implementing electrification projects with locally manufactured small wind turbines.

The following methodology was followed:

- Stage 1 → Identification of variables contained in the concept of delivery models and formulation of interview guidelines

Based mainly on existing delivery models theory [1], [2], [3] but also through ongoing reflections while extracting data from the experiences of WE members, variables appropriate to characterize the delivery models of these experiences were identified. Subsequently, using the identified variables as a framework, a set of questions was formulated and used as interview guidelines to conduct a user survey addressed to all WE member organisations. The identified variables and their dimensions can be found in Table 1 and the complete interview guidelines in Appendix II.

Variables	Dimensions
1. General description of project & General approach	1.1 Technical 1.2 Location-specific 1.3 Project initiation 1.4 Implementing approach
2. Enabling environment	2.1 Municipality, Government and Institutions 2.2 Policy, Regulations 2.3 Private Sector 2.4 Suppliers
3. Ownership & Management	3.1 Traditional decision-making and organising patterns 3.2 Map of Actors & their Roles 3.3 Model, Decision making processes 3.4 Community participation 3.5 Level of transparency, corruption
4. Training	4.1 Community capacity 4.2 Training actions
5. Operation & Maintenance	5.1 Distribution to End-Users 5.2 Maintenance 5.3 System performance 5.4 User satisfaction
6. Financing	6.1 Actors involved 6.2 Financial sources 6.3 Fundraising Community Actions 6.4 Financial assessment
7. Local socio-economic impacts	7.1 Productive Uses and Local job creation 7.2 Social impact
8. Dissemination & Scaling Up	8.1 Strategies 8.2 Assessment

Table 1. Variables and Dimensions of the Delivery Models concept, as defined in this study

- Stage 2 →Personal interviews with WE member organisations to identify and characterize delivery models that have already been employed in their projects

Personal, in-depth interviews were considered as the most appropriate way to investigate the dynamic concept of delivery models. Since members of Wind Empowerment are spread around the world, interviews were conducted through VoIP calls (Skype), in English and in Spanish, depending on the respondent's preference. All interviews were recorded and then transcribed.

Besides WE member experiences, we have chosen to conduct interviews and include in this work three experiences of public policy projects. The central difference among our case studies that leads us to this methodological decision refers to the kind of actors who drive the project.

Whereas in the first group we find different NGOs, small companies, study groups, and other private actors, in the second group we include those projects that have been promoted by the state and its agencies directly. Hence, there are marked differences between these groups, mainly in the scale of the experiences (number of systems installed), and in the methodological design adopted consequently.

Although the participation of the State is frequent in the Wind Empowerment Organizations' experiences (in financing, technical advice, institutional coordination, procedures and permits), the difference is that we cannot understand them as public policies, since these are those actions designed and executed by the State as the main actor, whose objectives are aligned with its political and institutional objectives.

The decision to incorporate the analysis of public policies within the area of low power wind energy in our study, has two purposes: on the one hand, not to abandon the pretension of larger scale projects promoted by Wind Empowerment; on the other hand, to show that the knowledge and methodology used by Wind Empowerment in its various experiences can be incorporated as input for the formulation of future public policies in the area of low power wind energy, and thus contribute to make these policies more efficient, effective and sustainable in time.

In total, interviews with 13 interviewees were conducted, about their experience in 19 projects of electrification with small wind turbines. These projects have taken place in 11 countries, in Latin America, Europe, Africa and Asia. A comprehensive list of the collected experiences can be found in Table 2.

#	Name of Interviewee	Case study	Organization	Location
WE members projects				
1	Aran Eales	Ethiopia project	WE, v3	Ethiopia
	Arthur Karomba	I-love-windpower-Tanzania	I-love-windpower-Tanzania	Tanzania
2	Bruno Domenech	Experiencia Cajamarca	Soluciones Prácticas Perú	Perú
3	Gael Cesa	Tripalium	Tripalium	France
4	Jay Hudnall	Ti'eole, Tripalium	Ti'eole, Tripalium	France
5	Jay Hudnall	Le jardin des cheminots à Narbonne	Ti'eole	France
6	Jessica Rivas	Caso Playa Blanca	WindAid	Perú
7	Jon David Simnett	Chile practical workshops	Bright Planet Education	Chile
	Jon Sumanik-Leary	Hugh Piggott community	Scoraig Wind Electric	Scotland
8	Kimon Silwal	KAPEG projects	KAPEG	Nepal
9	Kimon Silwal	India project	KAPEG, Practical Action	India
12	Kostas Latoufis	Spithari	Nea Guinea	Greece
13	Kostas Latoufis	Filiatra	Nea Guinea	Greece
14	Manuel	Exp. Salta	500RPM	Argentina
15	Manuel	Exp. Los Gigantes	500RPM	Argentina
16	Marco Ogno	Brazil project	I Love WindPower-Brazil	Brazil
Public policy projects				
17	Guillermo Gimenez Yob	Exp Córdoba	Direccion de Energias Alternativas y Comunicaciones de la Provincia de Córdoba	Argentina
18	Jon Sumanik-Leary	Malvinas		Argentina
19	Jon Sumanik-Leary	Chubut		Argentina

Table 2. List of collected experiences. The organization column refers to the organization that the interviewee represented in the specific project

- Stage 3 →Systemization of different delivery models - Identification of best practices and lessons learnt

Since the interviews were conducted using the identified delivery models variables as a guide, it was then relatively easy to dismantle the collected experiences into variables and thus translate them into delivery models. Moreover, the way each experience addressed the different variables was assessed so that best practices and lessons learnt were collected.

- Stage 4 →Presentation of the collected delivery models in the form of a guide

- Stage 5 →Reflections on the identified delivery models, conclusions and suggestions

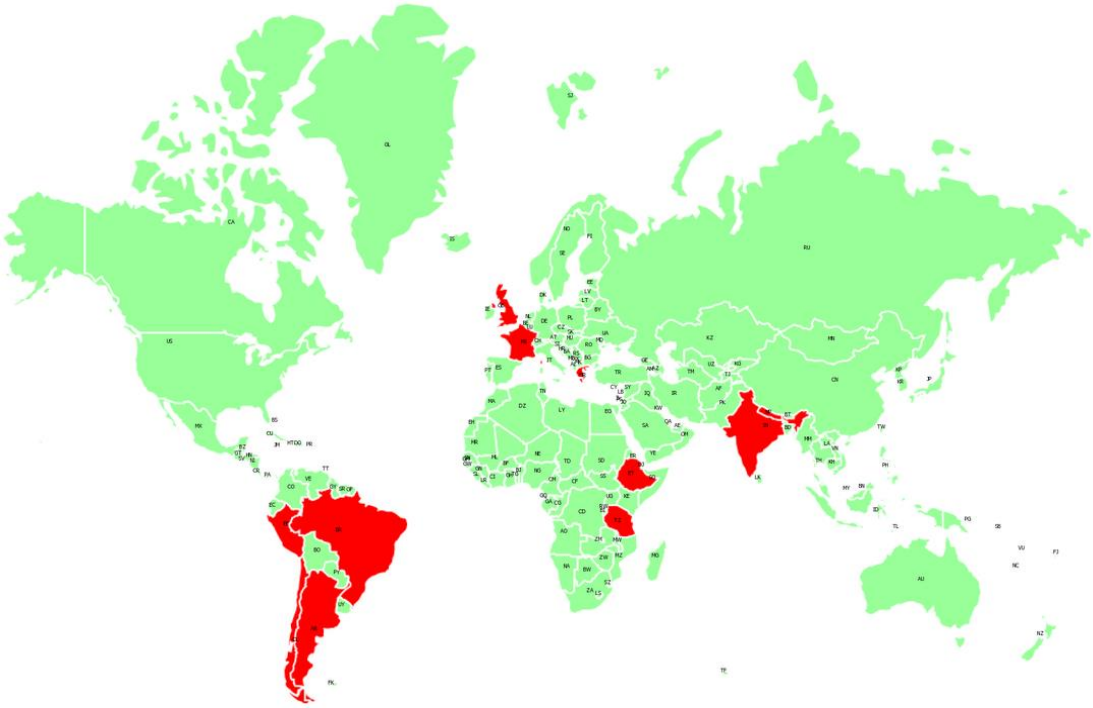

Image 1. World map: Countries where the collected experiences took place are marked in red

How to use this guide

The following session presents the identified delivery models that WE member organizations employed in electrification projects with locally manufactured small wind turbines.

The context in which each project took place defined the actions taken by the implementing organizations in order to achieve their objective; in other words, the initial conditions defined the delivery model applied by the organization.

This may suggest that similarities in the initial conditions might allow the employment of the same delivery model with similar results.

What is proposed here is to use the following collection of delivery models as a guide when designing projects with locally manufactured small wind turbines. The initial conditions and also the project's objective will define which is the most appropriate delivery model to be chosen. Similar to a map: it can help you only if you know where you are and where you want to go.

So, when designing a project, the following questions can be asked:

- Is the **implementing organization** located in the country where the installation will take place?
- Is the **location** off-grid? Is the location remote?
- Who will the **beneficiaries** be? What is the beneficiaries' capacity for understanding the technology? Are the beneficiaries of the project able to cover the project's cost?
- What is the **objective** of the project?

Once the initial conditions and objective are defined, they can be compared with those of the available delivery models. To achieve this, answers to the above questions are given at the beginning of each delivery model.

If similarities are identified, the relevant delivery models can be studied and utilized, by replicating their best practices and, most importantly, learning from their failures.

Guide to delivery models for sustainable Small Wind projects

The different delivery models are presented below through an assessment of their success and failure factors. These shall be understood as best practices and lessons learnt from each experience. The use of the terms Success (S) and Failure (F) factors was chosen for simplification of the symbols. More detailed description of all experiences can be found in Appendix I.

1. Small wind turbines for pastoralist communities in Ethiopia - Wind Empowerment, Mercy Corps, V3, Nea Guinea	
General description of project	<u>Initial conditions</u> **Implementing organization**: in foreign country **Location:** off-grid, nearest town is 30 minutes drive in one case, 2-3 hours drive in the other **Beneficiaries**: community shop, low capacity, can't afford to cover costs <u>Objective</u> To find new forms of income and market expansion for pastoralist people living in Ethiopia.
General approach	S: When implementing a rural electrification project in another country, it is a good strategy, if possible, to do a first pilot project. S: The whole idea of having a local partner is that they are able to identify suitable sites and they are able to initiate communication with the communities. "Having a local organization to do this work is very important, with the local knowledge of how the communities work and what the organizational structures are. It is essential to have that in place before you implement a project locally." F: Communication between partners in foreign countries can be difficult or slow sometimes. S: Partnership with local organizations and institutions is important at all phases of a project: planning phase, implementation, maintenance and dissemination of the project. S: A good project starts with a good proposal. It outlines the need for the project, a justification for the use of the technology, the methodology.

	F: Taking care of contractual matters, such as developing a financial policy or a risk assessment takes time, especially in case of a new organization that does this for the first time. S: Some basic criteria to identify an appropriate site are: to be open, to be free of obstructions, to have a productive use (a shop in their case) and to be accessible from the University so that maintenance would be easy. S: Unless the wind resource is already known from other sources, it is a very good idea to install data loggers to measure the wind at the potential installation sites. Otherwise you risk having a wind turbine with a very low performance. S: Another work that needs to be done during the planning phase is to identify the load profile (for which the turbine will be used for) and then complete the system design: sizing of the system, list of the materials and components needed.
Enabling environment	**Logistics** F: "Shopping all the components in a foreign country is complex, you need local support, a local engineer or technician to show you the right shops and assist you on the process." Also, you can't just trust a local engineer or technician to do the shopping alone because sometimes the right materials are not available and unless you've built a wind turbine before, you don't know how to adapt to what is available. The best is to have an expert and a local engineer/technician to do the shopping together. F: "It is very important to have plenty of time for finding the materials locally. If you are on a short time frame you end up paying more." F: Transferring components and materials in one's personal luggage can cause unexpected charges or/and delays at the Customs.
Ownership & Management	Wind turbine supplies the village's shop but the wind turbine is owned by the local implementing organization. During the first year, the shop keeper would receive the electricity for free and his obligation was to monitor how much additional income he receives due to the electricity. After the first year, he would need to pay for maintenance. The applied ownership and management model hasn't been evaluated yet.
Training	S: For the training, it is important to choose participants who either have an engineering background or technical experience (e.g. technicians who know how to weld or work with wood). The training will work better for them and you will have people who can really support the electrical system afterwards.

	S: Running the training course at a University which is close to the installation site works generally. The idea is that students who will participate in the course have the potential to support the system and carry the project forward by creating related businesses. Also, a University usually has the necessary facilities for a workshop and it can contribute financially to the project. It is much better to choose a Technical University, otherwise the students might not have the necessary technical background for the training to be successful. Also, the University should be close to the installation site. Otherwise the students will be discouraged to travel to the site and help with maintenance.
Operation & Maintenance	S: If it is difficult to train the community to do the maintenance, you should make sure that they are able to get support from a local entity. Someone that is close to the site, has the technical knowledge and is generally available to help.
Financing	<u>Capital costs</u> 90% covered by Mercy Corps, from a US Aid fund for the PRIME project. 10% covered from Jijiga Technical University and Semara University <u>Operating costs</u> In the short term (first year of operation) Mercy Corps is covering the operating costs. Eventually the shopkeeper is supposed to be able to pay for the maintenance. S: Implementing a project in a foreign country involves higher capital costs (higher logistics costs). Also, in developing countries, the beneficiaries often can't afford the operating costs and might need financial support. Appropriate funding -usually from international organizations- needs to be ensured when designing such projects. Learning how to write a good proposal to apply for funds is an expertise that implementing organizations need to acquire.
Local socio-economic impacts	S: If electricity can't be provided to all the community, it should at least be provided to a common place that people visit and use the facilities, e.g. a shop or a coffee shop. This multiplies the social impact of the project comparing to supplying only one house. In a place that is used by all the community people will be able to charge their phones, use the lighting, use a fridge, radio or tv.
Dissemination & Scaling Up	S: In case there is a strategy to scale-up the project to a whole country, it is important to do a market assessment. This study will show in which regions of the country the conditions are favourable for small wind turbine installations.

2. Hugh Piggott community in Scotland - Scoraig Wind Electric	
General description of project	Initial conditions **Implementing organization**: in the country **Location:** Small rural community in Scotland. "Alternative" and "model" community in renewable energy systems **Beneficiaries**: Families without access to the grid. Objective To satisfy the demand for electric energy for domestic use. To share and spread knowledge.
Ownership & Management	The system is made according to the users; their needs, their level of knowledge, their ability to pay, their intention to dedicate time or not to maintenance. Mr Piggott knows the user in depth and formulates a custom-made design.
Training	Mr Piggott was dedicated not only to manufacturing but also to research on low-power wind energy. It shares the knowledge with the user family while performing the system design and during its construction and installation. Mr Piggott conducts self-construction courses around the world, spreading knowledge about his design and providing tools for others to replicate the experience Piggott is a researcher, motivator and a transmitter of technology throughout the community. His actions have allowed people to know and adopt alternative renewable systems.
Operation & Maintenance	The infrastructure and knowledge to perform the maintenance are close to the wind turbine site. Mr. Piggott's workshop is located in the center of the community, where Piggott's tools and advice can be used. The maintenance plan is made according to the users, their ability to pay,

	their time and predisposition to perform maintenance. There are maintenance plans which are more expensive than others, according to what the user requests. The materials and spare parts are easily obtained within or nearby the community. This is an advantage derived from the choice of the technology used.
Financing	Each user/family finances their system. The system is designed according to the financial possibilities of the family and to the way of doing the maintenance (contribution of work by the user)
Dissemination & Scaling Up	Mr. Piggott dictates courses and with the collected money, materials and supplies are acquired for new installations and / or projects

3. Renewable Energy Cooperative Societies in Tanzania - I-love-Windpower-Tanzania	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** off-grid, remote with bad road connection **Beneficiaries**: community schools or dispensaries, low capacity, can't afford to cover costs <u>Objective</u> To give local communities access to clean energy, to improve their life quality, to establish a proper way of community ownership
General approach	S: This model underlines the importance of being in the location and knowing how to move around. So, if the organization is located in another country it is very important to have a local coordinator who will have a major role in the project. This person shall:

	● initiate communication with the community by visiting them and raising their awareness of wind technology and the benefits they can have. ● initiate communication with the local authorities and inform them about what will be done and where. ● select appropriate locations where there is good wind and no electricity. Having a local person to do these is an irreplaceable value. **Implementing organization** S: Having in your team people with various backgrounds (engineering, law, economics) can help understand and find solutions for complex local conditions. F: Working voluntarily for these projects is a problem, people also have to work and earn money. When work is voluntary, it is difficult to properly support a lot of projects.
Enabling environment	S: "All materials can be found locally and even the electronics that have been used until now were bought in the country." Having access to all the materials locally, simplifies the project's preparation and the system's maintenance.
Ownership & Management	S: For wind turbines installed in communities, a proper way of community ownership needs to be established. What this model suggests is to adopt a traditional organizational structure that is already familiar to the community and adapt it to the particularities of a renewable energy system. Here, Renewable Energy Cooperative Societies (RECS) composed by community members were established to manage the wind turbines system. S: A community usually has its own processes and power structures. It is good to let them decide about organizational matters but at the same time give them guidance and monitor how they are doing it. "In the beginning, I select maybe 3 people and I give them guidance on how to select people: to make sure they involve both genders, people from different political parties, from different religions and so on." (Arthur on selecting people for the Cooperatives). The community also selects who will participate in the training each year. Letting all the administration to the community (and just guiding and supervising them), cultivates a sense of ownership to them. Also, it creates trust of the community to the administration. S: Having a formalised management model can increase the sense of ownership and responsibility of the community. "They select their leaders, they have the chairman, the accountant, the secretary. The roles and responsibilities of the members and also the way decisions are taken are

	all mentioned in the constitution." After the installation, the community is responsible for everything and they have really proved capable in that. S: Sense of ownership is also increased when people learn to love the wind turbines and when there are real benefits for them and their families from the wind turbine system. S: The project doesn't end with the installation. After leaving the community with the wind turbine, someone should follow up their activity them and make sure that everything functions well. "I have the telephone numbers of the leadership and I make them my friends, so I know what is going on." F: The RECS is responsible to collect tariffs from the users. The idea was that there would be profit that would be shared among the members of the RECS but until now they haven't reached this point. They have problems to properly collect the tariffs. This means that sometimes they need financial support to pay for spare parts and also it is demotivating for them because they had expected to earn some money from this project, to improve their economy.
Training	S: An important aspect of this model is that the people selected to participate in the training are people who will continue living in the community. "If trainings are given to people who are going back to their towns afterwards, far away from where the turbine is installed, then nobody is left to look after the turbine. This is not a sustainable approach." S: The training's goal is to make people capable of servicing and maintaining the wind turbine. If this is not achieved in the first training, a second or third training will be needed. However, during the first training, the teacher has to make sure that at least 2-3 people will be able to take care of the system. "I identify 2-3 people in the group of 10, who are smarter and I focus on them and repeat as many times as necessary to make sure that there is somebody to take care of the system when I leave." S: Inviting engineering students to participate and help in the training course was a win-win approach: the students had technical background but not much practical experience so this was a great experience for them as well. S: The number of participants in each training course should be limited (10 is suggested here), otherwise the class will not concentrate.
Operation & Maintenance	S: Sometimes 2 or 3 trainings are needed but eventually people are really capable of servicing and maintaining the wind turbine.

	S: A big success factor is to make the people love the turbines so that they love to see them spinning! This makes sure that people will take care of the turbines even when there is no profit from it. S: People are motivated to do maintenance when they and their families have real benefits from the wind turbines. S: Failures are an opportunity to learn if feedback is collected. This can be achieved by filling information in a logbook and informing the person who is monitoring them after each failure is fixed.
Financing	All capital costs are covered by funds that I-love-Windpower-Tanzania has collected. F: The idea was that operating costs would be covered by the RECS through the the collection of tariffs. However, tariffs are usually not properly collected and the community needs external support to pay for spare parts. F: ILWP-Tanzania had difficulties getting funds from international organizations. Writing good proposals to apply for funds is an expertise that organizations need to acquire.
Local socio-economic impacts	S: Electricity is mostly used for lighting and phone charging in schools and also for fridge in the dispensaries. The students have light to study in the evening and as a result their pass rates increase. In the dispensaries the medicines can now be kept in the fridge, most of the tests are done and the quality of the service increases. Electricity is not used for productive uses but the overall quality of life has improved for the local communities.
Dissemination & Scaling Up	F: The main obstacle that this model is facing in order to replicate and scale-up is lack of funds. “When we have money things work. And if we had a lot of money, my work on these projects could be paid also and then I could devote more time to them. So, effort should be given to improve the organization’s fundraising skills. S: An idea that is not yet realized (because of lack of funds) but could possibly have great dissemination impact is to establish an environmental radio station which would advocate the ideas of renewable energy, wind technology, locally manufactured small wind turbines, etc. People from the communities would be trained to participate in this radio station.

4. Experiencia Cajamarca - Soluciones Prácticas Perú	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** rural area, Cajamarca-North Perú **Beneficiaries**: Families without access to electricity grid; a school; Two small shops; a church <u>Objective</u> Hybridization of different generation sources and the pretension to respond to the whole community
Ownership & Management	A very good initial community diagnosis work was done, over two months to know the socio-economic reality and the specific needs of the community. Another point to highlight is the formation of a multidisciplinary team composed of professionals formed in social sciences and engineering. This preliminary and consistent work allows the formulation of a precise action plan, suitable to the community, in addition to giving participation in the process to those who will be beneficiaries of the project. The community power structure (decision making) was identified, and this was taken into account in the management modality adopted to manage and maintain the systems. The identification of key actors in the decision-making process is extremely important for the dynamics of the project, its future sustainability and respect for the previous community structure. The demand comes from the community and this is a factor of success considering the motivation and involvement of the community in the project. It can be an adverse factor if it is not disseminated and gives equal opportunity to know about the project to other communities that have the needs but do not know about Practical Solutions. Different actors were involved which assure the sustainability of the project in the time. Government actors with institutional power and available resources were involved as responsible for the most costly maintenance (major breakdowns, battery change), and as system owners.

	A community management system was formed: a technical maintenance team and an administrative team are responsible for setting differentiated rates for users according to their consumption, and for the collection of funds, which are used for the maintenance of the systems. This initiative is extremely important because it generates community organization, employment and local knowledge, local financing mechanisms are generated from the funds of energy users. The community management system takes the characterization of the community obtained from the initial diagnosis and relies on the institutions, practices and idiosyncrasies of local residents (respecting their decision-making structure, their authorities and referents, among others) They did not use appropriate technologies, or which could be built locally, which resulted in high maintenance costs and complications to obtain the required supplies and materials. The technology employed was not satisfactory.
Training	Training is formulated according to the initial diagnosis, i.e. according to local knowledge available in the community and local needs. The community receives training on basic knowledge of electricity and maintenance. The selected technical team is the one that receives the most specific and complete training. It is good that the whole community is trained on the basic issues, but the most specific knowledge does not reach the whole community but the group that has been selected. It would be interesting to accompany this methodology with some mechanism of socialization of knowledge by the technical team towards the rest of the Community. All the actors involved, including the Municipality, receive training.
Operation & Maintenance	In individual systems, users pay a fixed monthly amount. In microgrids, an exponential payment system was established according to consumption, that is, the more it is consumed by extra electricity unit, the greater the price. Is an interesting and complex system of community energy management. The maintenance is in charge of a small local company, formed and trained by PS. Maintenance is prioritized through local labor, which is efficient and sustainable. The Municipality, owner of the systems, takes care of the most serious and costly problems, which also contributes to sustainability.

Financing	The financing strategy is interesting since local financial resources are generated for the maintenance of the systems. While it is not feasible for users to bear all costs. The financing strategy contributes to sustainability of the project in time, although the one that has the greatest decision making power is the Municipal government (owners of the systems) and not the user.
Local socio-economic impacts	They have a system of evaluation and monitoring of the social impacts of the project, which allows to rectify and correct or deepen the actions (for example, to create spaces to motivate a greater participation of women).

5. Caso Playa Blanca - WindAid	
General description of project	Initial conditions **Implementing organization**: In the country **Location:** Playa Blanca-located by the sea-fishing community **Beneficiaries**: A school, out-of-grid families Objective: Install renewable systems (wind turbines) to all non-grid families within 5 years
General approach	The Community is organized and has knowledge about sustainability and ecology. The project focuses its actions on generating empowerment in the Community so that they can self-manage their own systems (community organization, community participation, local training) An initial diagnosis was made to know the needs of the community (socio-educational level, energy demand, life history, interest in the project). The Initial Diagnosis was not contemplated in the beginning of the Project; the idea came from one of the assistants to the Construction Course, who trained WindAid members on methodology about Initial Diagnosis. WindAid receives this kind of Contributions, thanks to their policy of disseminating Construction courses in Universities around the world and

	in different areas of knowledge (not just Engineering). First, trust ties were generated with the Community, through talks with the community to tell them about the project.
Ownership & Management	Schools are involved, which, as well as being users of energy, they learn and spread knowledge. A community institution, formed by community members, was created to carry out the Management, Administration and Maintenance of the System. The network between the courses of self-construction and maintenance responds to the objective of the project. Foreign volunteers potentiate and replicate the project (knowledge contribution, donations, other contributions). Building a Community Training Center is in process.
Training	The construction and maintenance courses respond to the objectives of the project to install and maintain a wind turbine per family within 5 years. Basic maintenance training was carried out in the community. Users did not participate in the course about how-to-build-a-small-wind - turbine. Training in Social Methodology was carried out as input from one of the participants. Building a Training Center in the community is in process. In the training center users can use the tools needed for maintenance
Operation & Maintenance	A community institution, formed by community members, was created to carry out the operation and maintenance of the system. In the training center that is being built in the community, users can use the tools needed for maintenance.

Financing	Generation of own funds through the self-construction and maintenance courses oriented mainly to foreign participants The participants of the courses then carry out fundraising actions for projects in Peru. The Community contributes funds for the maintenance of the Systems. The modality is a fixed symbolic fee (the equivalent to the expense for lighting with candles)

6. Small wind turbine workshops in France - Ti'eole	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** 50% on grid - 50% off-grid **Beneficiaries**: training centers or people with an interest in locally manufactured small wind turbines or a few times municipalities, technical skills and capacity varies, can afford to cover costs <u>Objective</u> To spread the idea of locally manufactured small wind turbines in France. To make a living out of it.
General approach	S: Before doing a training course, it is good to visit the place and talk with the people in person. It is easier to explain things in person than by telephone, to make sure people know everything they need and to avoid misunderstandings. S: At on-grid sites where electricity price is low, locally manufactured SWTs are not a cost-efficient solution, people have other alternatives. If you want to work with on-grid sites, you have to find people with an "alternative" mentality, an awareness of ideas like self-sufficiency and a personal motivation.

	S: A different approach is needed when implementing public projects. At least 2 people should be responsible each time, so that when one is on leave the other can take care of the system. Also when someone retires they should train somebody to take their place. F: Beginning a workshop and constructing a wind turbine without knowing where this turbine will be installed, is a problem. "You will end up collecting uninstalled wind turbines after the workshops". **Implementing organization** S: Being a company, working full-time on it and getting a salary from it will most possibly increase the quantity of projects you can implement. It makes things go faster compared to doing this part-time or voluntarily.
Ownership & Management	F: In public projects, when ownership and responsibility for the wind turbine is given to a municipality in general and not to specific people, nobody feels really responsible or cares for the wind turbine.
Training	F: One workshop doesn't ensure that people can do maintenance on their wind turbines by themselves. It depends also on the person skills and mentality.
Operation & Maintenance	S: Doing the maintenance together one time and providing a copy of the manual to the participants of the training course can help. Yet again it doesn't ensure that people can really do maintenance on the wind turbine. S: When selling wind turbines, if you want people to be independent, it is good to sell it together with the tool to raise it and lower it. S: In Tripalium's website they are trying to make a list of people that are willing to be available so that when someone needs help with the wind turbine they can directly contact the person that is nearest to them. Now when someone needs help, people generally call the person who did the training course and installed the wind turbine, then this person may put them in contact with someone else who is closer to them. S: They are also trying to make a database of all the installed turbines in France. Some people may need extra help to register this information online. This information is valuable feedback about the failures that wind turbines have and the maintenance in general.
Financing	S: Ti'eole is a company and they don't get funds. Their work is covered by the participant fees. Cost of materials is paid by the person who buys the wind turbine. This model can be successful as long as there are people

	who can afford to pay the training fee and are interested in this kind of projects.
Dissemination & Scaling Up	F: Ti'eole's model is adopted for France. It couldn't be replicated in a developing country because they actually sell their service and the people there wouldn't be able to afford it.

7. Le jardin des cheminots à Narbonne - Ti'eole	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** on-grid **Beneficiaries**: a shared garden association inside the regional park of Narbonne, high technical capacity, can cover the operating costs <u>Objective</u> To spread the idea of locally manufactured small wind turbines in France. To make a living out of it.
General approach	S: Choosing a place that is used by many people (a group or a community) to be electrified by the wind turbine increases the potential impact of the project.
Ownership & Management	The garden association will have the ownership and management of the wind turbine.
Training	S: A good strategy is to provide the training course for free to the people who are going be responsible for the maintenance but charge external participants normally. A small number of external participants can be helpful to support the project financially.

	S: When working with communities or groups of people, it is good to let them decide through internal structure who will participate in the course.
Operation & Maintenance	S: People with experience on electric systems or with technical skills in general have a much better chance to receive the training successfully and be able to do maintenance on the wind turbine system after the course.
Financing	The capital costs will be covered by the regional national park of Narbonne. The operating costs will be covered by the association's budget.

8. Small wind turbine workshops in France - Tripalium network	
General description of project	<u>Initial conditions</u> **Implementing organization**: In same country **Location:** both off-grid and on-grid (50%-50%) **Beneficiaries**: training centers or people with an interest in locally manufactured small wind turbines, technical skills and capacity varies, can afford to cover costs <u>Objective</u> To spread the idea about locally manufactured small wind turbines in France. Vision: To help people become more self-sufficient about their energy.
General approach	S: In countries like France, where electricity from the grid is very cheap, installing a small wind turbine is not a cost saving choice. In this case, an important success factor is the presence of alternative people. People who have the mentality of self-sufficiency, permaculture and things you do by yourself. S: Tripalium's approach is to encourage people to be active and self-sufficient during all phases of a project. For example, the person who is

	interested to organize a workshop is encouraged to try and find the participants. During the workshop all people have an active participation, both practically and in theory. Also, people are encouraged to be self-sufficient about maintenance, to help each other and cooperate in their local network and not be dependent on Tripalium's teachers for support. F: A mistake they were making for some time was that they were not always arranging where to install the wind turbine at the beginning of an agreement. They soon realized that they had to make sure that after each workshop the wind turbine would be installed somewhere. Otherwise, they would be going back home with a turbine after each workshop. **Implementing organization** S: Having a vision and a personal motivation improves the sustainability of the projects. Especially since the work of people in these kind of projects is largely voluntary (in most cases). S: "You don't need to be expert to teach something to the others. If you know a little bit more you can still teach what you know more than the other".
Enabling environment	**Logistics** All the tools and materials for the wind turbine and the tower have to be transferred to the place where the workshop and installation will take place. A van is needed for this job. They prefer to buy everything in their city and then transfer it because they have specific suppliers that they work with and they know how to move around.
Ownership & Management	The person who pays the cost of the materials is the turbine's owner and is responsible for its operation and its maintenance.
Training	A lot of best practices for training from Tripalium! S: It is a good idea to make a theoretical introduction and explain the most frequent questions at the beginning of the course. If you don't do this, it is possible that 10 different people might ask you the same question at different times which is time-consuming. S: Participants are divided into 3 groups doing a different process at the same time. In order to make sure that all participants have an overview of all the processes, one time everyday they stop the workshop and each group explains to the others what they have done and all the problems they have encountered. The instructors correct or add information if it is necessary.

	S: A max number of participants is around 20. In most cases, it is 1-10 participants. S: It is a good idea to have 2 or 3 teachers during the course, especially if the number of participants is around 20. "The idea is to split the work, otherwise it can be very tiring and also it is better for the participants because every teacher has a different way of explaining." S: One of the most important best practices is how they encourage people to become teachers themselves. This way the Tripalium network has grown significantly over time. People who have participated in one workshop are allowed to come back to as many workshops as they want for free, to participate and help the teacher as well. Then after some workshops they can become teachers and organize a workshop themselves.
Operation & Maintenance	S: This model encourages people to be active in maintenance and to do maintenance together. That is, to communicate with other people in their local environment and cooperate to solve issues. Together they can remember better, discuss the problem and be more confident. However, this doesn't happen as much as Tripalium wants, people cooperate but just a little. For example, people are encouraged to do a wind turbine birthday party every year. The idea is to lower the turbine and do the maintenance together and celebrate as well. This could really help strengthen the local network but it hasn't really happened until now. Through website tools also, people are encouraged to give feedback on their wind turbines, discuss about their problems and help each other, so become more capable of doing maintenance on their turbines. F: Still, some people are not capable of doing maintenance and this is a problem. Tripalium can offer some support if needed but it is not like the guarantee of a product. They can't support all the projects on a regular basis, that would be a full time job. So, there is still work to be done towards making people self-sufficient in taking care of the wind turbines. F: For some time, Tripalium hadn't realized how important it is to keep contact with the owners of the wind turbines, so valuable feedback, which would help to improve the wind turbine was lost. Now they are trying to collect this feedback through their website. S: A network facilitates communication and cooperation of its members and creates synergies. Members of Tripalium help each other to support projects, e.g. when someone from Tripalium gives a workshop in a place and there are turbines in the area that someone else has installed, he

	might go there and help the people. This way, more projects can be supported.
Financing	S: Participants pay to participate in the workshop, so the instructors can be paid for their work. The cost of materials for the turbine and the tower is covered by the person who buys it. This model works for France because there are people who can afford this cost.
Local socio-economic impacts	S: Some years ago, there was no trust in home-built SWTs. But after 6-7 years that all commercial SWTs have proved to have problems, the manufacturers have gone bankrupt and there is nobody for maintenance anymore, home-built SWTs have gained reliability and people have seen that they are working, they are quite efficient and there are people who can support you in the maintenance, there is a network and it is something alive.
Dissemination & Scaling Up	S: Tripalium's example shows us how a network of people related to small wind turbines can be formed in a country. They started with 3 people and today around 700 people are part of this network. The number of members has increased through the workshops mainly. Especially workshops that were organized in communities or collectives' space helped a lot to spread the word about Tripalium. Also, the fact that new people are encouraged to organize workshops by themselves has increased the number of teachers in the network. And more teachers means many more members for the network. S: Tripalium's model is adapted for France. It could be replicated in other countries with similar conditions (economic, social, environmental). Important factors is presence of people with a mentality on self-sufficiency and similar ideas and people who can afford to pay the cost of a training course.

9. "Spithari" project - Nea Guinea	
General description of project	<u>Initial conditions</u> **Implementing organization**: in same country

	Location: off-grid, 2km from nearest town, 1 hour drive from Athens **Beneficiaries**: group of 7 people (experimental eco-community), high awareness but low technical capacity, difficulty to afford costs <u>Objective</u> To support people in becoming self-sufficient about energy. This project was kind of an experiment for both Spithari and Nea Guinea to see how a system functions and is sustained in real conditions. Also, Spithari needed the electricity and Nea Guinea used the location for training courses.
General approach	S: Choosing a good installation site is important. The community will be happier because the cost will be less and the production will be higher. Some criteria are: wind resource, distance from the loads (to reduce the cost of cables), quality of rock and ease of maintenance.
Ownership & Management	S: The people of Spithari are the owners, even now that the community doesn't exist anymore. Their plan is to donate the wind turbines to another project. This community also had a strong sense of ownership of the system, they were proud about it and they liked to show visitors around. One reason for this was that the community already had a mentality of renewable energy, self-sufficiency and diy constructions. These were not new ideas to them.
Training	F: Apart from a few-hour description of how the system works, there was no training offered to the community for these particular wind turbines. Two of them had participated in previous Nea Guinea's workshops so they knew the basics of small wind turbines. As a consequence, the community didn't really learn how to take care of the system and needed external support on this.
Operation & Maintenance	F: All maintenance work depended on the availability of one person. The community was not capable of doing maintenance, Nea Guinea was responsible for this part and specifically one person (Kostas). It was not a priority of this project to make the community independent in maintaining the wind turbines. Kostas was generally available to support them, but there was no plan B for the case that he would be away or not available.

	S: In projects like this one that the implementing organization is located close to the community, the system can be sustained even if the community is not capable of maintenance. For this model to be successful, it is important that the implementing organization is in close distance and is generally willing and available to support the community whenever they have a problem. In the case of Spithari and Nea Guinea, this worked successfully because the project was a common experiment for them and they both had benefits from it.
Financing	Cost of materials paid by the community. All work donated by Nea Guinea S: All work was voluntary but there were motives for the implementing organization to support the project. S: The community applied and got funds for its activities (including the wind turbines) from the European Youth in Action program
Dissemination & Scaling Up	S: This project had good dissemination in the sense that a real functional system was demonstrated to a lot of people. Whenever visitors came to Spithari, the community would show them around the system and explain how everything works. Also, they made one presentation of how to build a small wind turbine, using a demo wind turbine that Nea Guinea gave them. A lot of people visited the site and have been inspired by it. Some of these people contacted Nea Guinea and came to one of the presentations or one of the courses. S: Dissemination was higher because the community had the mentality to disseminate the idea and also because they were working together with Nea Guinea in this direction. Spithari and Nea Guinea are both connected to a kind of informal “alternative” network in Greece, they move in the same circles, they have similar values, so they could cooperate effectively. F: All maintenance work depended on the availability of one person. He was close and could support this project effectively but this model cannot scale-up. F: Working voluntarily means that you can support only a small number of projects. F: There is small potential to scale up in Greece because the electricity network is widespread and people who would choose this solution are a minority. “They are people who are usually involved with eco-communities, permaculture and self-sufficiency, who buy a land in a place

	outside a village where there used to be plantation so there is no electricity network and decide to build something there. It happens but it is a bit rare.”

10. “Filiatra” project - Nea Guinea	
General description of project	<u>Initial conditions</u> **Implementing organization**: in same country, 3 and a half hours drive from the location **Location:** off-grid, small distance from nearest town **Beneficiaries**: small house used only 1-2 moths/year by 7-10 people for agricultural purposes, no technical skills, can afford to cover most of the costs <u>Objective</u> To support people in becoming self-sufficient about energy.
Ownership & Management	The community’s relationship with Nea Guinea is a bit like hiring a company but in friendlier terms. Nea Guinea’s work is partly paid in the form of donations. This agreement seems to be satisfactory for both parties. If the work was completely voluntary (like the previous experience), it might have been a problem because this location is quite a long way from Athens and Nea Guinea doesn’t have so many other motives to be there.
Operation & Maintenance	There was no effort to make the community capable of taking care of the system. Nea Guinea is completely responsible for the maintenance. This works until now but there haven’t been any failures anyway. If they need more support in the future, it might be a problem because it is quite a long way from Athens to the community’s location.

Dissemination & Scaling Up	This project is successful in the sense that the wind turbine is working and the people are satisfied but it strongly depends on the availability of one person who can support a limited number of such projects. As it is, this model cannot scale up.

11. Exp. Salta - 500RPM	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** 130 km from Salta Capital-North of Argentina **Beneficiaries**: Rural school, Educational community, Rural community <u>Objective</u> To generate electrical energy to meet the energy demand in the educational process (lighting, audio, video).
Ownership & Management	S. The election of actors is made according to the roles to fulfill in order to contribute to the project, both from its beginnings to its future sustainability. We are talking about working with rural schools, institutions that are enduring in time and with important legitimacy and social functions in the rural community. F / S. The project formulation is not participatory, since the recipient is informed when the project has already been approved. This modality has its advantages, the main one is that it does not generate false expectations in the community. The main disadvantage is that the participatory planning can be in itself an instrument that generates community organization, that implies to know the common problems of the neighbors; it leads to a learning process that can contribute to the sustainability of the project (eg. allows the school to manage its future projects by itself). S. The planning and execution of the project is participatory and involves all participating actors, defining objectives, roles and responsibilities.

	S. It is very important to select the actors, considering the skills and competencies to incorporate the necessary technical knowledge for the maintenance of the system, and the infrastructure, tools, work and monetary resources to carry it forward. We refer to the University of Salta, with a chair specializing in renewable energy studies, and the staff and adequate budget to sustain and replicate the project over time. S. The selection of Piggott technology for this socio-educational project is very satisfactory because it involves a large amount of volunteer work, which is provided by the target community in the majority, but also by the other actors involved. Approximately 30 people are needed to build the base of the tower, to carry out the construction and to carry out the installation, the transfer also involves work. F. There is no initial diagnosis of the community, in the sense of socio-economic, demographic, etc. analysis, even though working together and with the school ensures a knowledge about the community in general. S. The School is the link with the whole community and an important part of it. Working with the schools contributes to the multiplication of knowledge of the project in general, reaching a large number of beneficiaries. Success Keys: ● The capacity to solve most problems locally, which is more efficient, (faster solution, saving of the costs of sending materials abroad or of bringing people who can do maintenance from outside to the community) ● Fluid communication among local participants and people from outside the community. ● Solid Institutional Network: Good coordination and articulation with the University and the Technical schools, which allows the sharing and transmission of knowledge and equipment
Training	S. A significant number of people are involved during the course of construction of the wind turbine. The interesting thing in this case is the diversification of the participants, representing the actors involved in the project (teachers and students of the rural school, the University of Salta) S. The methodology of Planning Courses and Training concentrate all the processes in a week, being efficient in terms of resources and contents (the selection of the actors that will receive the training. depends on this). There are working groups, rotating through all the processes to acquire

	the knowledge of the different steps in the construction. It is also a methodological success to focus on the practice and the training to the community on the maintenance of the system, performing repetitive actions on pulling up and down the tower for example. F. Centralizing training on the most suitable people is efficient in terms of time / resources, but this should be supported by the replication and multiplication by the latter of the knowledge acquired to the rest of the community. The opposite may be detrimental to the sustainability of the project, while hindering the goal of spreading knowledge about the use and maintenance of technology.
Operation & Maintenance	S. Daily operation and maintenance depend on the user, who is trained to do so. The modality that local actors can respond to most of the technical problems of the system, and the actions that are necessary for its operation is very interesting in terms of efficiency of resources and time. 500RPM responds in the third instance, if the school and the University of Salta cannot answer the problem, and does so with accurate information on the problem to be solved. S / F. The contribution of voluntary work for the maintenance of the system is fundamental. It is important to count the volunteer work contributed, for example in number of hours / technical staff, as a way of making it visible. If the user of the energy has funds to remunerate the work monetarily, it will be contributing to the creation of local employment. S. The choice of Piggott technology is fundamental for the system to be able to be sustained locally. It is a technology designed to be built with local resources and materials.
Financing	S. In this experience, many actors contribute resources to the project (University of Salta, Unir Foundation, others), which is a positive factor, since diversifying sources of financing contribute to sustainability. Although several actors participate, there is a preponderance of public-national funds without which the project would not have been feasible. F. The generation of specific financial resources at the local level by the users is not contemplated. The generation of resources can be in itself a tool of community organization around the electrification system (generating a specific action of fundraising for the system of electrification, like popular parties if it is a rural community, for example). When working with public institutions that persist in time like the schools, there is more availability of resources by the user.

Dissemination & Scaling Up	S. technical schools and universities are important participants of the Project, since they have the abilities and the knowledge to replicate the project. For example, the University of Salta promised to build and install a wind turbine following the method of the NGO.

12. Los Gigantes - 500RPM-Córdoba-Argentina	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** 80 km from Córdoba Capital by mountain trails **Beneficiaries**: School-Rural internship, 30 children attend the school, 10 people teaching and non-teaching staff <u>Objective</u> To satisfy the demand for electrical energy for domestic use (shelter) and for educational activities (school).
Ownership & Management	S. The actors involved contribute to the sustainability of the project. The school at Los Gigantes is managed by the Manos Abiertas Foundation, a solid non-governmental organization capable of providing resources and technical personnel (engineering, social, audiovisual and other areas) through voluntary work The community was responsible for the construction of the base of the tower, and participated during the installation by volunteering. Students were instructed on wind energy and named their wind turbine. The board of Alternative Energies and Communications of the Province of Cordoba was involved in the maintenance of the system and its management in general. The school is the owner of the system, which was received as a donation from 500RPM. Other systems were also donations (a wind turbine and

	photovoltaic panels in the Province of Córdoba, bank of 28 batteries of the Energizar Foundation), while a wind turbine was bought through international cooperation funds.
Training	S. The training was focused on two volunteers from Manos Abiertas Foundation, who are in charge of maintaining the school in general and have knowledge of electricity; one of them has advanced knowledge in engineering. In this way, 500Rpm makes sure to leave the necessary knowledge in the school to perform regular maintenance and detect problems of operation. F. Focusing knowledge on few people can be efficient and effective, but the maintenance and operation of the system depends on these people. It is an obstacle to sustainability if those people give up doing the work. There could be a mechanism of socialization of knowledge from these two people, who could carry out trainings so that other people of the school acquire the knowledge and the capacity to perform the maintenance. S. The 500Rpm courses are effective, since the community can solve most of the problems on their own. They could be complemented by further training to reinforce and deepen knowledge on the system and its maintenance.
Operation & Maintenance	S. The use of Piggott technology is decisive, since its design (tower and wind turbine) allows the users to perform periodic maintenance. It is not the same with the other 2 commercial wind turbines owned by the school. The wind turbine cannot be disarmed and to access the wind turbine, a person must climb an elevated tower and have the tools to manipulate it. S. The selection of the actors is fundamental. Manos Abiertas has the financial resources to operate and maintain the system, and has qualified technical workforce through the work of its volunteers. The Board of Alternative Energies and Communications of the Province also provides technical support to the Piggott system when conducting its control visits to commercial wind turbines (although they are not responsible for their repair).
Financing	S. The project received funds from different sources: Wind turbine construction Courses; the State through the Ministry of Science and Technology; the NGO Manos Abiertas and others; as well as community

	workforce and volunteer workforce from Manos Abiertas Foundation.

13. Small wind turbines in Nepal - Practical Action Nepal, KAPEG	
General description of project	Initial conditions **Implementing organization**: In the country **Location:** off-grid, extremely remote places, often with no road access **Beneficiaries**: rural communities or schools, very low capacity, can't afford to cover costs Objective To electrify communities in very remote places who have no access to electricity or communications
General approach	F: Most wind turbines were installed in villages in extremely remote areas of Nepal. These villages have no road connection and people have to walk for many hours to reach the closest town. In this context, it is doubtful if small wind turbines are a viable solution because maintenance becomes a very complicated issue. This model's approach also didn't address this situation. There was neither sufficient training to make the people capable of maintenance nor external support offered to them. Once the training and installation of the wind turbine was complete, there was no other support to the community, the project was practically finished. There were some good aspects in the general approach and methodology of this model. However, the particular context in the villages and poor design of the long-term maintenance from the implementing organization, sealed the fate of these projects.
Enabling environment	F: In Nepal, wind is seasonal and wind assessment is necessary before installing a wind turbine. Otherwise, you risk having a wind turbine that operates only three months of the year. Until now, there is no wind information available and someone has to take measurements for a year before deciding to do an installation. This problem can be solved with a Wind Atlas that is being developed and is going to be published by the end of 2018. This Atlas can change the

	overall scenario of wind turbines in Nepal and answer the question whether wind turbines are an appropriate technology for the country. F: The market in Nepal is not favourable for anything that is locally manufactured. When your country is between China and India, which are the giants of production and the cost of production is very low, constructing small wind turbines locally becomes very expensive. They simply can't compete with the prices of the chinese and indian ones. F: It is not possible to get government subsidies for locally manufactured wind turbines because they don't comply to any quality standards. When the government calls for tenders for wind energy projects, this is a problem because the wind turbines need to be properly certified.
Ownership & Management	F: There was effort to engage the community in decision making processes from the beginning of the project. Also, to establish a proper way of community ownership (a community committee). However, the committee members were often changing because people were not staying long in these remote villages. The new members didn't feel engaged with the system, the sense of ownership and responsibility, that was there in the beginning, was lost. As a consequence, there was no proper management of the wind turbines. The frequent migration of the community members is a factor to be considered during the design of a project. The same problem occurred for wind turbines installed at schools. Teachers were changing job often so there was nobody left there who knew about the system.
Training	F: The training that local people received was not sufficient to make them capable of maintaining the system. People in these remote villages don't have awareness and understanding of technology, they don't have a proper education. The training was not adjusted to the local people's capacity and there was no attentive effort to really make them capable of maintaining the wind turbines. Also, in the case of wind turbines installed at schools, training was offered to the primary school teachers who didn't have any technical knowledge, so again they were not capable of looking after the system.
Operation & Maintenance	F: The local people were not capable of doing the maintenance. The local capacity was very low (education, technical skills) and the training they received didn't properly address this.

	F: The remoteness of the villages made maintenance a very complicated issue. When there was a problem with the wind turbine, the people had to walk very long distances to the nearest town just to make a phone call. They would call a contact person from Practical Action who would try to understand what has gone wrong and which component is faulty but usually this was not possible just by a phone call. Practical Action would have to visit the place and understand what is the problem, then go back to the town and buy components and go back again to the village to fix the problem. This means a lot of logistics expenses and Practical Action couldn't offer this kind of support, especially after the first year of the projects. F: Another problem was that in many cases the committee couldn't pay for maintenance. It depended on how effectively the committee was running the system. If the committee was not able to collect the monthly tariffs from the users, then the system would probably shut down. F: Except giving advice by phone, Practical Action didn't really support the maintenance on these projects. Sometimes members of Practical Action would consider going to the place when there was a problem, but no more than 1 or 2 times. Also, there was no support from another local organization or institution. F: The communities also didn't have a sense of ownership and their interest was fading out with time. So, sometimes the community didn't even try to do something when there was a failure.
Financing	Capital costs were covered by Practical Action. They are financed by grants. F: The committee established at the community was then responsible for collecting tariffs from the users and pay for the operating costs. This didn't work out because the tariff collection system didn't function properly. F: Practical Action had a budget to implement the project but they didn't save funds for maintenance. So they didn't really cover any post-installation activities. If they had to visit the place to do maintenance they couldn't do this for free.

14. Project in India - Practical Action India, KAPEG, Gram Vikas	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country

	Location: off-grid, very remote (6 hours to nearest town) **Beneficiaries**: households and community center in rural communities, low capacity, can't afford to cover costs <u>Objective</u> To train the local fabricators in India to construct small wind turbines. To electrify rural communities.
General approach	S: One of the main reasons that this project was successful was the active participation of the local NGO, which was constantly monitoring and supporting the communities. One of the most important parts in a delivery model is that you need to have an entity that is looking over the system after the project. So, if any problem occurs someone is right there to solve the technical issues. You need to have some kind of local support and a good example is Gram Vikas that is doing a perfect job. S: The communities were approached from the beginning of the project. Without the participation of the villagers it is very difficult to work in these rural areas, there is a lot of labour work also and their assistance is necessary. You have to coordinate with them from the beginning. S: Effort was given to use locally available materials. During the fabrication process all people were actively involved in order to find out what parts are easily available locally and where to find the other parts.
Ownership & Management	S: The community owns the system. A committee made up of community members was formed to manage the system. Also, the tariff collection system is continuously monitored by local NGO, Gram Vikas, and works very properly.
Training	S: This project involved a lot of training. Altogether, they gave at least 5 workshops, either in the nearest town or on-site. The trainings were very extensive and went through all stages of building and installing a wind turbine system: how to build small wind turbines, how to fabricate the towers, how to do ground foundation work for the towers, how to erect the towers, etc. Even after the project period, they went to the community and did a training focused on maintenance. The trainings were considered very successful and the local people have already proved very capable maintaining the system. S: The trainings were focused on local fabricators and students from local technical schools. The technical background of the participants was an important factor for the success of the trainings.

	S: If replacement of the wind turbine is needed, the local fabricators should be able to replace the turbine. This was the objective of the workshops offered to them.
Operation & Maintenance	S: In case of failure, the community themselves are able to take the tower down, they don't usually need support in that. The system operates very well because the workshops were very effective. S: If they need any assistance they will call the people in the regional office of Gram Vikas and they will contact Practical Action. The communication is very effective in that way. S: In this project the community is able to pay for maintenance because the tariff collection system is continuously monitored by Gram Vikas and works very properly. So, within the first 6 months, the community had collected a good amount of money from the tariffs that was saved for maintenance issues. The system was profitable and they had money for maintenance.

15. Practical workshops for portable self-built small wind turbines in Chile - Bright Planet Education	
General description of project	<u>Initial conditions</u> **Implementing organization**: In foreign country **Location:** for this pilot project location was on-grid and not remote. Potential future projects in off-grid, very remote areas **Beneficiaries**: (for this pilot project) a family house, medium capacity, can't afford to cover costs. Future projects for indigenous communities <u>Objective</u> This was a pilot project to investigate the local potential. The wider objective is to train local people in the city of Coyhaique to set up a local production unit for construction of small wind turbines.
General approach	S: Having a local organizer is an indispensable asset: to find local partnerships, to identify appropriate locations and make all the necessary

	arrangements e.g. transportation, accommodation, participants, materials. F: If the coordinators don't have a common approach, a lot of misunderstandings and unpleasant surprises can occur that can damage the sustainability of the project. This is why some responsibilities have to be clearly defined and agreements officially made. F: Having to import all of the materials from abroad is an extra trouble. It is important that the chosen wind turbine design is constructed with materials that can be found locally. F: Not taking into account potential charges and delays that may occur at the Customs when transporting materials, can increase the cost, cancel local partnerships (due to change of schedule) and create a "bad start" for the project. S: Partnership with local organizations, institutions and networks is important at all phases of a project: planning phase, implementation, maintenance and dissemination of the project. S: Installing a wind turbine in a place that people visit often is a good idea for demonstration purposes.
Enabling environment	F: Charges may be applicable at the customs when importing materials.
Ownership & Management	S: One of the wind turbines is functional: it is owned and managed by people who had participated in the workshops and were able to do the annual maintenance. Also, they give feedback from time to time for its operation. F: The two other turbines were not properly installed. One was installed in a location with no good wind resource. The other was not installed during the workshop and the local people don't have the skills but mainly don't have the equipment to complete the installation themselves.
Training	S: One workshop is often not enough. An extra workshop to a few selected people who are competent and committed to continue with the project can make all the difference. It shall ensure that at least a few people can do the regular maintenance and take care of the system. S: Selection of participants that either need the technology or have the means to disseminate it to people that need it.

Financing	F: More focus has to be given on fundraising if these projects are to be sustainable. Designing, planning, implementing and monitoring this kind of projects, if done well, is a full time job and can't be voluntary in most cases. Usually people who do this voluntarily or almost voluntarily get tired after some years and this can have a strong effect on the sustainability of the projects. F: Being an NGO or charitable organization might not be an appropriate legal form if members need to get paid for their work.
Local socio-economic impacts	S: It helps to have a strategy for the potential productive uses of energy in the area. These can best be identified with the help of local organizations, networks and institutions that are already active in the area.
Dissemination & Scaling Up	There is potential to scale up if proper funding is found and responsibilities of the actors involved and agreements between them are clearly defined.

16. The Brazil project - I-love-Windpower-Brazil	
General description of project	<u>Initial conditions</u> **Implementing organization**: In foreign country **Location:** Pilot: on-grid, in town or close to it. Future projects: off-grid, remote **Beneficiaries**: Pilot: school of Capoeira in the town, farm outside the town, low capacity, can't afford to cover costs <u>Objective</u> ● 2013: was more of a scout program to understand the local culture, needs, environment ● 2015: they wanted to install a demonstration turbine in Montes Claros city and hoped that people would be interested, would see that it is working and it is cheap to build and ask them to organize more workshops. ● 2015-2020: train people from off-grid communities so that they go back and build turbines in their places.

General approach	F: The choice of location is very important. One criterion is having local partnerships in the area. However, there should also be good wind resource and there should be a need for the electricity. If the place is connected to grid and electricity is cheap the people are much less interested in maintaining a wind turbine system. This can result in less interest and motivation from the people to take care of the wind turbine. Alternatively, if there is not a necessity, there has to be a mentality for DIY renewable energy systems. People need to have motives in order to accept and take care of such a system. F: A good sizing of the system is necessary before the installation. If the components are not the right size, the system will fail, resulting in costs, wasted time and loss of motivation. **Implementing Organization** S: Working as a team when implementing a rural electrification project increases motivation. F: Working voluntarily can be a problem because your normal job is usually the priority. "One of the problems in ILWP is that everyone gives time when they have it but there is no continuity. If we had someone that could keep it going that would help a lot."
Ownership & Management	F: A sense of ownership should be cultivated to all people who own the wind turbine system. Here, only one person (the Capoeira master) had perhaps a sense of ownership but he was absent half of the year, so the wind turbine was actually unattended.
Training	S: A local partner (person or organization) knows how to approach people and communities and invite them to participate in the training course.
Operation & Maintenance	F: If failures are not fixed quickly and turbines remain inactive for long periods, people lose their motivation and their trust to such systems. If there is nobody capable of doing maintenance on time, these systems can become more of a problem than an asset to the local people. F: One person is not enough to take care of the system, however passionate and motivated he/she is. This can work if the person is an expert on small wind turbines but again there are problems about sustainability. Especially when we are not talking about experts, there should be a team of people being responsible and working together on the maintenance.

Financing	ILWP covered the capital costs and also the operating costs (which are not actually so much since the turbines are not operating). S: ILWP has applied and succeeded to get funds from Rotary International and also from Rambo, a UK-based, private engineering company. F: However, the funds didn't cover the work of those involved which was voluntary.
Local socio-economic impacts	F: The motivation is lost because people don't trust the wind turbines, they see them there for 3 years but no turbine works. The one in the farm never worked and the one in the school worked for about 2 weeks. So after all, this is not a good demonstration project at all.
Dissemination & Scaling Up	F: The main obstacles are that they are not a team anymore working on the project and there is no continuity; everyone gives time when they have it.

17. Exp. Córdoba - Alternative Energies and Communications Direction of the Córdoba State	
General description of project	<u>Initial conditions</u> **Implementing organization**: In the country **Location:** Province of Cordoba-Argentina **Beneficiaries**: 226 Rural Schools <u>Objective</u> To electrify all off-grid rural schools in the Province of Córdoba with renewable systems.
General approach	F. There was no initial diagnosis on the socioeconomic conditions, like the process of rural-urban migration and its impact on rural schools.

	S. The project was planned and executed by stages. This allowed to incorporate learning during the process.
Ownership & Management	S. The initiative arises from technical personnel from different ministries. A comprehensive survey of the total number of schools was carried out, articulating information from different ministries, analyzing different generation technologies and local energy resources, choosing the most efficient ones according to the context (photovoltaic energy). It was a priority to start with those schools whose socio-economic situation was most unfavorable. S. Technical assistance is requested from state agencies and privately owned renewable energy companies S / F. A standard system was designed for all schools , which allows lighting and the use of some devices used in school (radio, tv, cellular charge). Standard systems are small for some cases and bigger for others. In the different stages of the project, the schools with the greatest need of consumption are repowered. The owner of the systems is the Provincial State, who has to transfer the systems according to their use that , checking if there are other schools with unmet needs.
Training	F. The available local knowledge was not used, nor was the subject of maintenance issued from a pedagogical function (taking into account that the recipients-users are schools). There was no training aimed at self-management; the user was given a manual with instructions. His function in maintenance was to warn that there was a failure and wait for it to be resolved. Schools are located in remote and inaccessible places, so making trips to places for problems or failures that can be resolved locally is inefficient.
Operation & Maintenance	F. The user was not considered in the maintenance of the systems, not even for simple maintenance activities. S. Under the conditions for the company that tendered and executed the installation of the systems, it was specified that it should be responsible for the maintenance for two years. In addition, the company had to train in those two years, the personnel of the Province of Córdoba that soon

	would be in charge of the maintenance. Also, when leaving, the company had to leave the corresponding tools (sustainability of the experience). From the state it was recognized that there was neither the knowledge nor the tools to carry out the maintenance so the training of the state personnel was planned for that purpose. S. A system of monitoring and maintenance was planned for the systems that proved effective but not efficient.
Financing	Recently, as the will of the politicians changed and because the project depends only on the budget line of the government, maintenance has been weakening and the necessary inputs for its correct application are not available.

18. Malvinas	
General description of project	<u>Initial conditions</u> **Location:** Malvinas is a small scale case. They covered the entire population. **Beneficiaries**: 150 families <u>Objective</u> To meet the demand for electrical energy. To increase the efficiency of domestic systems based on diesel generators through the use of wind resource.
General approach	S. Tests were carried out on different wind turbines for more than 10 years to determine which was the most suitable for the project. S. An Initial Diagnosis was performed to determine the needs of users, their availability of payment, systems in use, among others. It was a deep socio-technical diagnosis. S. The implemented Methodology identified the most qualified person of the place, and that generated the possibility of carrying out a small business.

Ownership & Management	The Project was planned step by step, starting from an Initial Diagnosis of the needs and a level of knowledge of the settlers The User was able to decide when to start the Project. Each stage included a financing and training system, so that to request the second stage of the project, the first stage should be completed. (The First Stage was to acquire the Bank of Batteries, the second to install Wind Turbines) The systems were tailored to the users' needs. A small local company was formed to carry out installation and maintenance. The Government subsidizes small businesses to make their work cost-effective (transportation costs)
Training	The local owner of the small business was trained for a long time in the operation of small wind turbines. The installer performed the training during the installation, face-to-face with the user.
Operation & Maintenance	The user performs the basic maintenance of the generator set, the wind turbine and the battery bank. It was thought with a long-term perspective. Based on the capacities and motivation of each user, a customized maintenance system was designed. The project was not intended to replace the previously used systems, but to improve their efficiency by reducing fuel consumption. The government ensures the sustainability of the project through the transportation subsidy to the private company that performs the maintenance.

19. PERMER-Chubut-Argentina

General description of project	Initial conditions **Implementing organization**: In the Country **Location:** Off-grid rural community -Province of Chubut **Beneficiaries**: 1500 units (commercial wind turbines) Objective Satisfy demand for electric power in isolated rural units / replace diesel systems
General approach	F. There was no initial diagnosis on the beneficiary group. Socioeconomic, sociodemographic, sociocultural realities, for example, were different among the beneficiaries. There was no in-depth knowledge of the beneficiaries' consumption needs, their level of knowledge to maintain the system, their ability to pay.
Ownership & Management	F. The Project was designed from the top down; beneficiaries and future energy users did not participate in any stage of the project design or planning process. The owner of the system is the State. The user pays a minimum fixed fee. F. The project did not contemplate successive stages. The user was warned that he would be beneficiary of a wind turbine in the first visit. In the second visit, the wind turbine was installed. F. The generation systems were not designed according to the consumption of each user but the same system was installed to everyone. This is inefficient, since a house of 1 person does not consume the same as one of 10 people. F. The project proposed the replacement of existing systems (mostly, diesel generators), not considering hybridization or improving efficiency in the generation of energy based on existing, local knowledge, which would ensure greater possibility of sustainability. The battery bank installed did not contemplate the possibility to be fed by the diesel generators. When the wind turbines stopped working, people could not charge the batteries with the diesel generators (the batteries were also ruined). F. The Government chose to concentrate all actions instead of working fully with other actors, which would have been more efficient and

	participatory. For example, it assumed the task of maintenance of houses that were hundreds of kilometers away, instead of involving local actors. S / F. A national wind turbine model was chosen, which encourages national production and work, as well as technical improvement in the field of renewable energy. A large number of wind turbines were broken up, for various reasons, including the strong winds from the south (different from those in Córdoba, which were the original reason why the company originated), the wind protection system, the brake. F. The project did not contemplate stages in its execution. The beneficiaries were made aware that they would be recipients of a wind turbine (if they agreed to it), on a first visit. The second visit was for the system installation.
Training	F. Local knowledge was not taken into account in the project. There was knowledge about wind turbines and diesel generators. F. There were no instances of training with the user. The maxim was "do not touch". This was part of a maintenance plan that contemplated visits twice a year, and with the intention that the user did not break the system. It is an inefficient methodology, because with basic training, the user can learn to perform the simplest maintenance tasks, such as adding water to the batteries (which in this case were in a locked room), saving the maintenance team long trips to do so.
Operation & Maintenance	F. Maintenance was planned through a specialized area of the Government of Chubut. That plan contemplated visiting twice a year each system to perform general maintenance and extra visits in the event that the system broke down. The budget was reduced and the planned objectives could not be fulfilled : most of the experiences could not be visited. F. The user was not taken into account to perform basic maintenance tasks; the systems could only be manipulated by the project maintenance team. Even if having the money to do so, the user was not authorized to make any modifications to the system. S. Cooperatives of distribution of electrical energy were included to perform a part of the maintenance. In comparative terms, they were able to sustain a good number of systems in operation.

	S. Reliable user information and follow-up (number of visits, repairs, observations, others)

Analysis of Wind Empowerment Cases

Origins of the Project

In reference to the variable that looks into the origins of the projects, it is worth highlighting as the first success key, the realization of an initial diagnosis to know in depth the community where the wind turbine will be installed. Knowing the details of the socio-economic, socio-demographic, local level of knowledge, through tools such as in-depth interviews (dialogue with potential users), surveys, field journal (noting down observations), among others is the basis for the design of a sustainable project.

It is also the basis for the design of a project that meets the needs of the community, to come to know the most efficient electrification system, as well as to design the later management and maintenance of the systems. Performing a good initial diagnosis implies, first of all, building trust with the community, identifying the authorities and their referents as well as the power structure (decision making system), the predominant economic activities, the times of the community, their idiosyncrasy and world view.

In order to carry out an adequate initial diagnosis, according to the experiences investigated, it is advisable to take into account social and technical variables, which is why the formation of multidisciplinary teams is necessary. On one hand, the analysis of the "technical" variables (quality of the wind resource, distance between the system and the user, site of installation, availability of materials, among others) has a direct impact on the success of the project, its effectiveness. Knowledge about these variables is vital to carry out the project (it would be a very notorious mistake to install a wind turbine where the wind resource is not adequate).

On the other hand, the analysis of the "social" variables will be of utmost importance for the efficiency of the project, in order to maximize the local resources available and to contribute to its sustainability over time. Another success key is the degree of organization of the community and its ways of life. If the community is organized the times of the project are more dynamic and the sustainability of the project is supported by community agencies that the inhabitants themselves generate for the management of the system.

As regards the way of life, there are experiences in "sustainable" or "ecological" communities, which pose ways of life that put into practice the balance in the relation man-nature and self-management. In those experiences it is feasible the installation of renewable energy systems even when there is access to the grid and it is not the most efficient solution to have electric power.

In relation to the first steps of the project, another important success key refers to the selection of actors who are going to participate in it, and to the delimitation of the roles they will fulfill. The experiences of 500RPM in Argentina and WindAid in Peru are addressed mainly to schools, which are institutions that tend to last in time and involve a large number of people. Identifying and Involving strong local actors is a wise choice that contributes to the long-term sustainability of the project.

In addition, in reference to the selection of participating actors, it is important to identify the contributions they can make to the project. Involving local actors who can contribute economic resources, technical knowledge, transportation, workforce, among others, is beneficial in two main aspects: it generates greater social impact by involving more people (greater diffusion of knowledge, construction and strengthening of the social ties); and it contributes to the efficiency of the project, since the solution of problems through local actors is faster and less expensive. In projects driven by organizations that are not located near the site where the system will operate, it is recommended to work together with a local referent, be it a person or an institution.

The third success key refers to the level of community involvement in the project. The more the community is involved, the greater the possibility that the experience will be sustained over time. Community participation is not linear and responds to several factors, the most important is to identify the degree of participation and community organization before the completion of the project. A recurring mistake is to do so not involving the community, but only people outside of it.

The initial diagnosis can be oriented to the generate community participation and organization (empowerment, which will contribute to the future sustainability of the project), through participatory methodologies elaborated along with the community. The problem of participatory methodologies (as with any well-formulated initial diagnosis) is that it requires relatively long periods of time (in the case of Practical Solutions in Cajamarca, it implied two months of work). This time limitation as well as the fact that some communities are not very accessible, can make this diagnosis unfeasible.

This obstacle can be solved through local actors who have the knowledge and / or the interest to do it (eg: research teams or university students who need to accumulate experience). There is not just one methodology used to perform the initial diagnosis; its formulation will depend on the possibilities of the organization that will implement the project, as well as the time and resources available, and the characteristics of the community.

Ownership & Management

Regarding the variable related to the management of the electrification system, that is, those responsible for the systems, the modality the organization adopts, among others, there is a success key that stands out in several of the experiences: the generation of a community-based management of the systems. In the case of Cajamarca, promoted by Soluciones Prácticas-Perú, a company composed of 3 members of the community was formed, and it was responsible for collecting payments from users, and managing that money for the execution of the system maintenance. In the case of Playa Blanca-Peru, promoted by WindAid, the authorities of the community created an Energy Committee in charge of everything related to the electrification system (charges of users, system maintenance).

The rate was set at 1 (one) peruvian peso per day, the value of 1 (one) candle, which is what people used for illumination every day. This fee does not cover the total costs of maintenance, but it generates participation and community organization. It also motivates the appropriation

of the system by the users and promotes local skilled employment. In the case promoted by I-Love-Wind-Power in Tanzania, a cooperative was formed to manage the systems. The creation of the cooperative itself, responded to a participatory methodological design that aimed at involving the different actors (political parties, religions, among others) to generate representativeness.

The construction of community and associative management experiences is an important contribution to the sustainability of the project, since it is the users who control the whole process or a large part of the project (installation-training-maintenance-administration), generating positive social impacts. It is not a simple task to create these experiences, especially because they are medium- and long-term processes that need to be periodically assisted, such as the creation of cooperatives, committees and associative groups in general. The success key of the mentioned cases is to have generated management systems based on a good knowledge about the community and its form of organization.

As for voluntary work, it is regarded as a success key in most cases, but mainly for the construction and installation process. However, it has resulted in an obstacle to the maintenance process, since the work required is of periodic nature and must be sustained over time. The problem with volunteerism is that the volunteer provides his / her time as much as possible, but often prioritizes other activities other than maintenance which must be persistent, and the tasks must be completed within a certain period of time. Nonetheless, in all the experiences investigated, voluntary work is fundamental and indispensable.

The degree of commitment changes when there is a consideration for the service, which should not necessarily be financial, but beneficial to the contributor (exchange of local productions, work, training, among others).

Another success key to be highlighted in the design of the management model of the electrification systems refers to the capacity to solve locally the problems of the system. That is, the greater the proximity between the user and the tools to repair and maintain the system; or between the system (wind turbine) and the user; or between the user and the materials supplies and parts, the greater the possibilities of solving the system problems locally. Technical knowledge is also important and it is pointed out as a failure not to give continuity to the training process, usually taking place in the installation but not reinforced.

In cases such as the Mr. Piggott community, or the case of the Malvinas, as there are people with a great deal of knowledge nearby the systems, and the proper infrastructure, the possibility of solving problems locally also increases.

Proper selection of actors is another success key, as well as the fluid communication and synergy between them. In the case of Los Gigantes-Argentina, promoted by 500RPM, a fundamental agent of the project was involved: Manos Abiertas Foundation (beneficiary of the wind turbine donation), a solid organization capable of providing economic, logistical and technical resources. Also an important agent, the Board of Alternative Energies and Communications of the Province of Cordoba, a state agency , had to make periodic visits and promised to contribute to the maintenance. Involving solid and committed agents in the management system contributes to the sustainability of experiences.

Training

As regards the training processes, through which different organizations share the knowledge with local actors and users so that they can manage and maintain the systems themselves, we can highlight the following success keys.

First, a success key refers to the methodology used in the construction and maintenance courses. One of the most important matters is that all the actors can participate in the different processes. Therefore, the training promoted by 500RPM and Tripalium (among others), organize the work during the course in small groups that perform specific tasks of each process.

The groups rotate from time to time so that all participants learn about all processes. The selection of participants also refers to the methodological design of the courses and training and another success key is the possibility that the different actors be involved in the project, and especially the users, are represented during the realization of the courses and training. Another success key refers to the number of participants per course, an important aspect if you consider that the courses and training are mainly practical.

The fact that the training is oriented to practical aspects and the acquisition of practical abilities is in itself a success key in the methodological design. This aspect conditions the number of participants, since in order to be able to carry out a practical course, it is necessary that all the attendants can manipulate tools, have a comfortable work space and, above all, have the observation and periodic follow-up of the trainers. The adequate number of assistants, depending on the cases investigated, ranges from 10 people to a maximum of 25, depending on the space and infrastructure available (materials, tools, workspaces) and the number of trainers.

Another success key in the methodological design of training refers to the fact that the layout of the training is based on the initial diagnosis of the community, or from those who participate in it. Knowing the level of knowledge the recipients of the training have is essential to determine the contents as well as their development according to the knowledge of the participants.

The participation of the users of the system in the construction and training courses is,in general, a success key. Specifically, it is ideal is to be able to carry out the construction locally, and therefore, also carry out the training locally during the construction process and the system installation. It was observed in several cases that users did not participate in the construction process, but received training afterwards on basic knowledge of electricity and on how to perform minimum maintenance.

Another success key is the identification of those users or local actors who have a greater degree of knowledge to focus the training on them. In several cases it is pointed out how complicated it is for those who do not already have certain technical knowledge to absorb the knowledge acquired in the training. Even though this can be considered as a success key, since it contributes to the efficiency and effectiveness of the training and aims to make knowledge locally acquired, it can also be interpreted as the opposite.

Focusing and reinforcing knowledge in a few people, usually in one or two as investigated in the experiences, does not contribute with the objective of making knowledge on the system accessible and the project will depend on these people that will make its maintenance and consequently, will contribute to the sustainability of the system. Although it is true that the decision to reinforce the knowledge in some previously identified people responds to the time limits and accessibility of the place where the projects will be located, mechanisms can be implemented to spread knowledge locally, through those who have a higher degree of training conducting further training to other users.

The last success key in reference to the training refers to the possibility of carrying out more than one training course per project. In most of the experiences, the construction, installation and maintenance training takes place simultaneously and over a short period of time. The realization of a single instance of training would not meet the goal of knowledge being installed in the community. In some of the case studies, up to five trainings have been carried out, but in most of the experiences it is pointed out that with a second training, even if it is addressed to a smaller group of participants, the results are significantly better than performing only one course.

Maintenance

A recurring success key refers to the location of the system, especially its accessibility. The wind turbine must be located in the site that allows to take the maximum advantage of the wind resource, free of obstacles. In addition, access to the location of the system must be adequate to facilitate and make the correct maintenance feasible. In those projects in which the wind turbines were located in remote places, that demanded a transport and a more complex logistics, the accomplishment of the maintenance had difficulties.

Another success key to highlight is the response of the organization driving the project to some of the inconveniences generated by the distance or the difficult access to the place where the experience is located. This has to do with performing the maintenance of the systems locally, involving not only the users but also local actors (schools, universities, social organizations) in the maintenance process. The selection of actors with economic resources (money, transportation, materials) and technical knowledge (schools, students, universities, suitable people, others) to participate in the project maintenance process is very important, as well as being efficient in goal achievement (proper maintenance) and effective (problems are resolved more quickly and with less resources). In addition, to be able to perform maintenance locally, knowledge should be appropriate, as well as the availability of tools and materials.

As regards knowledge, a success key is to replicate the training, either by the same organization or through other local actors involved. In reference to the infrastructure and the tools, it is fundamental that the Piggott wind turbine be designed to be maintained with simple tools and materials that are easy to acquire. Good results can also be achieved when local actors involved have available infrastructure and tools. Fluent communication with those responsible for maintenance is central to an adequate monitoring of the system.

As a success key regarding performing the maintenance locally, we can point out the cases of Tiel and Tripalium. In the first case, the organization built a network of users and actors available to perform the maintenance according to the distance to which the problem was located. Different users, participants of the courses and others, share their thoughts about a specific problem and offer help based on their availability and closeness to it. In the case of Tripalium, they organize a community encounter to celebrate the birthday of the wind turbine, and as part of the celebration the maintenance is performed by the attendees. Through this action, Tripalium makes sure to perform maintenance at least annually, while promoting the encounter and relationship between people.

Something that has proved to be an obstacle in the maintenance process is to rely solely on one person in charge to perform it. The periodic maintenance of the system becomes dependent on a single person, and in the case of an unforeseen event, this maintenance is not made correctly or not made at all. Likewise, it hasn´t proved effective to depend exclusively on voluntary work, especially regarding sustainability over time. Moreover, the opinions on voluntary work are diverse, since it is also fundamental in most of the experiences, being the only option to carry out the maintenance. It is important to agree on responsibilities and roles in relation to maintenance, even if it is performed by voluntary work.

Financing

As regards the project financing, the diversity of financing sources can be considered a success key; that is, the possibility to generate the mechanisms for the project to be nourished by funds that come from different actors, avoiding to depend exclusively on one. This contributes to the sustainability of the project over time, since the possible drawbacks in any of the sources of financing do not endanger the continuity of the project, while generating autonomy and independence in the decision making about the project itself.

An appropriate selection of actors, depending on the potential contributions they can make (monetary resources, technical knowledge, transportation, materials, among others) contributes to this objective. Different financing strategies are used among the case studies such as charged theoretical-practical courses, charged courses for foreigners, applications to international cooperation funds, applications to national programs and projects, community parties and donations of public and private actors, among others. These strategies are formulated according to the need of the project and it would be interesting to share these different financing strategies and mechanisms with the other Wind Empowerment organizations, contemplating the skills and tools needed to successfully access the different resources.

Another remarkable success key refers to the possibility to generate funds locally. Although it is difficult to cover the costs of all processes with local monetary funds (construction, installation and maintenance process). Several of the case studies show that generating funds locally contributes to generating empowerment in the community, sense of ownership of the system and efficient resolution of problems, all of which contributes to future sustainability, generating in turn, organization and community participation.

For example, in the projects implemented by Practical Solutions in Cajamarca-Peru and WindAid in Playa Blanca-Peru, users pay a fee (in the first case it is a tariff according to consumption, in the second, it is a symbolic rate according to the daily consumption of electricity that families make), which is managed locally and used to the maintenance of the systems. In relation to this success key, it is important to work on generating the necessary skills and abilities so that local actors can generate funds that contribute to the sustainability of the project (for example, apply to international cooperation projects or programs , organize collective events and receive donations, among others). To achieve this goal, it would be important for the community to learn about the resources needed for the operation and maintenance of their installed system.

Finally, another success key is a financial plan designed according to the user. Starting from an adequate initial diagnosis, it is possible to determine the socio-economic conditions of the users, and therefore their ability to pay. It is not an option in social projects to be governed by market criteria, that is, excluding those who cannot afford the costs of generating energy. Instead, it should contribute to generate appropriation and involvement with the system when each user pays according to his or her financial possibilities. The contributions may not be exclusively in money; for example, there could be mechanisms of work exchange, solidarity finance, voluntary work and exchange of local productions, among many other options.

Local socio-economic impacts

This research did not go far enough on this variable, which refers to the socio-economic impacts generated during the different processes of the projects. To carry out an investigation about these would require another depth and another methodological approach on the variable. This could remain as a study for further investigation.

However, we would like to point out as a success key the system for evaluation and monitoring of impacts of the NGO Practical Solutions in Cajamarca-Peru. To have methodological tools for data collection during the different stages of the project and, above all, the follow-up after the installation of the system, allows to rectify and correct or deepen the actions (For example: to create opportunities to encourage a greater participation of women in the decision making processes). An adequate and fluid communication between the local actors and the organizations is fundamental to be able to implement an efficient evaluation and monitoring system, which can also be provided by local actors (research teams, universities).

Dissemination & Scaling Up

A success key that is present in each of the case studies, and therefore has a strong imprint on Wind Empowerment as an organization in general, is probably the diffusion of the Piggott technology (the knowledge about it, about its construction and installation and maintenance) in different geographic contexts and socio-economic conditions. The actions that contribute to the dissemination and replication of the projects are varied: the teaching of construction-

installation-maintenance workshops, the installation of systems in socio-educational spaces (such as schools and universities), or wherever many people could observe them in operation, or future projects such as conducting a radio program in Tanzania. The success in the diffusion of technology lies not only in the socio-methodological decisions on how the projects are formulated, but mainly in the fact that it provides a concrete and sustainable solution of electrification in certain contexts.

The decision of involving diverse actors and its selection for the projects is key to spread and replicate the projects. Each actor, whether an institution or a participant of a course, becomes a potential collaborator of the project, and in many cases, they end up generating their own experiences of installation and maintenance of systems. Something to keep in mind is that each project depends on its context, hence the need to start from an initial diagnosis that takes account of those particularities, and then adapt and replicate elements in other projects.

Analysis of Public Policy Cases

Cases of Malvinas, Chubut and Cordoba

Differences in General Approach

On the starting point of the projects, we first would like to point out a methodological difference, in terms of the design and formulation of the projects. The Malvinas case is an example of a "bottom up" design, because it starts from an initial diagnosis of the needs, demands and socio-economic dimensions, involving from the beginning the potential user and / or beneficiary of the project. However, in the case of Chubut, we find an "up to down" design, where the potential beneficiary is not involved in the project design, but this is formulated by technical teams without the knowledge and adequate contact with the target beneficiaries.

In the case of Cordoba, whose beneficiaries of the project are the rural schools of the province, the needs and problems of the community are known through the school principals and the data available from the Ministry of Education. Another important difference in terms of design and formulation of projects is that in the Malvinas case the project aims to install renewable energy systems as a complement to the widely used diesel generators, to make the whole system more efficient. In the case of Chubut however, wind systems are proposed as a replacement for existing systems on usage.

There are important differences in the execution of projects. In the cases of Malvinas and Córdoba, both projects were carried out in several different stages. In the Malvinas case, the first stage focused on obtaining the subsidy for the purchase of batteries, so that families could accumulate the produced energy instead of using the diesel generator. The second stage focused on the installation of the wind turbines and the integration of the two systems in a single more efficient hybrid system. In the case of Córdoba, the first stage focused on some of the schools (prioritizing them according to socio-economic level of the region), and included the installation of a basic photovoltaic system that would ensure the illumination and use of devices needed for classes. The later stages consisted in the installation of the systems to the rest of the schools and the repowering of those that needed the systems by means of the installation of wind turbines, thus conforming mixed wind-solar systems.

The case of Chubut was different in its execution, since a visit was made to the potential beneficiaries to obtain their consent. In the second visit, the installation of the system was made to all beneficiaries simultaneously. The execution of the project in stages allows making corrections during the implementation process, reducing the impact of possible mistakes in it.

As for the installed systems, there are also important differences among the projects. In the case of Malvinas, the electrification systems were designed according to the users´ needs, which was possible thanks to the survey conducted to find out those needs and the kind of use of each of the beneficiaries. In the case of Cordoba, a standard system was designed for all schools, contemplating their future repowering. In the case of Chubut, the same system was installed in

all cases, an inefficient decision since in many cases the system dimensions surpassed the demand of energy of the beneficiary.

As regards the choice of technology used in the projects, in the case of Chubut, it was a priority that the production of the wind turbine was of local origin with the objective of promoting local production. However, the durability of the technology was not proven for the conditions and the context in which the project was executed, thus generating countless failures (there will be modifications of the wind turbine in the future). In the case of Malvinas, several tests on different wind turbines were carried out over a long period of time, to determine which was best adapted to the context in which it was to be installed and choosing the technology according to its robustness.

Another interesting fact arises from the analysis of the role of private actors in the project. In the case of the Malvinas, the state agency in charge of the project involved private agencies for the implementation of the project, and contemplated the creation of a small local company (formed by 3 people) to carry out the installation, training and maintenance of the systems. The state agency subsidizes this small company (for example, to cover transportation costs) so that it can be financially sustainable, since the price paid by the user is not enough for the company to be profitable. In the case of Córdoba, technical knowledge for the design of the systems was requested to the college of engineers (non-profit association that brings together professional engineers). In addition, the company hired to install the systems also had to maintain them for two years, and then transfer the knowledge and the necessary tools to do so, so that state agencies could do it.

Differences in the Design of the Training Process

In reference to the training contemplated in the design and formulation of the projects, there are similarities between the cases of Chubut and Cordoba. In neither of these experiences was contemplated the training of the beneficiaries to perform the basic maintenance of the systems, since the users were not considered as part of the maintenance process. Training actions were limited to the delivery and explanation of a user manual, which explained the parts of the systems, helped in the interpretation of the information (operating lights), potential hazards and hazard identification. It also contained data about the maintenance personnel in charge, to get in contact with if needed. In the case of Malvinas, the local company carried out training on basic use and maintenance of the systems (such as adding water to the batteries for example), at the time of the installation, face to face with the beneficiary and through the same language. It is interesting to note that in the case of Cordoba, whose beneficiaries were rural schools, it was not contemplated to carry out training on renewable energies in order to increase the knowledge in these pedagogical spaces.

Differences in the Maintenance Process

As for the maintenance processes of the cases, we also found important differences, mainly among the case of Malvinas and those of Chubut and Córdoba. In Chubut and Córdoba, the

maintenance process was totally in the charge of state agencies, from basic procedures (such as adding water to the batteries) to more complex repairs, including the replacement of systems. This mechanism results in both cases inefficient in terms of resources, since the monetary costs of logistics, transportation and work to perform simple tasks are very high. As for the effectiveness of this mechanism, in the case of Cordoba it proved to be successful, since the systems were maintained periodically and were sustained in the time already for 12 years. In the case of Chubut it turned out to be ineffective, as the proposed number of scheduled maintenance visits to the project was never reached. The weakness of these two experiences lies in the lack of budget available. In the case of Cordoba, political will at the beginning of the project made an adequate availability of resources possible, something that has had complications in recent years due to changes in the political agenda. In the case of Chubut, the budget cut at the time of execution of the maintenance process was almost total, dooming to failure what was programmed in the project. The Malvinas case is substantially different, since a maintenance plan is designed for each beneficiary, contemplating his or her level of knowledge, resources and predisposition to carry out maintenance tasks by him or herself. In this case, the user was taken into account as part of the maintenance process.

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Appendix I

Full transcriptions of interviews

- Aran Eales, V3 and Wind Empowerment

Small wind turbines for pastoralist communities in Ethiopia - Wind Empowerment, Mercy Corps and V3	
General description of project	2015, Ethiopia Three Piggott wind turbines constructed and installed during training courses 1st in Jijiga, Somali region: 3m diameter, 800W wind turbine with 400W solar PV, battery storage with charge controller and inverter 2nd in Semara, Afar region: 1kW wind turbine, 500W of solar PV 3rd at the Semara University campus: 1.8m wind turbine **Partners:** Wind Empowerment, Mercy Corps Ethiopia, Jijiga Polytechnic College, Samara University, V3 Power, Nea Guinea, I-love-windpower-Tanzania For this pilot project they focused on shops providing phone charging, lighting, TV, refrigeration. For the next projects they will look for other productive uses.
Location	<u>Jijiga, Somali region</u> The wind turbine was installed in a village of about 100 people, 30 minutes drive from Jijiga city. In the village, a few people were using pico solar devices for phone charging and lights. These are cheap, personal devices, that you can buy in the market. The village was off grid, the nearest connection to the grid was 1 hour walk away. Only about 14% in Ethiopia is grid connected. The distances are long also. The main economic activity in the village is livestock. The climate in the region is dry, desert-like. <u>Semara, Afar region</u> Semara is a very challenging environment, it's really hot, they are really suffering from climate change. The installation site was a village, 2-3 hours drive from Semara town.

Initiation of the project	It was all initiated with a discussion between V3 Power and a guy from Ethiopia who participated in their course in Germany. This person runs a NGO called Sahhy Solar and invited V3 to do a course in Arba Minch. The course, along with a wind resource assessment, was indeed given in Arba Minch University by members of V3 and Wind Empowerment. At the time of the course there was a UN conference on rural electrification held in Addis Ababa. Jon Leary attended it representing WE. There they were introduced to Mercy Corps, an international NGO that is active in Ethiopia. Mercy Corps was engaged in a project called PRIME. This project was about finding new forms of income and market expansion for pastoralist people living in Ethiopia. Due to climate change these people find it harder to survive with the traditional pastoralist way of life, so they are looking for other sources of income, other businesses to run. The wind turbine idea seemed to fit in with the aims and objectives of the PRIME project. The idea was to train pastoralist people to build wind turbines and to provide energy to run businesses. The focus was on productive uses of energy. In December 2013, Wind Empowerment and Mercy Corps agreed to develop a proposal for a rural electrification project in Ethiopia as part of the PRIME project.
All the actions before the installation	**Writing the proposal** A good project starts with a good proposal. It outlines the need for the project, a justification for the use of the technology, the methodology. The proposal was written by Wind Empowerment but Mercy Corps was asking for clarifications and providing feedback all the way through. It took a long time, almost a year, to finalise the proposal. There was an ongoing dialogue going backwards and forward, trying to get the proposal in the correct form and then to agree on the activities and the budget. And then also to identify local partnerships. Mercy Corps requested quite a few documents from WE to work with them, such as a financial policy, a risk assessment, contractual matters. “WE is still quite a new organization so we had to develop all these things for this project”. **Identifying local partnerships and installation sites** The proposal was to build 3 wind turbines as part of training courses. They decided to run the courses at the Universities. Students who are just about to graduate would attend. The idea was to take the course and start a business when they graduate. Mercy Corps found Jijiga Technical University and Semara University. These were the two locations where they decided to do the courses.

	Mercy Corps had a central office in Addis Ababa and they also had regional offices around Ethiopia. The whole idea of working with Mercy Corps was that they already had a connection with the communities, they were able to identify sites and they were able to initiate communication with the community. Mercy Corps wrote a MoU, a Memorandum Of Understanding, which is a formal agreement between two or more parties. Having an NGO to do this work is very important, with the local knowledge of how the communities work and what the power/ organizational structures are. It is essential to have that in place before you implement a project locally. **Other activities in the planning stage** was to identify potential sites to install the wind turbine and to identify the load profile for which the turbine will be used for. The regional office of Mercy Corps chose the sites by using a guide that Aran had produced. The basic criteria was to be open, free of obstructions, to have a productive use (a shop in their case) and be accessible from the university so that maintenance would be easy. WE provided the guidance on the above. The guidance document was sent to Mercy Corps who shared it with the Universities to identify the sites and give WE information on the load profile. So, once the load profiles were obtained then WE completed the system design: size of turbine, size of batteries, list of the materials and components needed. **A long shopping list** The idea was that Mercy Corps would be able to do the shopping before they arrived but it didn't really work out. Aran thinks they didn't have the capacity, they didn't know what to look for Lesson learnt: better to have an expert in the country to do the shopping because sometimes the right materials are not available (right thickness of wire for example) and unless you've built a wind turbine before, you don't know how to adapt to what is available. Even if they had some technical skills, wind turbines is a very niche technology. "I think you always need someone to help doing the shopping together with someone from Mercy Corps, which is what we ended up doing". **Planning and preparation phase:** Concept note → Full proposal → Agreement on the budget → Signing of the contract → Site identification (done by Mercy Corps with help from WE) → Partners identification → Selection of students → System specification with all the components → Recruiting a team from WE (Aran from V3 and Kostas from Nea Guinea were already involved in the planning and they needed to recruit people to assist them) This process took some time because they had to identify what skills are needed.

	The last part of the planning phase was purchasing some of the materials that they had to buy from UK or Europe, arranging travel for the team and arranging insurance. **Travelling to Ethiopia and collecting the materials** For the next phase, the WE team visited Ethiopia. Bringing some components in their personal luggage proved to be very challenging because the customs stopped them and it took a long time at the airport to explain what every component was and to deal with the import tax at the airport. They had thought it would be easier to bring some components like this than delivering them. In Ethiopia they met with Mercy Corps team in Addis Ababa. The first week was all about gathering the materials. This was a really important part of the project and quite a challenging one because you have a very long shopping list for the wind turbine components They hadn't planned enough time for this activity but it is very important to have plenty of time for finding the materials. If you are on a short time frame you end up paying more. Shopping all these components in a foreign country is complex, you need local support, a local engineer or technician to show you the right shops and assist you on the process. There were 2 implementation phases: they visited Ethiopia twice, one for each wind turbine. The first time they didn't have so much support in shopping but the second time they had more support. Once all the components were collected they travelled to the University to run the course. <u>Semara</u> After the installation in Jijiga, WE members went to Semara to install a data logger to measure the wind speed. For the project in Semara, the WE team was a bit different. Arthur Karomba also joined from I-love-windpower-Tanzania, who shared his experience in Tanzania of establishing cooperatives to be responsible for the wind turbines.
Enabling environment	The government has a policy to invest on renewable energy but it's mostly on large scale. Aran doesn't think that there is any specific policy or subsidies for small scale renewables in Ethiopia.

Ownership & Management	Jijiga The agreement was between the shop-keeper of the village and Mercy Corps. The rest of the village was not really involved. The shop was the productive use of energy that they were looking for in the project. They agreed to give the shopkeeper the electricity that the wind turbine produces. The wind turbine was owned by Mercy Corps but the shop-keeper would receive the electricity. For the first year he would receive it for free and his obligation was to monitor how much additional income he receives due to the electricity. After the first year, he would need to save money to pay for the maintenance of the wind turbine. Semara Again the wind turbine is electrifying the shop. The agreement with the shop owner is the same as in Jijiga. Semara University campus The third wind turbine was sold to the University of Semara and installed at the campus for educational purposes. No feedback about its operation.
Training	Jijiga The training course took place in Jijiga Technical University in January 2015. The participants were 22 students from the University and the course lasted for 9-10 days. The installation site was close to the University, about 20-30 minutes drive away. Also the students already had some technical background (welders,woodworkers, electricians) so the course was very successful. The students were able to do maintenance on the system after the course. Installation was done as part of the course, they went to the village with the 22 students. The tower and the turbine was prefabricated during the course in the University. At the site they had to dig holes, pull the concrete, connect the electrical system and install the wind turbine. This was completed by the WE team and the students got very involved and it was a successful installation. There was some community participation but not very much. Installation took 4 days. Semara The university was newly built, it didn't have much equipment or tools, they had to build the benches and the workshop from scratch.

	The students didn't speak very good English and didn't have any technical skills so the project of building turbines was very challenging, the training was challenging. Aran doesn't think they have been able to do maintenance on that system since. Lesson learnt: to choose participants with an engineering background or with technical experience, to know at least the basics of electricity or to know how to weld for example. In Semara the shopkeeper who was going to have the turbine at his shop came to the course which was very good for him to see. He was pastoralist, without any formal education and he was very interested in everything that was happening.
Operation & Maintenance	<u>Jijiga</u> Only the shop was electrified but it is kind of a common area, people are coming to charge their phones, use the lighting, to get cold drinks from the fridge. The shop keeper was planning to have a TV as well so they could use the entertainment services. Currently they are running through the first year of this agreement. They had some figures for the first 6 months but after that Mercy Corps was not able to go back to the site due to local conflicts, security reasons. In Jijiga the students from the university were trained to conduct the maintenance. One year after the installation, Wind Empowerment notified Mercy Corps that it was time for the first annual maintenance. WE provided guidance and support for the maintenance procedure and then the students went out and did the maintenance themselves and it was successful. The first maintenance visit was done without problems. They also took some pictures and sent to WE. If there is a problem the shop keeper will contact Mercy Corps and they will contact the University or Wind Empowerment team for support. <u>Semara</u> These students are not actually able to do maintenance by themselves. At the moment the plan is that Mercy Corps will conduct the maintenance also with the help of some of the students They haven't done an annual maintenance yet but there are some problems with the system performance. Mercy Corps is responsible to check this and they have visited the site but they have also been very busy with other projects. So there are still some unresolved issues with this system. It is a problem that the site is much further away, 2-3 hours drive from the nearest town.

	Communication with Mercy Corps can be a problem sometimes also. Wind Empowerment team has asked for clarifications on the system's condition but they haven't answered for some weeks.
Financing	90% of the capital costs were covered by Mercy Corps, from a US Aid fund for the PRIME project. 10% came from Jijiga Technical University and Semara University who helped to pay some of the materials. In the short term (first year of operation) Mercy Corps is covering the operating costs. Eventually the shop keeper is supposed to be able to pay for the maintenance.
Local socio-economic impacts	They spoke to some people out there to find out what would be good productive uses. For this pilot project they focused on shops providing phone charging, lighting, TV, refrigeration. For the next projects they may look for other productive uses, like agricultural refrigeration, storing milk and meat for the pastoralist communities, maybe a small workshop or irrigation. <u>Semara</u> Before, the shopkeeper was using a diesel generator for refrigeration, phone charging, lighting, TV but now he is using the wind turbine for all of these. Feedback from the community is not yet available, for both installations.
Dissemination & Scaling Up	Currently they are writing a proposal to take the project forward. During this project they also did a market assessment for wind turbines in Ethiopia. This was a large project undertaken by WE. The results indicated that small wind turbines are suitable and economic but only in the Somali region, the southwest of the country (because of wind resource mainly).

- Kostas Latoufis, Nea Guinea

About Nea Guinea

Nea Guinea organizes courses since 2010. Around 20 courses on locally manufactured small wind turbines, all in Athens. They have also organized courses about locally manufactured solar panels all around Greece, some of them in schools with children. Around 6 locally manufactured small wind turbines installed in Greece.

Out of the 50-70 people that have participated in the wind turbine courses, 3 people have made their own small wind turbine and only 1 of them has installed it. Kostas says it is sometimes difficult for them to have all the necessary tools and the space to work and install the turbine. Most people come to the courses out of interest in the subject but they don't do something practical afterwards.

Nea Guinea is a non profit organization. 2/3 of the work that Nea Guinea does is voluntary.

"Spithari" project	
General description of project	Electrical system installed for an eco-community in Marathonas 2 small wind turbines – Piggott design 2012: 2.4m rotor diameter, 600W 2013: 3m rotor diameter, 1kW Battery bank 24V + Used deep cycle batteries, 1kW Inverter, Charge controller for the solar panels 3-4 permanent users, during weekend 7, during event 20 people Since 2015 the community is not in the location anymore Wind turbines still operate, Nea Guinea does maintenance/ measurements/ workshops there. This project was kind of an experiment for both Spithari and Nea Guinea.
Location	Spithari is located about 2km from Marathonas, Attiki Eastern Attiki has very good winds, Mean wind speed 6-7 m/s 2km from the sea, not very humid

	Marathonas is close and has good access. From Marathonas to Spithari bad road, slope, when it rains difficult access, 4x4 is needed Marathonas is connected to the grid. Spithari is off grid, 300-400W solar panels, the 2 wind turbines and a diesel generator for bigger loads(>1kW) **Community description** Group of 7 people who decided to start an eco-community in a piece of land that was given to them for some time. Self sufficiency project: gardens, animals, rocket stoves, permaculture practices, organize events and workshops in their space to inform public about alternative lifestyle. Decisions were taken generally in the community's weekly assembly. "Spithari" project was mainly about living there and using the place as a demonstration space for people to see this kind of lifestyle.
Initiation of the project	It all started when 2 friends of the community (European Village NGO) decided to donate a Piggott wind turbine to Spithari who were already interested in having such a wind turbine. These 2 friends had built the wind turbine before but hadn't installed it anywhere. The community knew about Nea Guinea, Piggott turbines and liked the idea of a locally manufactured wind turbine that you can build and maintain yourself. Spithari contacted Nea Guinea for support.
All actions before installation	2013: Nea Guinea visited the site and together with the community they chose the location, by taking into account factors like: where the wind is better, the distance from the loads in order to reduce the cost of cables (limited funds were available so this was an important criteria), where it would be easier to do maintenance and where there was good rock. Nea Guinea advised Spithari on all the technical aspects about wind turbines that they didn't know. Then Nea Guinea prepared the wind turbine to be installed (it needed some fixes) and took care of the installation process, the tower, the wire ropes, sizing of the system, etc. 2015: The second wind turbine had been constructed during a Nea Guinea's workshop: community didn't participate in the construction of the specific wind turbines, but had participated in other similar workshops
Enabling environment	For grid-tied systems there is feed-in tariff that is reviewed every year. No national funds for off-grid systems.

	You can get some European Union funds in case you start an agricultural business in the countryside. In this case, some money of the fund can cover the installation of a renewable system. There are no national quality standards for small wind turbines in Greece. If there were, it could be a problem for locally manufactured small wind turbines because each turbine is different, they can't be identical since they are handmade by different people.
Ownership & Management	The community was the owner and user of the system. 2 persons (and especially one, Kostas Malakasis) from Spithari were kind of looking after the system. The people of Spithari are the owners, even now that the community doesn't exist anymore. They will donate the wind turbines, not decided to whom yet. Meanwhile, Kostas may do some workshops there and maintenance at the same time.
Training	Two people from the community had participated in two Nea Guinea courses and knew the basics of how to build a small wind turbine. These people were those who became in charge of the system. After the installation, Kostas spent a few hours to explain to the members of the community how the system works. **Community capacity** There was one person (Spyros, not staying in the community all the time) with some knowledge about electricity and renewable energy and another guy who was involved with electronics. They could do some basic electrical stuff on their own. The two people that were actually in charge didn't have other technical background apart from the course.
Operation & Maintenance	No metering, no charging for the electricity The renewable system powered some tools like drills, angle grinders (~up to 1kw) and mainly lights, laptops, fridge A workshop with bigger machines continued working with the diesel generator.

Maintenance

Maintenance was one of the main problems for this project (and other Nea Guinea projects).

All maintenance work depended on the availability of Kostas. Spithari didn't have the tool (winch) to take the turbine down (nor the technical skills) to understand what was the problem and how to fix it.

Generally, when they noticed anything strange they would give a call to Nea Guinea. Kostas would think about what might be wrong, then went to the site with the winch, took the turbine down, see what's wrong, buy the materials, do the fix and take it back up. In the above process there were always some Spithari members present.

Kostas thinks that if they had the winch they could do the regular maintenance once a year (take the turbine down, paint the blades, put some grease in the bearings in the yaw pipe, the tail and put the turbine back up) but actually all maintenance was done by Nea Guinea as part of its courses so that Spithari didn't have to do it themselves.

However, Kostas thinks that even if people learn how to build a wind turbine, this doesn't make sure that they can do maintenance.

Kostas was available generally to support them so he doesn't know what would happen in case he was away/not available. There was no plan B for this case. Kostas thinks that maybe support could be given by him through phone.

When they had a problem with other parts of the system (battery, inverter) maybe they would contact also the people who donated them but they would also ask Nea Guinea. Nea Guinea used to give advice and maintain the whole system.

System performance

The 1st wind turbine (4 years old) had a few problems (it was built by people without much technical experience).

Although the turbine was maintained in Nea Guinea workshop before it was installed, it had some problems with the wires coming out of the stator; Kostas hadn't noticed that before the installation. After a year one of the cables coming out of the stator was cut. Kostas had to fix that and make that joint stable.

Problem with the diodes (rectifier) which were on top of the turbine in that design (they don't do that anymore, in the Recipe Book the rectifier is down next to the batteries). Because of a lighting maybe some of these diodes failed and they had to take the turbine down

	Another problem with the brake switch, the brake switch was a bit tricky, it was not carefully configured in the beginning. At some point one of the coils was burnt out. It was because of bad installation actually, not the wind turbine itself. The downtime was not very long but it depended on Kostas availability. The 2nd wind turbine (3 years old) hasn't had any failures. Only regural maintenance has been done (lasts about 1 day per year). **User satisfaction** They were very satisfied because it is a windy place and the turbines generally spin all the time. Before only with the solar panels they were struggling as they didn't have so much power but once the wind turbines were there everything was much better.
Financing	**Capital and operating costs** The first wind turbine was donated by European Village. All the other materials (tower, guy wires, cables, charge controller, damp loads, spare parts for maintenance) were paid by Spithari (first paid by Nea Guinea and later Spithari paid back). All work from Nea Guinea was donated (installation, maintenance) Also, Spithari pays for the transportation costs (diesel, gas, etc.) during installation and maintenance. **Community funds** Donations from individuals, personal money, participation in European Youth in Action projects (about the wind turbines and also other group activities) **Financial assessment of the system** The materials are quite cheap and the work was voluntary from everyone so the operating costs were low. The diesel generator that the community had was quite big and it would have been a waste of money+diesel to run it just for the fridge (or other small appliances). So, actually, they were not using it for that. They would have to buy a smaller diesel generator which would be much more expensive than operating the small wind turbines.

	For them there was actually no other affordable alternative.
Local socio-economic impacts	Before, the community had the solar panels and a small Whisper wind turbine that was making a lot of noise and didn't produce enough power. Only with these energy sources they were struggling but once the wind turbines were there everything was much better. With the wind turbines, they had more electricity to cover their basic needs (fridge, more lights, laptops, internet) and also their aquaponic system in an affordable way. For them there was actually no other affordable alternative.
Dissemination & Scaling Up	**The project's impact** "Spithari" used to show visitors around the system. When visitors came to Spithari they would explain what is everything and how it works. Also they had made one presentation of how to build a small wind turbine, using a demo wind turbine that Nea Guinea had It was a very good demonstration project for the locally manufactured wind turbines in the sense that it was a functional project, they were actually using the wind turbines. The community itself was an experimental, demonstrational kind of community. This project was kind of an experiment for both Spithari and Nea Guinea and the two groups communicated a lot about these wind turbines and the project. A lot of people visited the site and have been inspired by it. Some of these people have sent a mail afterwards to Nea Guinea and had come to one of the presentations or one of the courses. **Potential in Greece** It is quite difficult to find windy locations with off grid communities in Greece. The question is, who lives off grid and who is willing to have this kind of wind turbines. People who would usually install such a system are people who are usually involved with Permaculture and self sufficiency, who know Nea Guinea, Spithari and this kind of networks, .. The electricity network in Greece is widespread so people who would choose this solution are people who would buy some land outside of a village in a place where there used to be plantation so there is no

	electricity network and decide to build something there. It happens but it is a bit rare. **Potential of Nea Guinea for scaling-up** Right now, Nea Guinea can afford to support a small number of projects voluntarily. There could be a problem if they had to support more people but they don't really work in this level. There could be a problem also in case they left Athens or in case they were tired.

"Filiatra" project	
General description of project	Solar panels + 600W wind turbine: 5kW in total Installed in 2013 The wind turbine was installed there to be used mostly during the winter time when a lot of people were there collecting olives, in case it was cloudy and they couldn't have solar energy. During this period 7-10 people were staying there for 1-2 months. **Location** Filiatra, Peloponnese región, Greece The town is 3 and a half hours from Athens, it is quite a long way to go there.
Enabling environment	Same as "Spithari" project above.
Ownership & Management	Community owns and uses the system.

Training	One person from the community had participated in a Nea Guinea course.
Operation & Maintenance	Apart from lights and charging, electricity is used to power tools for the olive collection (around 100W each). They also have a water heater. **Maintenance** The users can't do maintenance themselves. If there was any problem they would call Kostas. **System performance** No failures until now. Only some minor problems with the blades. The type of wood that was used turned out to be a bit soft, so the leading edge was quite damaged. But they fixed that during the annual regular maintenance, it was not a big problem.
Financing	The community paid the cost of all the equipment. Nea Guinea's work is partly paid in the form of donations. Nea Guinea suggests an amount of money and if the community can afford it they give it. Otherwise they may give less or not at all.

- Kimon Silwal, KAPEG

About KAPEG

Initially it was called KUPEG because until 2004 it used to be inside the University.

A group of 8-10 engineers working in KUPEG, headed by an associate professor. There used to be a lot of projects, a lot of wind turbine projects, fabricating fiber glass blades, led lighting,... After a few years the group spinned out of the university and formed the company called KAPEG (Kathmandu Alternative Power and Energy Group).

They still cooperate with the university a lot though.

In KAPEG they work with pico-hydro (up to 10kW), small wind turbines or solar-wind hybrid systems. They do a lot of consulting work on small wind turbines.

KAPEG works on a project basis generally.They don't really sell products or services. They are generally funded by grants, like an NGO. They have to pay more taxes than an NGO, but there are some advantages of being a company.

KAPEG used to offer trainings to Practical Action. They were also inviting local fabricators and people from the communities to participate. But the last workshop they did was in 2010. The interest for small wind turbines has decreased in the past few years.

The social context of India and social context of Nepal is so different and that influences a lot the sustainability of the project.

Small wind turbines in Nepal - Practical Action Nepal, KAPEG	
General description of project	Around 2009, Practical Action was involved in many SWT projects in Nepal. They have installed more than 20 SWTs in Nepal but today none of them are functional. Some wind turbines were installed in communities in remote areas and others in schools. A lot of after-installation-issues occurred that were not thought of during the project design and SWT projects suffered in the long run.
Location	Practical Action's projects were all in remote areas (extremely remote or medium remote as characterized by the government). **Wind resource** Even though there are many windy places in Nepal, wind is very seasonal, the wind patterns show that good winds last for about 4-5 months and the rest of the year wind speed is below average, around 2.5 m/s. Only in specific sites the wind speed is constantly high. **Other energy sources** In rural areas, a very popular solution is solar panels, the government has given a lot of subsidies for them, 400W solar panel+battery+2 LED lights installed in houses Also, micro-hydro occupies a very big part of the energy sector in Nepal. Nepal is a mountainous country with a lot of river resources. **Economic activities**

	People in the village are 90% farmers. Also they do labour works. Or they try to find jobs in the nearest town. In some places they also weave blankets, clothes. It depends on the location.
Initiation of the project	In the beginning, Practical Action applies for funds and if they receive funding they initiate a project. Then there is a site selection work and then they look into specific sites in coordination with the local communities. They do a lot of meetings in the site. Practical Action initiates this process, they meet first with the leadership of the village. The village leader then gathers all the people of the village and they discuss and orient the people on what they are planning to do, etc. They also ask for support from the village because a lot of labour work will be included during the construction and installation process. Also, a committee is set up in the community to be responsible for the wind turbine system. The members of the committee (chairman, treasurer, secretary, etc) are selected in the village meeting where all the people participate. 6-7 members in the committee, all from the community. The committee is formed either before or after the installation of the wind turbine, depending on how the project is designed.
General approach	- PA was doing all the administration work - Local fabricators supported them on building the wind turbines - KAPEG was assisting more technically and supporting the local fabricators on how to adopt the wind turbine designs for Nepal conditions (they had to do some modifications in the Hugh Piggott design) In most cases, there was no wind resource assessment at the installation site. If you install a wind turbine without doing a wind assessment in the location, it is actually very risky in Nepal because the wind is very seasonal in most places. This model suffered. On the one hand, there was no support to the community for the long-term maintenance. On the other hand, the community was not capable of maintaining the system, the community handovers were not successful.
Enabling environment	**Wind resource assessment** It is very hard to work with wind turbines in Nepal: There is no assessment of the wind, very limited information exists. You have to go to a potential location and take measurements for 1 year before you decide to do an installation.

This problem can be solved with a very high resolution Wind Atlas that is being developed now. The project is funded by World Bank, the government works on this for 3 years now, it is going to be published by the end of 2018.

This Atlas can change the overall scenario of wind turbines in Nepal.

Now it is still a question, is wind really an option for renewable energy in Nepal? This may be answered after the Atlas is completed.

Government policy level issues with wind turbines
The government has divided the country into 3 regions of remoteness: extremely remote, medium remote, remote area
The subsidies are designed according to the remoteness of the area. Projects in extremely remote areas receive comparatively a little bit higher subsidies. But no subsidies for SWTs.

When PA was doing these projects wind energy was new in Nepal. (It was kind of a research, an experiment) There was no policy, subsidies. In 2014, a policy for SWTs started being formed but it is not completed yet, it is going through a lot of issues.
For solar and micro-hydro very good policy exists. Also, with micro-hydros you have resources that are consistent (unlike wind).

Government mechanism to carry out energy projects
There is a governmental organization, an energy promotion center which includes a wind department. This organization is open to receive demands from villagers. If a community has an interest for wind turbines, then they submit their interest for a project to the wind department. Then the government calls for tenders, for assessment, for installation.

But most companies that take over these projects install imported wind turbines (chinese usually), KAPEG is the only company that works with locally manufactured wind turbines.

Market assessment for locally manufactured SWTs
The main concern of companies about locally manufactured wind turbines is that there is no business with them, they are ultimately quite expensive.

When your country is between China and India, which are the giants of production and the cost of production is very low, constructing small wind turbines locally becomes very very expensive, you cannot compete with the prices of the chinese and indian ones.

Another demotivating thing is that locally manufactured SWTs don't comply to any standards. When the government calls for tenders, this is a problem, you must have properly certified wind turbines, the technical components have to comply to quality standards.

	Large scale wind turbines is a different topic. Government is very very interested in large scale wind turbines, but not really interested in promoting small-scale wind turbines because not much assessment has been done, social and technical assessment.
Ownership & Management	The community as a whole owned the system and were responsible for it. Very often the community didn't have a sense of ownership. There was no interest, also because the system's cost was not paid by the community. Another problem was that members of the committee were frequently changed. The reason was that people didn't stay for long in remote places, they had to look for income, so they would often go to the city or go to India to look for a job. So, new people had to take their place and the knowledge and interest for the system was lost. As a consequence, very often there was no proper management of the wind turbines. **SWTs in schools** In some cases PA installed SWTs in schools. In this case they would just handover the technology to the head of the school and this person would be responsible to look after the system. But in the long term, this was a problem because these were primary schools and teachers didn't have technical knowledge. Also, teachers were changing job often so there was nobody left who knew about the system and also contacts were lost sometimes.
Training	People in rural areas don't have awareness and understanding of technology, they don't have a proper education. Some people in the village don't even know how the town looks like. The training that they receive is not sufficient to make them capable of maintaining the system. It was a mistake when designing the project, to believe that after the training and once the committee is formed the community would be able to look after the system. Kimon believes that, no matter how much comprehensive training they give during the project, it needs continuous support even after the completion of the project.

Operation & Maintenance	Usually they had a tariff system. The committee decided about the amount of the monthly tariff. In case of failure, there were a lot of issues. Sometimes the community didn't try to do something, they had no interest (also because they hadn't paid the cost for the system) Also, the people didn't have the knowledge to do the maintenance, they couldn't identify which component is faulty. So what they would do is go to the closest town and call the person responsible for support. But this was a problem also because some places were very remote, with no road connection to the closest town, so people had to walk very long distances just to make a phone call. And then this person would try to understand what has gone wrong and which component is faulty but this was not usually possible just by a phone call. They would have to visit the place and understand what is the problem, then go back to the town and buy components and go back again to the village to fix the problem. A lot of logistics expenses! Another problem was how to cover the maintenance costs. In many cases, there was no proper management and proper collection of money, so the committee couldn't pay for maintenance. It depended on how effectively the committee was running the system. If the committee was not able to collect the monthly tariffs from the users, then the system would probably shut down. The people's interest would just fade out in time. Except giving advice by phone, PA didn't really support the maintenance on these projects. Sometimes members of Practical Action would consider going to the place if there was a problem, but 1 or 2 times max.
Financing	All PA projects were based on grants. Practical action covered the capital costs. The committee then was responsible for collecting tariffs from the users and pay for the operating costs. Practical Action had a budget to implement the project but after the project the budget was finished. So they didn't really cover any post project activities. If they had to visit the place to do maintenance they wouldn't do this for free.

Project in India - Practical Action India, KAPEG, Gram Vikas	
General description of project	In 2014 Small wind-solar hybrid systems installed in two rural villages in Kalahandi district (250W wind turbine + 1kW solar panels) 60 households electrified in these two villages (35 + 25) The communities were in a remote area, the distance of the villages from the closest town was 6 hours. The project was very successful and it is still running. The whole objective of the project was to train the local fabricators in India to construct small wind turbines.
Location	Kalahandi district, a remote rural area Not very far from the villages there is a Gram Vikas regional office. Also, the area is covered by mobile network, so the villagers could communicate effectively when there was a problem.
Initiation of the project	In the beginning of the project, when the site was identified, Practical Action India contacted Gram Vikas and a partnership was formed. The communities were also approached from the beginning of the project. Without the participation of the villagers it is very difficult to work in these rural areas, there is a lot of labour work also and their assistance is necessary. You have to coordinate with them from the beginning.
General approach	Practical Action India and local NGO, Gram Vikas, were coordinating this project together and KAPEG was a technical consultant for them. One of the main reasons that this project was successful was the active participation of the local NGO, which was constantly monitoring and supporting the communities. Gram Vikas has a lot of branches in different rural regions of India. Each regional office looks over specific communities. The villages where the hybrid systems were installed were in one of the regions supported by Gram Vikas. Gram Vikas works very actively in the rural areas, they are very dedicated and effective. If there is a problem they go to the village, monitor what is happening and support them, in matters like healthcare,

	education, energy, etc. So having this local NGO made a huge difference for the sustainability of the project. One of the most important parts in a DM is that you need to have an entity that is looking over the system after the project, like Hugh Piggott has done in Scoraig. So, if any problem occurs someone is right there to solve the technical issues. You need to have some kind of local support and a good example is Gram Vikas that is doing a perfect job. **Materials** The fabrication was designed to use locally available materials. You have to actively involve all people during the fabrication process to find out what parts are easily available and where to find the other parts. A few components had to be found (e.g. magnets) in bigger cities. There is no standard methodology, you have to see what works best with the given condition in the place.
Ownership & Management	The community owns the system. A committee made up of community members was formed to manage the system. Also, the tariff collection system is continuously monitored by local NGO, Gram Vikas, and works very properly.
Training	This project involved a lot of training. Altogether, they gave at least 5 workshops, either in the nearest town or on-site. First, they trained the local fabricators in the nearest town. It is a medium-sized, commercial town in the Eastern part of India. There were a lot of fabricators in this town, a lot of workshops that work with metal, wood. There were also technical schools in the town. So, 3 technical schools and local fabricators from 2 mechanical workshops were invited and attended the workshops of how to build small wind turbines, how to fabricate the towers, how to do ground foundation work for the towers, how to erect the towers, everything was taught during these workshops. The objective of these workshops was to make local people capable of building an entire wind turbine and install a wind-solar hybrid system. Also, to make them capable of doing maintenance, of understanding each time which component has a problem and how to fix it. The villagers participated in the erection of the tower and civil construction on-site.

	Even after the project period, they went to the community and did a training focused on maintenance. After that, the villagers were capable of lowering/raising the turbine and doing basic maintenance. If replacement of the wind turbine was needed, the local fabricators should be able to replace the turbine. This was the objective of the workshops offered to them.
Operation & Maintenance	Each household receives a fixed amount of electricity, enough for 2 LED lights, 5W each, and for a charging powerpoint. In the community center a television is also powered. All users pay a flat tariff for the electricity they receive. The systems were operating fine the last time that Kimon communicated with the engineer of Gram Vikas. **Maintenance** In the case of failure, the community themselves were able to take the tower down, they didn't usually need support in that. But if they needed any assistance they would call the people in the regional office of Gram Vikas and they they would contact PA. The communication was very effective in that way. At some point, there was a big storm predicted in the area that would damage the wind turbine. The villagers were able to lower the tower and take down the wind turbine without problem before the storm stroke. The system operated very well because the workshops were very effective. Also, in this project the community is able to pay for maintenance because the tariff collection system is continuously monitored by Gram Vikas and works very properly. So, within the first 6 months, the community had collected a good amount of money from the tariffs that was saved for maintenance issues. The system was profitable and they had money for maintenance.
Dissemination & Scaling Up	The service provider model is getting quite popular and could be a successful delivery model. A service provider is an organization that has complete responsibility of a project for a particular period (e.g. for 10 or 20 years) and then handovers the system to the community. But this would be more appropriate for medium or large-scale projects.

- Jay, Ti'eole and Tripalium

About Ti'eole and Tripalium

Ti'eole is Jay's company that he started in 2008. Ti'eole is a member of the Tripalium network.

Tripalium is a network that they started with 2 more friends (Thomas and Thomas) for the development of Small Wind in France in 2009. The members of Tripalium have their own activity/company/association and Tripalium is just a network bringing them all together, kind of like Wind Empowerment.

They were two ideas that developed in parallel but Jay wanted to move quicker and do this as his main job, this is why he formed Ti'eole.

Small wind turbine workshops around France - Ti'eole and Tripalium	
General description of project	Ti'eole organizes most of Tripalium's workshops because it has a structure and Jay has been doing this for a while and is working full-time for it, whereas the other Tripalium members do this part-time. >100 workshops and >100 wind turbines installed in France The oldest turbine is now 10 years old and several others are 6 or 7 years old.
Location	Workshops organized all around France, depending on who is interested. Electricity price is very low in France (around 0.11/kWh) so Jay prefers to work in off-grid sites where electricity is not taken for granted. It is more interesting because if the turbine doesn't work there are no lights, phone, fridge, nothing. However, they also work with on-grid sites (about half of the installations are on-grid). In this case people choose to install such a wind turbine because they are interested and they have this mentality.
Initiation of the project	Most of the times someone (individual, training center, etc) contacts Ti'eole (or someone else from Tripalium) and wants to organize a course at their

	place and also have the turbine installed there. At this stage, they prefer to confirm that the person will buy the turbine and have it installed at their place, otherwise they would be collecting uninstalled wind turbines after the workshops. People who contact Ti'eole learn about it through internet, training courses or Renewable Energy Fairs in which they participate. Jay also cooperates with training centers but this is a problem generally because after the course the turbine is not installed.
All actions before installation	Before doing the course, Jay tries to visit the place and talk with the people in person. He finds it easier to explain things in person than by telephone, to make sure they know everything that they need to know and answer to their questions. Most times he tries to visit the place beforehand even if he is far away.
Enabling environment	Ti'eole doesn't get subsidies or any government aid. In the past, they were getting some subsidies from the local regions but lately this support has stopped because of budget cuts. There are a few cases that municipalities or organizations (e.g. national parks) contact Ti'eole because they want to electrify a specific location or to promote renewable energy, etc. But only 5% of Ti'eole projects are public projects funded by municipalities/ organizations.
Ownership & Management	The turbine belongs to the person who buys it. Usually it is the person who organizes the course at his place. Other times, if the course takes place at Ti'eole's space then if someone is interested they can buy the wind turbine and take it to their place.
Training	People come to the courses for various reasons: Some people come to the training course just because they want to spend a week with a bunch of people doing a common project, some people want a week of vacation, some people want to learn how to build a small wind turbine, some people want to learn how to weld or do wood working.

	People with very different backgrounds come to the courses: engineers, farmers, people that live in the city or in the country and are interested in wind, people from other countries who have a project behind them. It doesn't mean that all these people will put up a wind turbine afterwards, they just want to learn how to do that, because maybe they don't have a place to put up a wind turbine right away. People of all ages participate. The majority is white men but also some people with Algerian or African descent. 10-20% women. Women come to the course usually because they have a real project behind them. Men come also because of pure interest. So, 1 out of every 10 men and 1 out of 2 women will build a wind turbine afterwards. Women are more practical in this. The teacher tries to make sure that all people learn a lot of things during this 1 week and also help the people who already have a project going on. 90% of the wind turbines are installed after the workshop. Usually the fee is 400€/person for 1 week workshop. In Ti'eole workshops, food and accommodation is included. Price can vary a little bit but Jay recommends it to be between 350-500€ because if it is too expensive people won't choose to go to this workshop. There are 1-2 workshops organized each month in France so people have a choice.
Operation & Maintenance	For the first year, from a moral, legal and his personal perspective (because technically he has sold them the wind turbine), if people have a problem, Jay will go and fix the wind turbine or work with them to fix the wind turbine. Afterwards it's their responsibility. If Jay feels like it or if he is in the area, he will stop by and help them, otherwise he will tell them that they should do it themselves this time or he will ask money if they want him to fix it. So the first time they do the maintenance together and then they are supposed to know how to do it themselves, unless they have a serious problem. People also have a copy of the manual so these are failures that they should normally be able to fix themselves. But this doesn't always happen. Many people after doing the training course install the turbine by themselves, this is the idea. But most people need a little bit of help.

Most people that install a wind turbine have the tools to lower and raise it. Everytime Jay sells a wind turbine he sells it with this tool, he wants them to be independent. There are some people that do all the work themselves which is great and there are some people that don't do any.

People generally call the person who did the training course and installed the wind turbine for help, then this person may put them in contact with someone else who is closer to them. For example Jay has given a lot of courses in Brittany which is 1000 km away from where he lives. Now there are other people in Brittany who give courses so Jay is trying to arrange with them to do maintenance on the wind turbines he has installed there.

Jay recommends to the people to service the wind turbine once a year.

Sometimes Jay makes a big trip around France and he tries to spend half a day at each site and help people with the maintenance. It takes Jay around 4 hours for a standard maintenance, then it depends on how far is the site.

Some common failures: Wear on the leading edge of the blades, bearings getting rusted by water, bearings not well fixed and rubbing against the rotor

Ti'eole doesn't have a different approach for the public projects. Jay is contacted by the mayor's office or an organization, he goes and do the training course with them, installs the turbine, goes back 6 months or 1 year later to teach them how to do the maintenance and then he says, "Here's my card give me a call if you need anything else" and the wind turbine is their responsibility.

Generally it is more difficult to handle the maintenance in public projects because nobody is responsible for it. The wind turbine is owned and managed by the local government but not by specific persons and this is a problem. Nobody feels really responsible or cares for the wind turbine. Jay suggests that at least 2 people are responsible each time, so that when one is missing the other can take care of the system. Also when someone retires he should train somebody to take his place. But Jay's suggestions have not been taken seriously by the mayors.

If after some years they call him, he gives them advice on how to fix it or he goes there and fix it with them but he gets paid for that. Other times the mayor hires another technician to do the maintenance. So there are delays in maintenance but eventually they are fixed.

	Materials are imported from all over the world: Off-grid inverters: Holland, On-wind inverters and magnets: China, winding wire: Italy, wood: USA, steel: probably India In Tripalium's website they are trying to make a list of people that are willing to be available so that when someone needs help with the wind turbine they can directly contact the person that is nearest to them. Now when someone needs help, they send a mail to Jay for example and Jay redirects them to another available person who is closer to them. They are also trying to make a database of all the installed turbines in France. Jay specifically is trying to get as many people as possible to register their wind turbines and helps those that don't have the IT skills to do so. This information is valuable feedback about the failures that wind turbines have and the maintenance in general.
Financing	The capital cost of the wind turbine is paid by one of the participants of the course who decides to buy the wind turbine and install it at his place. In most cases this is the person who has arranged the course. The person who arranges the course also pays to Ti'eole a fixed amount to cover the cost of the teachers, the materials and the tools. He also receives the fees from the participants. If he finds a lot of people to take the course, he will cover the fixed cost of the seminar and he can use what is left to cover part of the cost of the turbine. For example, Jay usually asks around 3000€ when they are 3 teachers. So the organizer needs to find at least 8 participants that will pay 400€ each in order to cover the fixed fee (8x400=3200€). If the organizer finds a lot of people to take the course and more than 3000€ is collected, then he will use the profit to cover part of the cost of the wind turbine (which is around 8000€⊇materials for wind turbine, tower and electronics). Ti'eole's model is adopted for France. It couldn't be replicated in a developing country because they actually sell their service and the people there wouldn't be able to afford it. They don't get subsidies or any government aid so they can't offer the service for free. In the past, they were getting some subsidies from the local regions but lately this support has stopped because of budget cuts.
Dissemination & Scaling Up	Jay believes that the cost of putting up a small wind turbine system can be prohibitive especially at an on-grid site since electricity is very cheap.

	Also, solar systems have become cheaper and are subsidized by the government (price of solar electricity is 0.25-0.3 euros/kWh), so someone has to be very motivated about small wind turbines to decide to install such a system. This is why Jay believes that there is not a big potential to develop more in France. There is enough potential to run his company and maybe a bit more but not a big potential, mainly because there are not so many off-grid sites and there is no government funding.

The Railwaymen's Garden in Narbonne	
General description of project **Location**	Inside the national regional park in Narbonne there is a very active association that manages a shared garden. The garden of the people who work in trains. It is a 6 acres garden and there are 230 smaller gardens inside this space where people who live in the city can go and make their garden. The gardens are all organic, they are not allowed to use pesticides. *They have a shared building where they have an office, a coffee machine, a fridge and it is not electrified. So the wind turbine will electrify this building.*
Initiation of the project	This project was initiated by the regional national park of Narbonne. They had put aside some funds for renewable energy projects and decided to finance this 'How to build a small wind turbine' project for the shared garden.
All actions before installation	During this week (September 2016) the association takes care of all the civil work and electrical installation and Ti'eole will go there in October 2016 just to do the course, build and install the wind turbine.
Ownership & Management	The garden association will have the ownership and management of the wind turbine. Participation in the course will be free for 10 members of the garden association and afterwards these people will be responsible for the maintenance.

Training	*The people who will participate in the course are the people who have gardens there.* Actually 10 people coming from the garden and 5 or 10 more people coming from outside. *The president of the Garden association will select the participants.* The only term that Ti'eole set for the participants is that they have to be free for 1 week, so already a lot of people were eliminated. Participation in the course will be free for the 10 members of the garden association. *The external participants will have to pay the normal course fee, around 400euros.*
Operation & Maintenance	They have already talked about the O&M, these 10 people from the garden association who will participate in the training course will be responsible afterwards to do the maintenance. *In these 10 people, there is the president of the association who is very active and also an electrician who has already worked with small wind turbines. Also all these are people who already work with their hands, so Jay is sure that after the training course they will be capable of taking care of the wind turbine.*
Financing	The capital costs will be covered by the regional national park of Narbonne. They had put aside some funds for renewable energy projects and decided to finance this 'How to build a small wind turbine' project for the shared garden. The park is generally funded by the government and also the EU. The operating costs will be covered by the association's budget.

- Gael Cesa, Tripalium

<u>About Tripalium</u>

Tripalium was initiated by 3 people who had participated in Hugh Piggott's courses in France. That period Hugh Piggott was coming to France once a year but except for his courses, nothing

was happening in France about small wind turbines. So, these 3 people wanted to be more confident to do things alone without Hugh. Gael joined at the time they were organizing the first workshop without Hugh Piggott to spread the word about homebuilt small wind turbines in France. This was the beginning of Tripalium.

One of their first works was to translate the Hugh Piggott book in French.

During the first few years all the work they were doing to get themselves ready, to see what they are doing, where they are going, was voluntary work.

Within Tripalium there is horizontal structure. No board, no secretary/treasurer. The names of the members are not written somewhere, it's not a formal association. Once a year there is a 1-week assembly and most of the decisions are taken during this week. Otherwise, if decisions have to be taken during the year, through mails or phone calls they try to reach a consensus (no voting).

Small wind turbine workshops in France - Tripalium network	
General description of project	More than 150 Piggott small wind turbines installed since 2007. Workshops have been organized all around France. All small wind turbines are locally manufactured and according to Hugh Piggott's manual. Tripalium does both off-grid and grid-tied installations (50%-50%). Around 10 active people who organize workshops, who are working on the internet website, who are talking about Tripalium during a Fair for example. At the last assembly they were around 20 people. Around 700 people have participated in workshops.
Location	Workshops have been organized all around France. Experience has shown that apart from good winds what is really important for a location to be considered favourable is the presence of alternative people. In southern France it is very windy but the people are rich, they are not very alternative, they are not really into something that you do by yourself. So Tripalium has very few wind turbines there. In France electricity from the grid is very cheap, so installing such a wind turbine is not a cost saving choice.

Initiation of the project	People who are interested to organize a workshop at their place contact Tripalium through its website (Tripalium doesn't search for people, they contact Tripalium).
All actions before installation	When a person calls, first they discuss about the price, the place where the wind turbine can be installed, the size, etc. Then if they make an agreement, Tripalium asks the person to find 10 people to participate in the workshop by advertising it within his/her network. Tripalium helps also to find participants through its website but it is good that the person tries to find the participants himself. The person who calls is usually the one who wants to install the turbine at his place also. Sometimes it is a local organization which is interested in renewable energy/ecology/sustainability projects that make the initial arrangement and there is another person who will have the turbine installed at his place.
Enabling environment	**Relation with public authorities** Generally Tripalium doesn't get government funds, sometimes from municipality. If they tried maybe they could find some government subsidies but this is not the way they are working, they try to evolve without the government. **Policy** Until recently if you were off-grid and the cost of bringing the grid to your home was bigger than installing an off-grid system, then the National Electricity Company (EDF) could fund 90% of the off-grid system and you would have to pay 10% (and then pay electricity bill every month like everyone). But it was very difficult to apply and get approved for this fund and there was no so much belief in small wind turbines, maybe because of lack of standards or because there was no private company making them so nobody was interested to promote them. **Availability of materials** All the tools and materials for the wind turbine and the tower have to be transferred to the place where the workshop and installation will take place. They prefer to buy everything in their city and then transfer it because they have specific suppliers that they work with and they know how to move around. A van is needed for this job and everyone has their own van to do this, there is no van belonging to Tripalium for this purpose. They have discussed this idea but found it too complicated

	because workshops are done all over France and they would need to buy a lot of trucks.
Ownership & Management	At first, after the training course at the end of the week they would ask the people who wanted the turbine: they wrote their names, put it in a hat and pick one randomly. So people were paying the cost of the wind turbine and they were going home with it. This is how Tripalium worked for many years. Then, as less people were interested in having turbines (because they didn't actually have a project to install such a system) they had to find other options. Otherwise they would be going back home with a turbine after each workshop. And this is not what they wanted to do, having turbines locked in a garage. And of course it is not economically viable. Now when organizing a workshop most of the times they ask that the turbine will be installed at the place. The idea is that they arrange with someone to do the workshop at their place, for example at a farm, and most of the times the turbine will be installed at the same place. This person pays only the cost of the materials (not the work) for the turbine and the tower and at the end of the workshop he has the turbine installed at his place. All the participants pay a fee to participate in the workshop. The person who pays the cost of the materials is the turbine's owner and is responsible for its operation and its maintenance.
Training	Training is mainly practical. First, everybody presents themselves and then a small theoretical introduction because people have questions in the beginning and if you don't answer them then 10 different people might ask you the same question at different times. It is time consuming so Gael tries to explain the most frequent questions in this theoretical introduction at the beginning of the week. Then practical sessions begin. Three groups of people doing a different process at the same time. One time every day they stop the workshop and each group explains to the others what they have done and all the problems they have encountered. The instructors correct or add information if it is necessary. Also 1-2 times during the week they might do again some theory, especially on electricity because people are not always so confident about it.

	A max number of participants is around 20. Usually it is 1-10 participants. Mostly men, maybe 90% men. 1 week, at least 50 hours. Most of the times the participants are hosted at the place of the workshop, for example the farm. When Tripalium members organize a workshop they usually try to be 2 or 3 teachers together, depending on the number of participants. If you have 15-20 participants it is better to be 3. The idea is to split the work, otherwise it can be very tiring and also it is better for the participants because every teacher has a different way of explaining. After paying for a workshop then you can come back to as many workshops as you want for free to participate and also help the teacher (you only have to pay for your food and accommodation.) It is a good way to encourage the people who are trying to become teachers themselves. Then after some workshops they can organize a workshop themselves. And this model is working; it doesn't mean that every year there will be 10 more teachers but all the teachers of Tripalium have emerged through this process. **Background of participants** In the first workshops all the very motivated people came who had always wanted to build a SWT, most of them had already tried something but it was not working. Once they saw that sth was possible they came to the workshop and at the end of the workshop 10 out of 10 people wanted to build a wind turbine. After maybe 2 years as the word spread, they had more people that were interested even if they didn't have a current project. Little by little more people were coming just because they were interested in how they teach and how it works. The courses are open to everyone, even to people who have never worked with their hands. They teach everyone how to use tools, how to curve wood and all this stuff. At the end of the week you will not be able to build a wind turbine but you will have learnt to weld, to curve wood, etc.
Operation & Maintenance	The person who pays the cost of the materials is the turbine's owner and is responsible for its operation and its maintenance. Tripalium can offer some support if needed but it is not like the guarantee of a product. After completing the workshop every participant is supposed to be able to fix their own wind turbine. If they don't succeed to fix it they can call Tripalium and they will give advice through internet/phone. Also, something that Tripalium recommends to the people is to communicate with each other when having a problem. During a workshop there are 10-15 participants, so Tripalium advises them when they have a

	problem to contact each other because they can remember better, discuss the problem and be more confident together. However, this doesn't happen as much as Tripalium wants, people cooperate but just a little. For many years Tripalium didn't contact the people afterwards to check on the turbines; they had the mentality "if we have no call it means that the turbine is working". But this was not always true. In the first year people usually call one or more times to ask things. But it really depends on the person. After the first 1 or 2 years people don't call so much and Tripalium doesn't have any feedback (which would help to improve the wind turbine). Now they are trying to collect this feedback through their website, where someone can add their wind turbine and give information about it. But most owners are not very comfortable with such web applications so some people do it but not all of them. Lack of capability of people to do the maintenance is a problem. Sometimes when someone from Tripalium gives a workshop in a place and there are turbines installed in that area, he might go and check on them. Even if he was not the one who had installed those turbines, someone else from the network may ask him to go there and help the people. But they can't support all the projects on a regular basis, that would be a full time job. Some people do 10 workshops per year, so supporting all of them for free is not possible. In the first year they help for free and then if they have to go back to the place they try to make it as cheap as possible. But they strongly encourage people to try and fix their wind turbines before contacting Tripalium. Some jokes made during the workshop: 'the wind turbine has a guarantee of death' and 'Once you leave the workshop, the guarantee starts!'. It doesn't mean that they leave people on their own but they want to make sure people really understand that they have to take care of their own wind turbine.
Financing	Generally, Tripalium doesn't get government funds, sometimes from municipality. If they tried maybe they could find some government subsidies but this is not the way they are working, they try to evolve without the government. Participants pay to participate in the workshop. Someone pays the cost of materials for the turbine and the tower and has the turbine installed at his place. Also, there are grants from organizations given to farmers who

	want to be trained, so sometimes a farmer covers the cost of a workshop by such a grant. The instructors are paid for their work during the workshop. This is a part time job for them, only Jay (Ti'eole) does this as a full time job.
Local socio-economic impacts	There is a local impact for sure because the wind turbine can be seen from quite far, so people from the neighbourhood or even further stop by and ask questions to the owner. It kind of works as an advertisement as well. Today there is no market for small wind turbines, there is no more manufacturer, Tripalium is the only one who is building and installing SWTs in France. Some years ago, there was no trust in home-built SWTs, they were considered good enough only to store in your garage. But after 6-7 years that all commercial SWTs have proved to have problems, the manufacturers have gone bankrupt and there is nobody for maintenance anymore, home-built SWTs have gained reliability and people have seen that they are working, they are quite efficient and there are people who can support you in the maintenance, there is a network and it is something alive.
Dissemination & Scaling Up	New people are encouraged to organize workshops on their own. Some rules are respected in order to make sure that all work is done in respect of Tripalium's principles/standards. Many things are in common but everyone has their own approach, their own way of teaching and their own tricks as well. After paying for a workshop then you can come back to as many workshops as you want for free to participate and also help the teacher (you only have to pay for your food and accommodation.) It is a good way to encourage the people who are trying to become teachers themselves. Then after some workshops they can organize a workshop themselves. And this model is working; it doesn't mean that every year there will be 10 more teachers but all the teachers of Tripalium have emerged through this process. Through workshops mainly the number of people in Tripalium network increased. Especially workshops that were organized in communities or collectives' space helped a lot to spread the word about Tripalium. They never actually advertised or tried to attract people with campaigns or staff like that. What has made Tripalium known is actually word of mouth. Today in all alternative places people most of the time know Tripalium.

	Through the website tools the idea is to make people discuss about their problems and help each other, so become more capable of doing maintenance on their turbines. Also, during a workshop Gael suggests to the people to have a party every year at the same date (like a wind turbine birthday party) to lower the turbine and do the maintenance together and celebrate as well. This could really help strengthen the local network but it hasn't really happened until now. Tripalium as a network is increasing in number, slowly but surely. The vision is that as many as possible people will become more self-sufficient about their energy, food, etc. There is also a personal motivation to gain practical experience through these workshops, to learn to be more practical, to work with your own hands, there is a lot of self-development in this process. "You don't need to be expert to teach something to the others. If you know a little bit more you can still teach what you know more than the other".

- John David Simnett, Bright Planet Education

Practical workshops for portable self-built small wind turbines in Chile	
General description of project	**Location:** Chile, Aysen Region, Coyhaique and La Junta **Date:** February-March 2016 **Technology:** Bright Planet's "Elementa" wind turbine,150W at 10 m/s, 1.2m diameter blades, 4.5kg. Design was based on Hugh Piggott and Norman Woolard designs. **Project coordinator:** Jon David Simnett, member of Bright Planet Education and trustee of Window of the World. **Local coordinator:** Alexis Salgado Moreno, engineering graduate and Wind Empowerment member Workshops were given in two locations: Coyhaique and La Junta
Location	Coyhaique is the regional administrative centre for the Aysen Region of Chilean Patagonia, with a population of 50,000. The main connection to the area is by ferry with a 24-hour transit time. The region is therefore remote with poor connection to the rest of the country so although it is an attractive place to live it is sparsely populated. One of the reasons for this is the lack of connection to mains electricity.

	People use oil lamps in their wooden houses causing severe accidents and many deaths. The Aysén region has huge freshwater reserves and has become target of many large hydroelectric power schemes. The large companies have the monopoly of the energy latent in the rivers so smaller-scale and environmentally friendlier technologies cannot be adopted. However, Patagonia has also some of the best wind power resources in the world. The area is of great natural beauty and scientific interest and so, low impact technologies such as renewable energy sources are greatly favoured. This is why Bright Planet Education decided to offer a practical course in small wind generator construction in the city of Coyhaique, Patagonia. <u>La Junta.</u> A small town of 1,200 inhabitants, in an area colonized and settled only in the last 50 years. Grid supply of electricity is only available within a short radius of the town centre. There are huge areas of potentially cultivable land in the wider district but largely unused because there is no electrical supply for even the basics of lighting and communication. A few people have petrol or diesel generators but these are expensive to fuel and frequently fail following which they remain idle since there is no servicing facility nearer than the regional capital of Coyhaique (270 km to the south).
Project initiation	The project was initiated when Coyhaique resident, Sr. Alexis Salgado Moreno posted a message on the Wind Empowerment website indicating an interest in the development of small wind power generation in his locality. This message was taken up by Bright Planet member, Dr. Simnett, and together they decided that Sr. Moreno would invite Dr. Simnett to give a practical workshop similar to those he had already given in the UK.
Actions prior to installation	Local organizer, Alexis Salgado Moreno took care of the necessary local arrangements before the workshops. It was (correctly) assumed that very little of the materials needed could be provided locally and therefore all specially-made components (such as rotor discs, drive shaft, bearing housing), off-the-shelf components (such as magnets, copper wire, bearings) and dedicated tools (such as coil winder and stator mould) would have to be sent. Magnets cannot be sent by air so all materials were packed in two 40 kilogram boxes and sent by sea to Valparaiso, from whence they could be sent overland and by local ferry to Coyhaique – a distance of over 2000 kilometres. Sr. Moreno took complete charge of the operation which included customs clearance of the consignment of materials and components in the port of Valparaiso, overland transport from there to Coyhaique, choice of venue for the workshops, selection of participants and coordination with local

	educational establishments. He also arranged local transport and accommodation for Dr. Simnett and his co-worker Ms. Motekaityte-Simnett. At first it was arranged that the practical workshops would take place in the Coyhaique Campus of the Chilean Technical University (INACAP). However, this plan had to change later. Publicity, selection of participants, choice of venue and hospitality and accommodation in La Junta were undertaken by Don Daniel Huaiqui of the Agrupación Indigena "Trawulwun". **Communication between project coordinators** Several misunderstandings occurred between the two coordinators regarding accommodation, workshop facilities, and communication with the locals.The local contact person was really valuable and necessary but also unreliable in many ways. Dr Simnett recognizes that besides technical difficulties there are also human difficulties that one has to face in such projects. Some problems that occurred was the eventual lack of support from the Chilean Technical University (INACAP) which was supposed to host the practical workshops and disagreement with a local environmental organization whith which they were supposed to cooperate. Dr Simnett also recognizes how important it is that the people participating in such projects are community oriented and not personal profit driven. From this aspect, they had an excellent cooperation.
Enabling environment	They had a lot of problems getting the two packages with the materials through the Chilean Customs. Despite they had declared it as non-profit and for educational purposes, they were charged a huge amount of money and it took 3 months to get them through customs. This seemed to be the reason that the University of Chile decided not to support the project, which was a major loss. The EU-Chile Association Agreement (2002) refers to: the need to promote economic and social progress for their peoples, taking into account the principle of sustainable development and environmental protection requirements; Cultural agreement between the UK and Chile specifically mentions collaboration in education and the development of renewable energy. For future work, they want to explore government and diplomatic channels in order to avoid the above charges and delays.

Ownership & Management **Operation & Maintenance**	**Wind turbine #1** Out of the three generators that were constructed during the workshops, one was left with local organizer, Alexis Salgado Moreno, but it was installed in a location with not really good wind resource. **Wind turbine #2** Another one of the constructed generators has been installed at the home of the Maira family. This is connected to the house where it charges a battery bank ready for installation of basic end-use equipment. This will be a great point for demonstration to local residents as their house is like a meeting place and many people visit it daily. The family of Sr. Roberto Maira provided accommodation and transport and became increasingly involved in developing the technical aspects of the project. Hari Maira is now the local correspondent for collaboration with Dr. Simnett. Until now this wind turbine is functional without problems. Dr Simnett says that generally this type of wind turbine doesn't really need maintenance and he doesn't expect it to have problems. These people also have participated in the workshop and are capable of doing the standard annual maintenance. In case they need something more, Hari Maira, the son of the Maira family, will contact Dr Simnett. **Wind turbine #3** The last one was left in La Junta but it was not fully installed during the workshop. The people there don't have the skills but mainly don't have the equipment to complete the installation themselves. In case they need something, there is a responsible person, Don Manquenahuel, to contact Dr Simnett.
Training	Three courses were given: The first course was in Coyhaique, the regional capital of the Aysen Region with a population of 50,000. The second was given to 20 people belonging to the Trawulwun Indigenous Association in the town of La Junta, 270 kilometres to the North via the Carretera Austral (Southern Highway) which at this latitude is mainly a gravel road. Although there was a high demand for the courses, they limited numbers in both to 20 participants. The third workshop was given to a small number of selected people who were competent and committed to continue with the project. This was carried out at the home of one of the course participants.

	Each course consisted of three six-hour sessions spread over three days. The programme was: DAY ONE Introductions and brief exposition of theory. Magnet positioning with emphasis on safety. Winding coils and soldering connections. Preparation of resin, positioning in mould and compressing the mould. DAY TWO release of stator from the mould. Drilling of stator for shaft and cables. Cutting and equilibrating propeller blades. Full assembly. Bench testing and gathering data for Excel Table DAY THREE Field test. Choice of site. Caution on avoiding turbulence. Measuring output when generator is powered by the wind. The key point of the two main workshops given was that every participant should have some hands-on experience for example in working with magnets and in making the copper coils. In both workshops, participants were given the website address so that they could download the illustrated construction manual and full CAD plans free of charge (www.bright-planet.org.uk) Participants proved highly capable of learning the theoretical and practical principles of small wind generator construction. **Background of participants** Coyhaique Workshop. Most of the participants were professional people living in the town. These people didn't need the technology because they had electricity in the town. However, many of them had farms that didn't have electricity and also they had the contacts to disseminate the technology in the community. La Junta Workshop. The majority of the participants in La Junta were members of the Mapuche community Asociacion Indigena Trawulwun which has a strong social network favourable to diseminating the technology. Special thanks to local organizers, Daniel Huaqui and Donald Manquenahuel. Many of the participants of this workshop didn't have access to electricity. The group of participants in La Junta proved to be ready learners and quickly grasped the process for constructing the generator. However, they are lacking in the required workshop facilities and have little concept of the details of how the generator can be integrated into a household circuit. They will require more assistance from the group in Coyhaique and the costs of materials and travel will necessitate further fund-raising. Women were well-represented in both main workshops but particularly in La Junta where over half the participants were women from the Trawulwun Indigenous Association.

Financing	The legal entity that undertook this project is Window of the World, which is a charitable organization. The problem with this type of organizations is that it doesn't allow people to get paid for their work. So, now they are planning to form a community interest company, consisting of trustees of WoW (Dr.Simnett and 2 more) and also 3 more people. The community interest company is a more appropriate legal entity because you still can't make a profit out of it but you can pay yourself a salary. Until now they haven't really tried to fundraise because they were focused on everything else. They only applied to WISIONS but their application was not approved. WoW had some money left from a government grant. These were just enough to cover only one airfare to Chile.
Potential local socio-economic impacts	Even a small amount of electricity could make a huge difference in these regions and open new a new horizon to the local people. This small generator will not run a washing machine, deep freeze, large TV set or heavy machinery. It will provide sufficient power for safe electric lighting, radio / CD player, charging for mobile phones, netbook computer and other digital equipment. Electricity can also be used for sewing machines, light use of power tools such as electric drill, angle grinder and power saw and household equipment such as food processors. The entire area is one of supreme natural beauty and some of the participants had businesses offering rural holidays to visitors, many of which come from other countries. One of the attractions for such visitors is having meals made from locally-produced organic food and an extra attraction would be living in accommodation supplied with low-carbon sustainable energy such as can be provided by the wind generator. Provision of off-the-mains electricity would thus boost the economy of the area. How the project would be developed would be up to the decision of those attending the courses. It could be to give them the experience to continue teaching further such workshops themselves, or to set up a small local manufacturing unit. The latter could also include installation and servicing, provision of storage batteries and circuitry and the sale of suitable end-use equipment such as lights and communication with financial benefits from bulk purchase.

Dissemination & Scaling Up	They have received requests to give workshops in several towns in Chile (the coastal town of Puerto Cisnes, the city of Temuco and Punta Arenas, the most southerly city in Chile). They therefore consider that there are big opportunities for the further application of their small wind generator technology since the areas mentioned have excellent wind power resources. **The following points for consolidating the project** are suggested and some are already in the process of being implemented. TECHNICAL Due to difficulties in accessing materials and components locally a kit of parts is being designed which can be shipped from the UK and which will achieve lower costs through bulk purchase and fabrication. Storage batteries are an essential part of the complete system but are expensive. Experiments are underway to determine the best technique for restoring used lead-acid batteries. EDUCATIONAL Kits referred to will be designed so as to teach people the essentials of theory and practice so that eventually they may be able to bulk purchase and make their own kits for local distribution. ORGANISATIONAL Extra costs (customs duties) and delays were experienced in the process of shipping components and tools from the UK to Chile. The UK and Chile have a mutual accord concerning collaboration in the areas of education, technology transfer and development of renewable energy. Such accords will be explored in order to reduce costs.

- Arthur Karomba, I-love-windpower-Tanzania

About I-love-windpower-Tanzania

Arthur and Roland (from Holland) formed ILWP-Tanzania in 2010 and they have been training people in Tanzania to build locally manufactured small wind turbines, to construct, install them and do maintenance on them in rural places in Tanzania. In 2013, Roland left to the Netherlands so since then Arthur is dealing with these projects alone. However, during a project students come from abroad to help him.

Two different kind of projects depending on who funded the project.

The first type of projects were mainly funded by Rural Energy Agencies (government agencies under the Ministry of Energy that are responsible for rural energy).

At first, ILWP-Tanzania approached these agencies who had the responsibility to electrify rural communities and tried to make them aware of how rural communities can be electrified with wind technology. These agencies agreed to fund ILWP-Tanzania's projects but they didn't let them carry out the project exactly as they wanted. The main problem was that these agencies selected the participants for the workshops by themselves without having the mentality that the people who receive the training should be the people of the community where the wind turbine would be installed. As a result, in these first projects trainings were given to people who were going back to their towns afterwards, far away from where the turbine was installed and nobody was left to look after the turbine.

Arthur realized that training people like this and leaving the wind turbine alone with nobody to service it, was not a sustainable approach. After doing 3 projects in this way, he was not satisfied at all and he told the agencies that he wants to select local participants that after installing the turbine, will keep living there and keep on servicing the turbine. But they disagreed on that and Arthur refused to get any more funds from them and tried to find other financial sources.

Three years ago he contacted Engineers without Borders in Warwick University in London (through James Low, WE member) and they agreed to fund them and send four students to Tanzania every September to help them do the projects. The students were engineers so they had technical background but not much practical experience so this was a great experience for them as well.

Arthur was at last comfortable because he could pick the participants and the place where they would install the turbine and do the training. He made sure that the people who participated in the training were people that would continue living in the community.

At this point Arthur started establishing the Renewable Energy Cooperative Societies (RECS) in the rural communities.

Renewable Energy Cooperative Societies in Tanzania - ILWP-Tanzania	
General description of project	More than 10 projects with SWTs in different places in rural communities in Tanzania, since 2010. 1kW Piggott wind turbines, locally manufactured Management of the system is done by Renewable Energy Cooperative Societies comprising members of the community. Most of the wind turbines have been installed in secondary schools, boarding schools, girls dormitories and dispensaries where they didn't have electricity before. Communities usually have around 300 people.

Location	In Tanzania many communities and villages are not electrified. ILWP-T's installations are in rural places with no access to electricity. In the villages most of the people do farming, livestock keeping or small enterprising activities. The country has very good winds generally. And anyway for small wind turbines , not very high wind is needed so a lot of places in Tanzania are suitable. Tanzania is a big country, the road network is not so good, the projects are often done in remote places and it can take days to travel there. Unless you travel by plane which is very expensive. In Tanzania Cooperative Societies is a common way that people organize themselves, for example there are many Agriculture or Livestock Cooperative Societies. There Arthur saw a good opportunity to establish Renewable Energy Cooperative Societies (RECS) in the different rural communities where he gave workshops and installed wind turbines. This way he could ensure a proper way of community ownership for the wind turbines. (Arthur had studied law by the way)
Initiation of the project	The first wind turbine was installed in the district where Arthur is coming from, so he knew people, he knew schools, he knew that they needed this service as they didn't have other sources of electricity at that time. Something that helped Arthur in choosing the locations and initiating projects was the experience he had from his work as engineer in the Utility Company: he knew a lot of places, he knew where there is a good wind region, the places where there is no electricity. So it was not difficult for him to decide which locations are suitable for such projects.
All actions before installation	In the beginning, you have to travel to go there, to see, to establish a relationship, to raise the awareness of the people for wind technology, to tell them what you intend to do, what will be the benefit of that, to make them understand that wind can also produce electricity for them. When you are in Tanzania and you know how to move around it [the process of raising the awareness]is not so difficult. You start by local government and inform them about what you intend to do, for example 'I have selected these places to do this'. Especially when Arthur is accompanied by foreign students then he has to inform the government that they are there, with how many students and for how long (for 3 or 4 weeks). Then you go to the village and meet with the village leadership, you tell them what to do, etc. When you are in Tanzania you know the ways and what to do.

	A problem at this stage is that people in some places might think you have a political motive and they can be suspicious. Especially if they are not sure if you support the opposite party. So you talk to them, try to convince them, make them understand what is the benefit for them. Also, you have to take care of the legal process of establishing a Cooperative Society, you have to go to the local government (municipality) to take and fill the form, to help them write a constitution. So, it is a process actually that needs also a little fund. The process of establishing the Cooperative Society may begin before or in parallel with the workshop. It is a process that needs time -because it involves government bureaucracy- and funds also – to make the constitution, to pay some fees. By law the members of the Cooperative Society should contribute to pay for these. But these communities are very poor and it can take 2 months to gather the money so Arthur in order to speed up the process lends them the money and they pay back when they have collected it. If he waited for them to collect the money he would have to come back to the district after 2 months to do the project and this would be a problem.
Enabling environment	Local government is not really involved but what you normally do is to inform them that you are there and you are planning to do this and that. Especially when Arthur is accompanied by foreign students then he has to inform the government that they are there, with how many students and for how long (for 3 or 4 weeks). The schools/dormitories/dispensaries where the wind turbines are installed are owned by the local government. For sustainability reasons they have to pay a fee for the electricity to the cooperative society. They have to get the permission for that from the government. **Wind technology awareness** Wind technology was new in Tanzania even if the country has very good winds. Now there is not any wind farms in Tanzania but there are some projects planning to build wind turbines in the regions of Singida and Makambako, which are regions with very high wind. **Local technicians and suppliers** External technicians are not needed, the community receives training and becomes capable of doing maintenance for the wind turbine. All materials can be found locally and even the electronics that have been used until now were bought in the country.

Ownership & Management	The system is owned and managed by a Renewable Energy Cooperative Society (RECS) that is established in the community at the beginning of the project. By law the members of such a cooperative should be 10-50, so they select who will become member from the community (the village usually has around 300 people). In the beginning, Arthur selects maybe 3 people and he gives them guidance on how to select people: to make sure they involve both genders, people from different political parties, from different religions and so on. They follow Arthur's guidance and the RECSs function well generally. The members have the sense of ownership, they like to see the wind turbine running, even if they don't get money and most times they do work for free. Usually it's their own children going to the school and benefiting from the electricity so they have an extra motive. **Model - decisions** Arthur came up with the idea of Renewable Energy Cooperative Societies to ensure a proper way of community ownership for the wind turbines. The idea was that the people from the community that received the training from Arthur would form a Renewable Energy Cooperative Society which would own the wind turbine. And this would lead to sustainable wind turbines in the long term. The Renewable Energy Cooperative Society (RECS) of the community has its own leadership. They select their leaders, they have the chairman, the accountant, the secretary, it is well established. The members have specific roles and responsibilities that are mentioned in the constitution. Also the way decisions are taken is mentioned in the constitution. After Arthur had formed the first constitution then he used this for the other projects also, with small changes because every district in Tanzania has its own traditions in which he had to adopt. There is also a cooperative officer in every district and normally he is the one who guide the people on how to form a cooperative society). The RECS is responsible for collecting the fees from the school/ dormitory/ dispensary. **End-users participation** The RECS members are people from the community so there is trust. Sometimes in the village meeting they talk about the wind turbines. **Control – Transparency**

	It is Arthur's duty to monitor them, to follow up their activity and make sure that they function well. There are no corruption issues. Arthur has the telephone numbers of the leadership (chairman, secretary, accountant) and he makes them his friends. So he knows what is going on. Monitoring so many projects takes time and this is a problem for Arthur because he needs also to work and earn money. His work in ILWP is not paid, ILWP is a non-for-profit NGO and most of the time he works for free for these activities.
Training	Arthur makes sure that the people who participate in the training are people that will continue living in the community. All members of the Renewable Energy Cooperative Society receive training and they are all capable of servicing and maintaining the wind turbine. The idea is that if after the first training, the people haven't got all the necessary skills, then Arthur will visit the place again next year to do a second training and sometimes even a third. It depends also in the level of education that people have. Most of the times a second training is necessary. However, during the first training Arthur identifies 2-3 people in the group of 10, who are smarter and focuses on them and repeats as many times as necessary to make sure that there is somebody to take care of the system when he leaves. He also wants to make the people love the turbines so that they love to see them spinning :) This makes sure that people will take care of the turbines even when there is no profit from it. The community selects who will participate in the training each year. Arthur prefers to have a maximum number of around 10 people - otherwise the class will not concentrate. All administration goes through them, Arthur just supervises them.
Operation & Maintenance	**Distribution to end-users** The school/dormitory/dispensary has to pay a flat tariff each month to the RECS. There is no meter installed until now but they are thinking to use one in the next project to measure consumption.

	However, usually payments are late and the RECS doesn't have money. They keep arguing and asking them to pay but it takes 2 or 3 months without paying. But they can't simply cut the electricity because the target of the community is to offer this service to the children/patients who need it. There is no meaning punishing the students by cutting off the electricity. So, they do the service for free to keep the turbine running (they like to see it working also). However, if spare parts are needed then there might be a problem. Then if Arthur has money he gives them the money to buy the spare because he also needs the project to be sustained. Sometimes also families from the community donate some money to the school so that it can pay the fee to the RECS. **Maintenance** In most cases, after installation the participants normally do all the maintenance themselves. Arthur generally doesn't visit the place again to help them on maintenance. Unless they have a big problem; then they call him and he arranges to go. When there is a problem the school administration calls somebody from the Cooperative Society to come and check the problem. Arthur is informed also after the problem is fixed for monitoring purposes. Also, they fill some information for each fix in a logbook. Every month they take the turbine down and do service. All materials can be found locally and even the electronics that have been used until now were bought in the country. **System performance** Failures are fixed quickly, they are sharp, there are no delays. **User satisfaction** Community is happy generally, the students who are selected to go to that school love it (the government selects who will go).
Financing	**Capital and operating costs** All capital costs for the workshop, construction and installation of the wind turbine are covered by the funds that i-love-Windpower-Tanzania has collected. The RECS is responsible to collect the fees from the school/ repository/ dispensary and with that money to cover all operating costs. However,

usually payments are late and the RECS doesn't have money, so they do the service for free to keep the turbine running (they like to see it working). Sometimes also families from the community donate some money to the school so that it can pay the fee to the RECS. They don't give money directly to the RECS, they only give their contributions to the school.

Sometimes if spare parts are needed and the RECS doesn't have money, then Arthur gives them the money to buy the spare -if he has money- because he also needs the project to be sustained.

During the workshop and installation, the community also contributes with food and accommodation for the participants.

Funds

Two different kind of projects depending on who funded the project. The first type of projects were mainly funded by Rural Energy Agencies (government agencies under the Ministry of Energy that are responsible for rural energy).

After the disagreement with the Agencies, Arthur refused to get any more funds from them and tried to find other financial sources. 3 years ago he contacted Engineers without Borders in Warwick University (through James Low, WE member) and they agreed to fund them and send every September 4 students to Tanzania to help them do the projects. The students were engineers so they had technical background but not much practical experience so this was a great experience for them as well.

Arthur is in contact with EWB in other Universities as well.

ILWP-Tanzania has also tried to apply for funds from international organizations but haven't succeeded until now. Arthur recognizes that it needs expertise to write a good proposal and hopes that in the WEPatagonia2016 there will be some people who can give guidance on this.

Is the system profitable?

The idea of the RECS is that when money are collected and there is profit, it is shared among the members of the RECS.

The schools though, most of the time are not capable of paying. When payments are late and the RECS doesn't have money their motivation goes down because they had expected to earn some money from this project, to improve their economy. You can see that they start concentrating on their own other activities, to do small socio-economic businesses. So, some members think 'let me concentrate on my own activities because this is how I'll get some few money to pay for my kids, ...'

	The idea was that there would be profit that would be shared among the members of the RECS but until now they haven't reached this point. There is just enough money to cover the operating costs and sometimes they also need Arthur's help to cover the cost of spare parts.
Local socio-economic impacts	Electricity is mostly used for lighting and phone charging in schools and also for fridge in the dispensaries. The students have light to study in the evening and as a result their pass rates increase. In the dispensaries the medicines can now be kept in the fridge, most of the tests are done and the quality of the service increases. Electricity is not used by other kind of local businesses. The money collected from the fees are used to buy spare parts, which can all be found locally, so money are fed back to the local economy (only electronics are ordered but from inside the country). If there are money left from the payments the members of the Cooperative Society share them. This is the idea of the Cooperative Society but until now they haven't really reached this point.
Dissemination & Scaling Up	Students from EWB have already come 3 times to Tanzania to take part in IWLP's projects. Normally when they come they discuss with Arthur what to do in the next year. So, when they came last time they had the idea to establish an environmental radio station which would advocate the ideas of renewable energy, wind technology, small scale wind turbines which are locally manufactured, RECSs, etc. People from the communities also would be trained to participate in this radio station. But the students haven't come this year and Arthur thinks that maybe they failed to raise the fund for this last idea, which was bigger than usual, around 30.000 USD. Another idea is to use wind turbines for water pumping in neighbourhoods (Tanzania has big problem with water). In Arthur's opinion, the main obstacle to replicate and scale-up such projects is the lack of funds. When they have money things work. And if they had a lot of money his work on these projects could be paid also and then he could devote more time to them.

- Marco Ogno, I-love-Windpower-Brazil

The Brazil project	
General description of project	Montes Claros, Brazil Two Piggott wind turbines installed as part of training courses Two phases: **2013**: First turbine installed in a farm outside the city **2015**: Second turbine installed in a capoeira school inside the city of Montes Claros None of the two wind turbines work today. It was more of an educational project there, it didn't cover a need for electricity.
Location	Montes Claros, 400.000 people, grid-connected and electricity is cheap. People don't really need the electricity from the wind turbine. Wind is constant but not very strong. There are many villages and communities in the area that are not electrified and live with candles or diesel generators. Marco wants to approach them after they have managed to build a reliable system so that he doesn't lose their trust.
Initiation of the project	ILWP had contact with a local NGO in Brazil, "Beriumbau de Ouro" in Montes Claros. The owner of the NGO had a farm where they did the first workshop in 2013. That person is a Capoeira master and 6 months/year in his farm he is giving capoeira lessons to the kids and also trying to show local people how to live in sustainable and alternative ways. Montes Claros was not the most suitable place to do the project since it is connected to the grid but ILWP chose this location simply because they had their contact there and it was difficult to do the project in an off-grid place where they didn't know anybody locally (a supporting local organization or somebody who actually lives there).
All actions before installation	2015: The Capoeira master (Luiz Carlos Afonso) promoted the event by talking with people, with the university, with the municipality, local organizations, giving fliers, inviting people to attend to this free workshop on how to build a small wind turbine.

Ownership & Management	2013: There is no turbine up in the farm since the tower and the turbine broke during installation 2015: Capoeira school is the owner but the people who come to the school don't do management, they don't have a sense of ownership of the wind turbine. They are not at all interested in it, especially now that it is not working. One of the participants of workshop, Oliver de Oliveira, is the only one today who looks after the wind turbine in the school. Marco has asked him to visit the school once per month. Marco has saved some money to pay Oliver for this job but Oliver has already done this for free for some time because he is really interested in the wind turbines. He is going once per month to the school to check the turbine and fix problems.
Training	They tried to target 3 types of people: 1) people from university (highly educated people who could understand the technicality behind it and could take care of the turbine technically), 2) kids from the school and the streets(tried to gain their interest, make them understand why the turbine is there, why it is good for them) in order to protect the turbine from vandalism (which is a real problem in this very poor city, there is high risk of people stealing the electronics and mainly the batteries), 3) craftsmen, people that live in communities outside the city without electricity The local NGO (the capoeira master) approached all the above people and invited them to attend. Eventually they had a good mix of people. Some people traveled even 5-6 hours by bus to come to the workshop, from places that are off grid. He also offered accommodation, food, space and tools for the workshop, helped them to buy all the materials and transport them with his car. The course lasted 2 weeks, 1 week building the turbine and 1 week building the tower and installing the turbine. Each day, between 6 and 15 people were coming to the workshop. There were 5-6 people really interested that followed all the workshop and Marco thinks would be capable of building a wind turbine afterwards. However, out of these 5 people only 1 person kept really close to the wind turbine (a student from the university, Oliver de Oliveira), was the only one interested to keep the turbine working.

Operation & Maintenance	Turbines do not operate today. 2015: It was working when Marco left (September 2015) but after 2 months it stopped running because nobody actually took care of it. The batteries ran out and people started to steal staff. Oliver started to take care of it some months ago, in May, when he had more time. But again the turbine was not fixed because the inverter was burnt and they waited for a really long time for the company to replace it (it had guarantee). But then it was burnt again and they understood that the inverter was not the right size to bear the power of the pump and finally ordered another one that they hope will work fine. **Maintenance** Oliver (electrical engineer student that participated in the workshop) is the only person locally who is interested to keep the turbine working. He lives close to the turbine, he visits the school once per month to check the turbine (after Marco's instructions) and when he notices an issue he contacts Marco, they discuss and try to fix the problem. The fact that Oliver is alone in this is a problem. It is difficult to do these kind of things alone. He is also looking for a job and might not have time to help in the future, although he is very enthusiastic to do it, he is passionate about it. He has built a container for the batteries to prevent them from being stolen and a container to protect the electronics, all by his own and without getting paid. Only in the last month has Marco convinced him to accept money for the work he is doing. Oliver has tried to convince the rest of the active participants to join him in the maintenance but has not succeeded. Only when the capoeira master is going back to Brazil Oliver is not alone but there are so many things to worry about and the wind turbine is not the priority. **System performance** In 3 years the wind turbine in the school has worked only for a couple of weeks. In the farm it hasn't worked at all. **User satisfaction** People definitely lost interest because the turbine was not working. It took 5 months to replace the inverter so people lost their motivation.

	People already covered their need to pump water with electricity from the grid. When the turbine stopped working, naturally they just plugged the pump back to the grid because they needed water. They had another alternative so of course they wouldn't wait 5 months for the inverter to be replaced. In the next weeks they want to install the new inverter. However, the motivation is lost because people don't trust the wind turbines, they see them there for 3 years but no turbine works. The one in the farm never worked and the one in the school worked for about 2 weeks. So after all, this is not a good demonstration project at all.
Financing	ILWP covered the capital costs and also the operating costs (which are not actually so much since the turbines are not operating) ILWP has applied and succeeded to get funds from: ● Rambo, a UK-based, private engineering company (Piet from ILWP works in Siemens and Rambo does the foundation design for Siemens wind farms) ● Rotary International (Marco knew closely some people in this union and he applied to them through ILWP) The local NGO offered accommodation, food, space for the workshop, tools, promoted the event and found the participants. He (Capoeira master) also helped them to buy all the materials and transport them with his car. Since the city is electrified and electricity is cheap, Montes Claros is not a place where this system could be profitable. The wind also is constant but not so strong so you don't get really high power.
Local socio-economic impacts	2015: the turbine was meant to power a water pump that pumps water high to a water reservoir and then the water would be available not only for the school but for all the neighbourhood. About 30 houses would get cleaning water for this trunk. Before, this pump was powered with electricity and as soon as the turbine broke down the first time, they disconnected the batteries and connected it back to the grid.

Dissemination & Scaling Up	The strategy for the Brazil project was the following: ● 2013: was more of a scout program to understand the local culture, needs, environment ● 2015: they wanted to install a demonstration turbine in Montes Claros city and hoped that people would be interested, would see that it is working and it is cheap to build and ask them to organize more workshops. ● 2015-2020: train people from all the places where they really need it so that they go back to their places and build turbines in their places. They could also donate some turbines to communities since they had 2 more wind turbines in Montes Claros from older projects that were not in use. However, things didn't go as planned and today none of these turbines are operating. **Organizational issues** One problem is that they are not a team anymore working on this. At the peak of the project there were 4 people involved, 3 in UK (2 from the Rambo company) and 1 in Denmark. Now it is only Marco in UK and 1 in Denmark. And Oliver in Brazil as well. When they were 3 people active in the project the motivation was higher because they worked as a team. Also, this work is voluntary and when your normal job keeps you busy it is difficult to keep the motivation, especially when you are alone in this. The 2 people from Rambo had expressed will to continue in the project but then their jobs kept them busy. Also, Marco was always the manager of this project and when at some point he was very busy with his job he disappeared for 4-5 months and he lost the connection with other members of the team. Also, it was difficult to keep them engaged because he didn't have something to ask them to do next, they didn't have a next project planned. One of the problems in ILWP is that everyone gives time when they have it but there is no continuity. For example now everyone is active because of the WE conference but after this probably there will be silence for 3 months. If they had someone that could keep it going that would help a lot.

1-Manuel 500RPM-Isonsa, Salta- ARGENTINA.	
General description	The city of Isonsa is 130 km from the capital City of Salta and it takes four hours to make that distance, since the roads and routes are dangerous and rocky . It is located 3000 mts. above sea level. The NGO installed a 350 watt turbine which generates approximately 63 kw hour /month, using the Piggott design of 300w and 700w. They have in total 15 projects, two of which are not currently operating .One of these is in Mendoza and the other one, in Buenos Aires. They are currently working on 4 more Projects in the cities of Mendoza, Bs As, Bariloche, and Chile. There are currently two people working half-time and one person full time.
Community Description	Isonsa has a scattered rural community. The main activities is stockbreeding, mainly cattle and sheep and the main means of transportation is by horse. Houses are 5 km. apart. There are not hierarchic visible authorities. The school is the only public location and a reference point within the community, it is a meeting point. The families of the rural area don´t have renewable energy systems. They don´t feel the need to live like other communities, they were born there and grew up with a different lifestyle with which they are satisfied. How was the need for electricity discussed? How did they learn about the project? They do not like cities and they only relate to the people outside the community when they have to sell their products. They have a domestic economy for their families consumption.
Ownership & Management	At first, the NGO looks for funds for a school that qualifies for the Project ; i.e., that has Eolic resources, appropriate social context, lack of electricity, closeness to the city). It is very important that people are willing to work and participate actively. The community participates in the construction of the base of the windmill and the aero. Firstly, the communication of the project, which needs to be spread to become known by the community. About 20 volunteers are needed for this task. They contact institutions such as technical schools or Universities, which can take up the knowledge, incorporate it, provide resources and time, logistics, transportation and local help. Secondly , the application of the project . A list of potential rural schools for applying the project is made. Once funds are raised, the schools and the involved participants are informed, and there is a confirmation on the interest to carry out the project. Afterwards, the first trip to the community is organized. All participants of the project get together and discuss and define what they will need to accomplish the objectives. They visit the school to familiarize with the social context and learn about it. How is the context defined? Which aspects are taken into account?. There is a definition of the exact technical position of the aerogenerator, training to the people of the school to build the base of the tower. Thirdly, the fund raising and shipping of materials. Once the people receives 50% of the funds, the materials are purchased or acquired, and sent to the site of construction. Which materials are bought outside the community and what can be purchased locally or acquired through donations?;After this, there is a coordination with the institutional participants of the Project, i.e., technical school or University among others and an execution of the tasks involving the initiation of the project: workshop on construction at the university of Salta, Transference of materials and workshop on installation in the rural school. Workshop on Maintenance for the community and /or the School, Evaluation and Follow-up: Questionnaire to the school to find out how the system is functioning. ***Participants*** ***Rural School of Isonsa:*** They are the users of the system, and are in charge of the preparation and construction of the base of the tower. Also, they are responsible of communicating the project to the rest of the community, and motivate their participation in it. Which strategies or methods are used to accomplish these goals? **500rpm** : General coordination : formulation, search and administration of funds, coordination between participants and execution activities. **AAEE** : It is the legal representative of Fund Management, and in charge of coordination with members of the government (for example, with PROCODAS-Ministry of Science and Technology) **Community of Salta:** Location, construction of the aerogenerator (students and professors of the National university of Salta; participation, volunteer work, fund raising (from the community) **Unir Foundation:** Logistics and moving of the tower. **University of Salta- Institute of Non-conventional Energies.** Location. Building of the aerogenerator (tools, workshop), logistics and transportation. Acquisition of materials for the tower and aerogenerator); communication of the Project and motivation for participation of people within the community. Others: Ministry of Education, Ministry of Science and Technology
Training	**Construction Workshop:** 25-30 people took this course. Six in the Rural School (teachers and students); 8 form Salta, who paid for the training, and 11-16 from the University of Salta. The NGO 500 rpm was in charge of the training. **Duration of the course:** One week , full time and consists of Training, Building, Translation and Installation.

	Content of the training: Building of Asps (work in wood), cabezal and structure (work in metal, welding), electricity, building of bobinas. **Methodology:** Selection of institutions that have previous knowledge and infrastructure and can apply it: Technical schools, University, Group Workshops, specific tasks, rotation of all processes. At first, The training at the workshop aims to be effective, so as to make the people who will take care of the maintenance as prepared as possible to solve future problems. The trainer climbs up and down with the trainees from the tower several times a day (four or five times), to generate confidence on them so they can manage the issues themselves and become as independent of external help as possible. At the University and the Technical School (participants responsible for technical support and maintenance) support is also focused on few people , Teachers or Principals for example. Local Knowledge: The people from the community didn´t have previous knowledge on renewable systems o related technical information, although some teachers from the rural school did have knowledge. They teach the families, house by house, how to maintain renewable systems, but as individual actions. **Results**: People from the community can maintain the system locally; there are cases in which people build other aerogenerators themselves. The Project of Isonsa has been active for one year; other projects have four or five years and had kept contact with the teaching board of the schools.
Operation & Maintenance **Financing**	***Management Process:*** The first participant that interacts with the system is the rural school. They are trained to manage simple maintenance tasks, and have the Piggott wind turbine manual, which contains a section to solve common problems. They make sure that there is a responsible person such as a Teacher to take care of a problem if it appears. This teacher deals with the problem first; if he or she can´t solve it, they contact a Professor at the University of Salta. If this person can´t help either, they call a representative of the NGO 500rpm, who help them from Buenos Aires. So far, they have made only one enquiry to Salta, which was quickly answered. The work of maintenance is voluntary. Participants who collaborate are the School (users of the system), the university of Salta (which includes Professors). The workforce is also voluntary. If material or costly parts need to be repaired, the NGO 500RPM administrates the funds available (courses, donations from other participants, etc.) Most problems can be solved on site if it is possible, since it is expensive to travel because of the long distances. But if it is necessary, 500 rpm collects as much specific information as possible about the problem before making the trip. After the installation, maintenance is not very demanding. The system works 2-3 years on average. Some projects are better than others in this respect, it depends a lot on the participants involved and their commitment. Obstacles: Shifts in the participants (for example, the replacement of the teachers or other people in charge in the technical schools). The lack of replacement of expensive batteries, which last 4-5 years, and need financing. Sometimes it takes time to repair a system for the difficult conditions involved (long distances, few access routes). Lack of follow-up with local participants (communication). It is a challenge to consolidate a system of Maintenance and Management to include more participants and experiences. **Materials**: The Piggott design has only a few materials that are difficult to obtain; most of them are easy to find. Some materials are only available in Buenos Aires and 500RPM purchases and sends them to the community. **Financing strategies:** Public funds from the Ministry of Science and Technology-Procodas. Construction Workshop Donations from “Unir” Foundation Donations from the city of Salta Donations from the University of Salta (materials and translations) **Process:** 500RPM is responsible of obtaining financing for all the stages of the Project: installation, management and maintenance. The AAEE is the legal representative and personeria juridical. Financial resources come from Public institutions, in the local, state and national level. For example: Ministry of Science and Technology. Private Sector and companies (Petrobras, YPF); International cooperation (Swiss Embassy). The community of Salta, students and professors from the University made actions to obtain donations and funds. Collective action to get financing are not very common. It is possible that obtaining funds for the purchasing of batteries will be difficult. Context: There are good conditions in Argentina to present projects about Renewable Energies.
Local socio-impacts	Positive social impact in the community. Transmission of knowledge and abilities.

	Environmental impact: Beneficial for the environment. Diesel generator is only used for specific tasks (certain tools, drills) and the alternative system is used in everyday life (on radios, TV, appliances). At schools, most of the energy is used for lighting and to power personal computers. Follow-Up: A survey is sent twice a year to the users to evaluate their perception on the performance of the system. In general, they claim to be satisfied with the systems and the method of work. It is not easy to receive periodical information as feedback. The participants that made donations are informed about the Project; some visit the location and confirm and evaluate how those resources were used.
Scaling up	Technical schools and universities are important participants of the Project, since they have the abilities and the knowledge to replicate the project. For example, the University of Salta promised to build and install an aerogenerator following the method of the NGO. At the community of Ingeniero Giacobasi there is a workshop for the construction of wind turbines and aerogenerators. The undertaking is being carried out by CONEA and the Atomic Center of the Giacobasi City Hall. The NGO is providing the materials and the participants are replicating the model by themselves. They used to be the beneficiaries of a previous project and now they are making one of their own.

2-Bruno- Soluciones prácticas (SP)-Perú-Cajamarca	
General description	There is an hybrid (wind-solar) micro network for 7 Houses and 1 Church; 2 wind turbines of approx. 1200 watts r and photovoltaic panels. Also, a Micronetwork Windmill for 6 Houses; 2 Wind turbines. They have an Hydroelectric turbine for 1 School. The implemented electrification project is a pioneer in its class (it encompasses an extensive territorial community and different technologies are used). There are two types of systems: 1) Micro-networks for "collective" users (school, health center), which entail an improvement in public service points (to ensure better quality in these points and pay a fee according to the energy consumption that they have). 2) Individual systems (photovoltaic panels), for which users pay a basic minimum tariff
Community Description	Cajamarca-sierra Andina Northern Peru. Isolated rural community, 200 km. away from the capital of the Province. There are 58 homes, 1 school, 1 health center, 2 restaurants, 2 small shops and 1 church. Mining is practiced in the surrounding area. The area presents a great socio-economic contrast between those who benefit from mining and those who do not (for example, the Community under study). Environmental effects? **Economic activities**: agriculture and subsistence family farming. They produce products (cheese, milk) and sell them in the Market. Men work in mining to supplement their income, and / or migrate to cities (workforce in construction). Women who are the ones who stay at home, do domestic chores. **Political organization and decision making**: two referents. 1 Institutional Representative (Mayor) - 1 organizational leader (President of the Peasant Rounds). Peasant Rouds: it is a community system of alerts and care to protect against dangers and thefts. The population depends on the decisions of both referents. The Mayor transmits the requests of the population towards the Municipality of the region
Ownership & Management MODELO DE ENTREGA	SP receives a request from the community (the community is the one that comes to SP in the first moment). The multidisciplinary team of SP (1 general responsible of the Project, 4 or 5 technical and social workers), makes a visit to the community and performs a brief feasibility analysis. Technicians: they analyze local resources-hydraulics, wind turbines or photovoltaic panels. Social workers: analyse general characteristics of the population, how they are organized, who are the community referents, who are the leaders or who have more influence, what is the demand that population has, etc. Frequent visits are made to strengthen ties and build trust with the community. A study is carried out to find out what the expectations of the inhabitants are as regards the electrification system. This diagnosis is useful to know the demand of the population and the energy resources to use. Social methodology: Four points of insertion in the community. **Duration:** 2 months 1) Secondary Data Analysis (databases, energy resource maps of the area, censuses, characteristics of nearby communities) 2) Surveys to all members of the community (questions on the daily lives of people, activities and income) 3) Interviews (to key informants to know their perspective and impressions for more detailed information) 4) Focus groups (some with the whole community and others with specific groups, e.g.: women). Detection of needs of all members of the population. **Actors** NGO "Practical Solutions": managers from the beginning to the end of the entire project. Regional Government / Municipality: they financed the project, owner of the systems, covers the financial deficits when maintenance costs exceed the funds collected through the payment of fees by the user families. Community: families pay a fee according to consumption; must be the one initiating the Project (requests it to SP) Institutions of Support (Technical / Financial): Engineering without Borders of Spain; Agreement Empowerment, University of Catalonia **System Management**: Local Work Teams (administrator, two or three local technicians) that adapts according to the characteristics of the population. Example of the case: in the community of Cajamarca people are more individualistic, to look after their own family, so that community work was not done as it could be done with a village with more community sense, as it happens with the inhabitants of the Peruvian Amazon jungle. Creation of a small company that will manage the systems. A competition is held in the community where local work teams apply to perform the maintenance of the systems. There is also a competition for management and systems management teams (The winning team will be in charge of management and administration, fee collection, fault tracking, etc.). As a result, a local company is formed (maintenance and administration winning teams) **Ownership of the System**: Wind turbines developed by Soluciones Prácticas were used, developed to give impetus to wind technology and the small-scale wind market within Peru. As a design criterion it was taken into account that they operated from very low wind speeds, as well as the fact that they could be manufactured with domestic products. It was important to avoid dependence on inputs from a foreign supplier. One aspect to highlight is that in practice, the wind turbines have given some problems, especially in terms of breakdowns, breakage of parts, wings of wind turbines and other types of problems. That is why SP has considered to buy the wind turbines from China, at a much lower cost and with fairly good performance. Failures and repairs represent a very large cost for a population whose resources are very limited. As regards the ownership of the systems, the equipment once bought go from the NGO to the Municipality becomes a property of this institution, not to the villagers. Consequently, the Municipality may decide to take the system to another community in the same region, for example.

Training	The Training courses used by SP are adapted according to the initial diagnosis made by the multidisciplinary team (characteristics of the community). Contents of Workshops in the Community. Electricity: It is explained to the community what it is, what it is for, how the electrical system works, what its components and characteristics are; Maintenance: basic maintenance of the systems (Example: panel cleaning and water control of batteries) The local teams selected in the competition receive specific and intensive training for 1 week in the Center for Training and Development of Appropriate Technologies of SP (where there is equipment and infrastructure). There is also a brief formation to people of the Municipality who will be in charge of maintaining the system in the future, but it is usually people who already have a higher level of education and require other type of training.
Operation & Maintenance	There are two types of systems: 1) Micro networks: (for the school, health center, housing). They pay a fee according to the energy consumption they have. Meters were used to prevent a user from using more tan needed and leaving the others without electricity. A rising cost charge was imposed, so that the user pays proportionately more, the more they consume. The upper portion of consumption, has a "disproportionate" cost to discourage abusive consumption. 2) Individual systems (photovoltaic panels), for which users pay a basic minimum fee. Families pay a monthly fee for maintenance. Given the socioeconomic situation of the users, these rates are very low and can not cover the costs of replacements or important arrangements that must be made to the system. In these cases, the municipality of the region covers the deficit. Individual users who have photovoltaic panels do not pay tariff, since they end up consuming depending on the days of sun they have and the power of the panel installed. Community Management System: The Maintenance is in charge of a small local company (formed by the teams of settlers whose proposal was chosen in the contest). Management Team-Maintenance Team (who earn a salary) consisting of 3 people: 1 Administrative (performs collections, accounting of income); 2 Technicians (Maintenance and repair of systems). If the fault is complex, the technical team is in charge of managing the repair with specialist technicians in the city. If the costs of complex arrangements exceed the financial capacity of the community management System, the Municipality absorbs those costs. The local company is autonomous and responds only to users (if there is any problem, users transfer their demands to their leaders who organize a meeting to solve the problem. Users have the power to fire and form new teams if the current ones do not respond)
Financing	The main funds for the acquisition and installation of the Systems come from International Cooperation (European countries and United States), and a small contribution from the NGO Practical Solutions (national funds). Local Funds During the implementation: the Community is asked to pay for labor or some materials (it is a requirement before starting the project, so there is the idea that this is not something free, but it requires their participation and commitment) . Payment of fees from users: these are not used to pay for the implementation of the project, but for daily maintenance (repair of faults, replacement of parts, etc.). The administrators are responsible for collecting the payment of the families. These funds are partly destined to pay these salaries and another part is reserved in a common fund to cover maintenance expenses. The municipality contributes with resources for major breakdowns or replacements.
Local socio-impacts	SP has conducted studies and analysis of socio-technical impacts of this pilot experience. At the social level have been identified: • Improvements in the Community Organization (they have had to generate agreements for decision making and forms of collective management of the systems). • Improvements in the Environment, by reducing the smoke from candles, kerosene, and other lighting systems that were used before. • Increase in light hours for activities such as the study of children, or the performance of productive activities by women for example. How much did they increase? Are the impacts of greater use of electricity good?
Scaling up	

General description	The experience began in the 1970s in the Surrey community, on the northwest coast of Scotland. Mr. Piggott designed and implemented the system there. At first, he tested with windmills. In these years there was no electricity or running water in the area, so Mr. Piggott modernized the place, which explains his great motivation to maintain and improve the systems of the locals. He was interested in investigating why wind energy works, why it has remained as a sustainable energy for more than 30 years, unlike other short-term projects , and which were the factors that contributed to this. Other technologies in the area include quadricycles to move through mountainous areas and machines for small-scale production. Also, there are domestic implements that save energy by optimizing their use. For example, a washing machine that uses a heating system through a stove, which at the same time functions as a central heating system. In the washing machine the already heated water is used to avoid re-heating it, thus saving energy.
Community Description	As for the use of solar energy, the project is located in the north of Scotland, where there is much height, and in the winter there is almost no sun. Instead, it is a windy place and it was more advantageous to exploit this characteristic. The Community consists of people who have moved from other areas or cities of the United Kingdom, looking for another way of life, "fleeing" from the city. They want to preserve this peaceful and healthy lifestyle (the Government offered to subsidize an electrical line, but the community did not accept). There are no restrictions on joining the community.It is not a very organized community but rather a group of people gathered by the same place. Some resources could have been used as waterfalls, but because of the lack of community organization, it was not done. Everyone preferred to do things on their own and take responsibility for their system, without depending on anyone else. Economic activities: some people have micro-enterprises known throughout the country (eg: violin lutheria, loom, among others); Others are dedicated to agroecological cultivation; Others do not work in the community but have vacation homes there. There are also a wood processing workshop for housing construction and a boat manufacturing workshop Decision-making: There is an association in Surrey that sometimes makes decisions, but in most cases people make decisions as individual entities. Therefore they have preference for isolated systems. There are some connected in microgrids, but most are individual. There are community practices; eg, older people taught maths or physics to children on the peninsula, but very few children are left, 5 or 6, and they go by boat to the nearest village. The character of the community is increasingly individualistic.
Ownership & Management DELIVERY MODEL	Mr. Piggott has designed the system and after-sales plan for each user, taking into account their economic situation, desires and technical skills, giving practically personalized answers to each inhabitant of the place interested in this project. There are some microgrids, but integrated by a familiar group; isolated systems prevail. Mr. Piggott talks to each family and finds out about their financial resources, motivation to build, operate, and maintain their system, and designs a plan for each person based on this. Some people are not interested in being responsible for the maintenance of their system, in which case Piggott designs a maintenance plan for a year ("annual service"); while others do maintain their system on their own.
Training	Mr. Piggott teaches courses in different parts of the world, although for a few years now, he has not travelled as much, and he teaches courses in Asia and Surrey once a year. Many times, the family that will receive the training course pays the costs of the materials. In this case, they pay Mr.Piggott directly. The family does the learning but also has a lower cost. In addition, there are people from other places that participate in these courses.
Operation & Maintenance	Unlike other places where there are Wind Empowerment projects, the distances from the place where the turbines are manufactured to the homes of the users are very short. This is one of the success keys in the maintenance of these systems. For example, from the house of Mr. Piggott, located in the center of the village, to the farthest house in the community, there are just 40 minutes by walk. For those with more money, he has a service plan where he takes care of everything: he pays for the parts and the repairs. For those who have more technical knowledge, he can provide help on the phone, guide them while the user does the maintenance. There are many people who have technical knowledge and motivation to harness energy. For example, a scientific user, designed a turbine which differed slightly form the model. This man made his own mill and made several machines to use energy. For example, he has a workshop to make violins, he wanted something to sand the wood and used the motor of a car to do so. The supply of spare parts and materials is not difficult, since the community is on the narrowest side of the waterway, whereby people can cross to the mainland by boat to supply it, in small shops and factories. In addition the material can be ordered by e-mail, in online stores, although the process is slowed down by the import policy that protects domestic industries.
Financing	Individual families finance their systems. Mr. Piggott designed the system according to the economic possibilities of each user and offers different options of maintenance
Local socio-impacts	

	The key factor behind the success of this venture is the fact that the designer / manager, Mr. Piggot, is also a user of the system because he lives in the community of Surrey himself. He put his knowledge and motivation to improve the system to the service of his neighbors and their place, and provides the service at a reasonable price. He likes to live in that community and wants people to desire to continue living there. By chatting with his neighbors, he learns how effective the system is, and adapts it to the needs of users. If this does not happen, he changes the system, or gives advice to the villagers about which appliances to buy. This does not happen in other places, where the person who installs the machine lives far away and almost never comes back to control it or keeps track of it.
Scaling up	

9-Guillermo Gimenez Yob-Electrificación de Escuelas Rurales-Dir. De Energías Alternativas y Comunicaciones Pvcia. Cba-Córdoba-Argentina	
General description	The experience was promoted by the Board of Alternative Energies and Communications of the Province of Cordoba during 2004 and 2010. The project had four stages in total and its objective was to provide electric power to every rural school of the province. In the second stage, wind turbines were installed in 17 schools. In the third stage, these schools were repowered using photovoltaic panels, resulting in 17 experiences with hybrid wind-solar systems.
Community Description	. It drew our attention in the case studies studied in the rural area of Calamuchita (where rural electrified schools with hybrid wind-solar systems were visited), that the interviewees constantly mentioned the process of emigration of the rural settlers to small and medium-sized urban settlements. We considered to investigate this phenomenon, since the sustainability of the experiences over time is affected by this migration process, because it depends fundamentally on whether there is population with electricity needs. The decrease in the rural population influences the day-to-day management of the systems, as less and less workforce is able to operate and to make repairs (albeit minimal) to the systems. The possibility of collectively responding to the management of systems are also ruled out (for example, parents' cooperators in schools, who have contributed actively in the past, are currently disintegrated or made up of one or two people) In the rural area of Calamuchita, of the eleven (11) rural schools visited, it was found that at least two had been closed due to lack of students, while the tendency in the others was of a marked decrease in students (only one school surpasses the amount of 15 students, the rest have about 3 to 5 students). The referents pointed to two changes in the economic structure of the area that influenced emigration to urban centers: 1)Changes in the practice of mining widespread in the area (modern technology requires a low labor force); 2)Displacement of small and medium-sized farmers by large foreign owners and / or seed pools intended for the production of soybeans and the planting of pines.
Ownership & Management MODELO DE ENTREGA	Starting from the initiative of middle managers of different areas of work of the Provincial Government, the work of the NGO begins designing a project that brings some type of electric power to the schools. The first step was to exhaustively account for each school in the Province of Cordoba that did not have electricity, reaching a number of more than two hundred schools. It was decided to prioritize the one hundred schools located in the northern Departments of the Province, thus delimiting the first stage of electrification of rural schools. This first phase is articulated with the Ministry of Education of the Province, and it is the Ministry of Infrastructure of the Province of Córdoba (MIPC) which is responsible for the planning, execution and financing of the project. At that point, and with knowledge of the quantity and location of the schools, the extension of the grid network is discarded and alternative energies, both wind and solar, are analyzed as an option. The MIPC associates with the Association of Engineers of the Province of Córdoba (CIPC) requesting technical support on alternative energy systems. The task team, made up of specialists from the ICPC and members of the MIPC Communications Area, analyzes local natural energy resources and determines that for this first stage, it is most convenient to use photovoltaic panels. A "standard system" is designed according to the needs of the schools (3 batteries of 200 Ah of 12volts, an inverter to 220 V of 500W, for a system of 12 V) and the Orco Huasi school is electrified as a pilot test by the administration. Having the specifications and guarantees for operation, the Pliego is armed and photovoltaic equipment is tendered for 100 schools This tender contemplates the acquisition of equipment, its installation, and maintenance for two (2) years. This first stage defines, in turn, the organizational structure that will dictate the actions of this experience throughout the following stages. A team of specialists from the CIPC and the Communications area of the MIPC are responsible for designing and tendering the standard electrification units for each school, while fulfilling a control function over the provider company. In turn, the Pliegos indicate that the maintenance of the systems will be in charge of the supplying company during two years. After this period, the Province takes control. In 2008, the Board of Alternative Energies and Communications (DEAyC) was created within the MIPC, and made up of specialists from the ICPC and staff from the Communications Area of the MIPC, which are responsible for the maintenance of the systems.
Training	The Project directive was that the users did not touch the equipment. They were given a manual with indications of what not to do, how to interpret the lights and indications that they observe in the equipment, and whom to contact in case of problems. At the time of the

	installation, the teacher was trained and given the user manual explaining how to handle the equipment and how to proceed in case of failures, being the main directive not to touch the equipment or try to repair them.
Operation & Maintenance	As regards the sustainability of this experience, it is important to clarify that we are referring to a public policy promoted by the Provincial Government, so that its perpetuity over time depends on various factors, such as the political will of the moment, the appropriate formulation of the Project undertaken in terms of the maintenance and availability of the necessary funds so that an experience of this scale does not deteriorate. At first, the province did not have the tools or people trained to perform the maintenance of the systems. The Board of Alternative Energies and Communications of the Province of Córdoba asked the companies that installed the equipment to provide them with tools and basic toolboxes (this is included in the corresponding tender). The maintenance of the supply systems in each of the schools is carried out by the Alternative Energy Division of the province of Córdoba, which carry out preventive maintenance every six months using caravans with all the equipment. The Director of the DEAyC explained how difficult it was to prepare and organize the maintenance system of the equipment installed in schools. The maintenance was structured according to preventive and corrective visits. The first ones are carried out every 6 months, although no complaints of failures have been received but general maintenance requests to lengthen the useful life of the system. Corrective maintenance is performed after receiving a complaint for a specific fault, in which case the maintenance team accounts for the complaints of failures structuring weekly trips, visiting the corresponding place within the week to repair the system.
Financing	
Local socio-impacts	
Scaling up	

10-500RPM-Los Gigantes	
General description	. The NGO 500RPM carried out a self-construction paid course for Piggott wind turbines in the city of Córdoba, which was opened to the whole community. With the funds obtained by the course, materials were purchased and the various costs involved in the construction of the wind turbine were covered. At the same time, this course contemplated voluntarily collaborating in the subsequent installation of the aero-generator built at Nuestra Señora del Valle de Los Gigantes School.
Community Description	The Nuestra Señora del Valle Rural School is a hostel-school located at the foot of the Los Gigantes massif, at 1900 mts. of height and to 80 kms of the city of Cordoba. It is managed by the Manos Abiertas Foundation and thirty (30) primary and secondary students attend there free of charge. The school is key in the rural community, promoting environmentally oriented teaching, cooperative work and active community involvement. The problems faced by local actors are: lack of job opportunities for young graduates of the school and emigration of young graduates to urban centers.
Ownership & Management MODELO DE ENTREGA	The school developed a hybrid-solar model in the area, made up of photovoltaic panels and three aerogenerators, along with 28 batteries. The aerogenerators currently operating are two of the Eolux models of 1kW of the company Giacobone, and a Piggott one of 700w. The school received the Piggott aerogenerator in the form of a donation, and a collective installation day was set up, with the educational community and the rural community in general. The Manos Abiertas Foundation provided the materials and manpower for the construction of the tower on which the generator is located (a requirement that 500RPM implements to increase the involvement of the local agents). The installation was attended by the Board of Alternative Energies and Communications of the Province of Córdoba, and included the installation of a data collector to increase knowledge about the local wind resource

	and the benefits of wind turbines. During the day of installation, 500RPM conducted training activities with teachers, non-teachers and students of the school, on the use and maintenance of the system.
Training	Training was focused on two volunteers from the Manos Abiertas Foundation who were going to take care of the maintenance. These people carried out the course of construction of the aerogenerator and participated in the trainings in the school. At the school, training was given on the overall functioning of the system, on basic maintenance issues and on how to proceed in case a problem arises.
Operation & Maintenance	The Piggott model is a simple design prepared to be repaired and maintained by the users. What was useful in this experience was the fact that the school staff already had knowledge about alternative energies due to the use of the other systems mentioned. The actors involved are another extremely important factor. The Manos Abiertas Foundation has the structure and capacity of resource management to pay for an eventual repair of the system, while the Board of Alternative Energies and Communications provides technical support on the repair and maintenance of the system in its scheduled trips to control the systems installed by them (photovoltaic panels and Eolux wind turbines). Also, related to the contribution of Manos Abiertas Foundation, its volunteer program allows it to have qualified personnel for the daily maintenance of the system and to generate the pertinent reports about the observed failures. About the operation of the system over time, the Piggott aerogenerator works properly since its installation to the present. The electricity generation was interrupted once for a lapse of about three months. The causes were the twisting of wires inside the tower, which was made for safety reasons due to the cut of a tensioner after strong winds. The problem was detected by school staff; volunteer maintenance staff informed 500RPM of the problem and they elucidate the causes and ways to solve it. The repair was carried out by the school staff, along with Manos Abiertas volunteers and the staff of the Board of Alternative Energies and Communications.
Financing	El financiamiento del proyecto involucra la hibridación de distintas fuentes de donde provienen los fondos. 500Rpm pudo costear la Construcciónyy los materiales del aerogenerador a través de Cursos rentados. Manos Abiertas posee un sistema activo y efectivo de gestión de fondos (basado en donaciones, aportes de otras ONGs, aportes del Estado, Cooperación Internacional), de ellos provino el dinero para la construcción de la torre y la base de la torre, y la mano de obra para la realización de la instalación y del posterior mantenimiento del sistema.
Local socio-impacts	
Scaling up	

11-Caso Chubut-Argentina	
General description	Two months visiting the Permer-Chubut Project (renewable energies for rural markets) - Government of the Nation - Inter-American Development Bank. Each province had its own program, most of them applied photovoltaic panels. In Chubut, as the wind resource is very good, it was decided to install small-scale aerogenerators. The funds were provided by the World Bank. Medium-scale case. A thousand five hundred (1500) wind turbines were installed for rural schools and settlers in isolated areas. Eolux wind turbines of 800/1000 / 1200W of national production (company from Rio Cuarto-Córdoba) were used.
Community Description	Economic activity: Small-scale sheep farmer, family economic units. In Chubut the population of the rural areas are old; young people went away to the nearby villages.
Ownership & Management MODELO DE ENTREGA	Agents: The regional eolic energy Center were the ones who first managed the project (they did tests of wind resource, system design, worked with the Provincial Government of Chubut-Board of public services for long-term maintenance. Management of Experiences: Chubut. Model from up down. The government wanted to do everything 100%: installation-owner-maintenance. In Chubut, the policy sought to replace diesel equipment, not to complement what they already had In Chubut it was different, it all happened at once. Some measurements and tests were made. They obtained the grant from the World Bank and installed the total of 1500 aerogenerators. They had to spend the money before a deadline. They went through the province, asking people if they wanted an aerogenerator, saying that it would be brought in a few months. They signed a

	letter; those who were not in the houses at the moment, were left without equipment. The user could not choose when to install the system, it was imposed to him. The project was intended to replace diesel systems, to supply everything at once. When the aerogenerators broke, they ran out of power to charge the batteries. They had the diesel system, but not the system to charge batteries with their diesel generator. The aerogenerators used were designed for milder winds, those of Cordoba, which is why they broke, since they were not robust enough for the stronger winds of Chubut. There were neither specific studies of each house, nor what exact wind resource they had or their consumption. All the systems that were installed were the same. The Giacobone was chosen because of the production capacity of the Eolux. Tests of the Eolux were conducted in Patagonia but to measure its performance, not its durability or sustainability over time. This is a machine designed for Cordoba, not for the winds and climatic conditions of Chubut. . The installation was very fast, to meet the deadlines. For the maintenance / monitoring plan, a technical team was going to go around the country to do the maintenance. They had a very good management board, with frequent information of each experience, spare parts, details, data of the settlers, claims. In Chubut, they tried to "reinvent the wheel," instead of complementing what already existed. Local knowledge was wasted and systems that were already in use were not taken into account. It is estimated that 100 of them work (Esteban / Ingenieros Sin Frontera). The general Director (Gustavo) has diversified the state of each experience, each bank of batteries and each machine, those that work when there is wind. He does not have up-to-date and accurate information. All systems are the same, they are not being designed according to the specifications of the demand.:A house inhabited by an old lady had the same equipment as a family of 10 people System Property: The owner of the equipment was the State, the user had to pay 400 pesos approx at the beginning and then 300 pesos per year (far below the costs). Still, they did not even collect that money, they did not go through the experiences because funding was cut,. The users wanted to pay, and they could not touch the equipment because it was not theirs. The General Board of Public Services passed twice a year and the villagers paid 300 pesos per year; that was the "contract" they signed. It could not be fulfilled, they only visited a few places. They did not have sufficient resources to do so. The provincial or national government cut the funds. At the beginning all the aerogenerators worked, the installation was good; what did not work was the follow-up. The government centralized way of doing the maintenance and location (Rawson) caused that when the funds were cut, the settlers could not do anything.
Training	There could have been more training to the peasants. A folder with instructions was left. There were posters with instructions to keep horses out of the way. They put a padlock to the bank of batteries so that the people did not touch them, the settlers could not open it to pour water to the batteries which is something basic and very easy to do. To go there twice a year would not have been enough according to Jon; it should have been at least once a month. The computers ran until they did not work anymore. The knowledge of local people, whom already in the 1940s had small wind turbines to use radios and lighting, was not used.
Operation & Maintenance	Pros and Cons : When the aerogenerators broke, there was no one to repair them. Users could not even touch the batteries and the equipment. The aeros were placed in elevated towers only accessible with harnesses for specialized people to do the maintenance. There was a very limited budget compared to the planned budget. The most isolated rural systems are the first to be cut since they are the most expensive

	to maintain because of the long distances. Even though a market research was conducted, an homogeneous equipment was bought for all users. The homogeneous systems did not adapt in many cases to the consumption needs of the users. Either it was too large, or could not be extended if more consumption was needed. People can pay for repairing systems, even changing bank batteries, but they could not do it. The need for electric power was created, since the generation of electricity worked out. The systems were noisy. The mismanagement created the problem, the training could have been reinforced, the knowledge of the settlers used, and the systems put together taking into account the specific needs of the users. In very isolated places the aerogenerator is not the best option, unless the villager has the knowledge and a good predisposition to maintain the system A good strategy used by the Board of public services is to work with public service cooperatives that aim to provide electricity to the settlers.. They trained a cooperative from Rawson to carry out the maintenance. They were able to fix on their own 100 out of the 400 aerogenerators that they had in charge, without resources and without spare parts. The cooperative did not charge users, because they could not pay, and the State never paid the cooperative. Possible solutions include training, designing systems according to the needs of the user (efficiency, consumption, payment capacity, previous knowledge) and the assistance of local cooperatives and agents.
Financing	PERMER Program (World Bank)
Local socio-impacts	
Scaling up	

12-Caso Malvinas-Argentina	
General description	Conocimiento resultado del trabajo de campo en 2014. 2 meses de visita en las Malvinas El caso de Malvinas es un caso de pequeña escala, 100 o 150 unidades. Cubrieron a la totalidad de la población.
Community Description	Actividad Económica: pobladores aislados.Son ovejeros, ganaderos de ovejas de pequeñas escalas, unidades económicas familiares. En Malvinas mas como flias tipo con gente joven y niños.
Ownership & Management MODELO DE ENTREGA	Hizo varias pruebas por 10 años y decidieron subvensionar aerogeneradores para casas aisladas en la red (100-150 aerogeneradores). En Malvinas fue un programa estatal, pero a través de un organismo semi privado. En Malvinas fue una mezcla entre la Fundación que menciono antes, la que subvenciono los aerogeneradores, baterías e inversores. Y "una pequeña empresa fundada por un campesino de la isla oeste, hizo pruebas durante varios años con las distintas marcas y modelos, los aerogeneradores se rompían por los vientos. Malvinas se utilizaron marca escocesa llamada Aprovin-ahora Kingspan. La empresa se fue a la quiebra cuando el gobierno de reino unido retiro un programa que fomentaba la inyecccion de energía a la red y con ello a emprendimientos de sistemas de electrificación alternativos **Malvinas.** Segunda Parte se subvencionó el 70% de la compra de los aerogeneradors. El campesino fue duelo de todos los equipos. El FLC solo diseño con el diseño del sistema, tamaño de aero y banco de batería. Hicieron mediciones de cuanta energía consumía cada granja. Tenia varios sitios de prueba, varios molinos se rompieron muy rápido. La única que

	sobrevicio fue la robustez de la maquina escocesa. Inclusive modificaron para que produjera menos pero que durara mas. El equipo Diesel es el Corazon de la granja, el banco de baterías hace mas eficiente el sistema. Dos entidades, la empresa del campesino Powersents, fue un pionero haciendo pruebas, capacitándose, inclusive en EEUU y con H Piggott, asesorándose de cual es el mejor sistema para Malvinas, asique en la aplicación de la experiencia fue quien hizo de parte privada asesorando en el diseño de los equipos y luego manteniéndolos. Piggott ayudo con el diseño y mediociones del aerogenerador que se empleo. Fue un proceso de largo plazo, el campesino debía pedir la subvención (primera etapa y segunda etapa en distintos momentos), y allí se iniciaba el proceso donde la empresa reelevaba el consumo de la granja, adquisición de sistemas y demás. Instalaron datalowers en cada casa, hicieron estudios específicos, y diseñaron equipos a medida (combinando bancos de baterías y sistemas con posibilidad de ampliarse). Los aerogeneradores eran más robustos, diseñados para esos vientos. Capacitación).
Training	El dueño de la empresa realizó la capacitación en la instalación con los usuarios, de campesino a campesino. Las granjas ya tenían un sistema de generación asique la capacitación requerida no fue tan exigente, durante la primera etapa (baterías) se indicó como se las mantenía , como operaba el aerogenerador.
Operation & Maintenance	Fue un programa de largo plazo donde el usuario podía elegir cuando instalar el sistema, y cada sistema fue diseñado a medida, de acuerdo a su demanda y recursos financieros y otros parámetros, que la hacian el sistema mas eficiente. Otro es que el proyecto no se propuso reemplazar el diesel sino bajar su consumo ny aumentar su eficiencia a través de un sistema híbrido eólico-diesel. Los pobladores tienen capacitación sobre el uso básico y mantenimiento de los sistemas. La torre empleada puede ser bajada y elevado por los usuarios para realizar mantenimiento y reparaciones. Aprovecharon los sistemas y el conocimiento local de los pobladores. Los sistemas instalados podían aumentarse en caso de que las demandas de la familia usuaria fueran cambiando. Sistemas flexibles y dinámicos para ajustarse a la demanda Diseño de sistemas a medida y política a largo plazo. Los arreglos mas complicados los realizaba esta empresa privada, con aportes del Gobierno, es un lugar muy remoto y sin el apoyo de estado no cierra el negocio. Ofrece un servicio de mantenimeinto anual. Hizo una capacitación para que los usuarios chequen y carguen con agua las baterías, lo básico; si algo malo pasa el poblador lo contacta y el viene. El usuario paga los respuestos y el tiempo de trabajo del equipo de mantenimeinto, pero no el transporte (apoyo del estado
Financing	
Local socio-impacts	
Scaling up	

3-WindAid-Playa Blanca-Perú	
General description	La experiencia se ubica al Norte del Perú. Comunidad integrada por 60 familias. El Proyecto comenzó en el 2012 a través de la instalación de un aerogenerador en la Escuela. La Comunidad vive de forma medioambientalmente sustentable, conciencia ecológica.lar y El Proyecto se propone instalar un aerogenerador Piggott de 500w por familia en un plazo de 5 años. Es una zona marina y la actividad pesquera de escala

	doméstica es la actividad económica principal. El nivel educativo formal es bajo. Autoridades Comunitarias. El Proyecto surge a través de la difusión en una Escuela Democrática, donde se habló sobre las actividades de WindAid. Un Docente de la Escuela generó la relación entre WindAid y la comunidad de Playa Blanca, la cual estaba en búsqueda de resolver su falta de energía eléctrica.
Community Description	
Ownership & Management DELIVERY MODEL	WindAid tuvo en cuenta 4 características excluyentes para impulsar el Proyecto: recurso eólico adecuado; seguridad; aprobación de la comunidad (necesidad de electricidad real; Institución educativa (sostenibilidad/apropiación). WindAid prioriza en la Selección de sus Proyectos a experiencias educativas que generen empoderamiento. WindAid construyó el aerogenerador a través de Cursos de Autoconstrucción que realizan, en su mayoría pero no exclusivamente, voluntarios extranjeros. El análisis inicial sobre la comunidad no estaba contemplado en un principio, pero una asistente al Curso de construcción proveniente de España, aportó al Proyecto las herramientas metodológicas a través de las cuales se realizó un Diagnóstico Inicial de la Comunidad (nivel socio-económico y socio-educativo, interés en participar del proyecto, demanda de energía, entre otras). Se realizaron en primera instancia /conversaciones informales con referentes comunitarios, difundiendo la Idea Proyecto y generando confianza con la comunidad. Luego se realizaron Entrevistas a cada flia (estructura familiar, actividad económica, historia de vida). WindAid plantea la Formulación Participativa del Proyecto, para evitar que sea una acción “Arriba-Abajo”. Se proponen a través del proyecto generar organización y empoderamiento para que la Comunidad Gestione los sistemas que usa. **Actores Participantes en el Proyecto:** WindAid (NGO EEUU): gestión integral Voluntarios / Estudiantes Extranjeros: Universidad de EEUU/North Carolina (realizó Diagnóstico Inicial) , construcción aerogenerador y posterior instalación. Comité de Energía: Organismo Comunitario que define gestión de los sistemas-priorización de usuarios –intermediarios entre WindAid y Comunidad. Encargado del Mantenimiento del Sistema, adquisición de materiales. Las autoridades de la comunidad impulsaron la creación de un organismo comunitario encargado del mantenimiento y Administración de la energía eléctrica generada. La tarifa se fijó según el valor de una vela por día, ya que es lo que gastan las familias para iluminarse diariamente. Esta tarifa no alcanza a cubrir los costos (de Instalación, mantenimiento), pero es una herramienta empleada para que el usuario se apropie del proyecto. WindAid se hace cargo de los costos monetarios de la Instalación y de la mayor parte del Mantenimiento. Tanto la Instalación como el Mantenimiento (bianual), se realizan a través de Cursos (de Construcción y otros de Mantenimiento). Durante los cursos, los participantes, mayormente extranjeros que pagan por el curso y la experiencia en general (comida, alojamiento, transporte), realizan la Instalación o el mantenimiento del sistema en la comunidad, conviviendo con los pobladores durante una semana.
Training	Se realizó un Curso de Autoconstrucción, donde los participantes construyeron el aerogenerador Piggott que luego fue instalado en la Comunidad. La fabricación fue en el taller de WindAid, y luego los participantes del curso se instalaron en la Comunidad para realizar la Instalación. WindAid realiza durante el año dos tipos de Curso, uno de Autoconstrucción (donde se aprende a construir y luego se instala el aerogenerador en la comunidad), otro de Mantenimiento (donde los participantes viajan a la comunidad para realizar el mantenimiento de los sistemas) Se realizaron Capacitaciones en la Comunidad con los futuros usuarios del sistema. La Capacitación tuvo lugar durante la Instalación, y se enfocó en el mantenimiento cotidiano el sistema.

	Actualmente WindAid está construyendo un Centro Comunitario de Pruebas y Capacitación en la comunidad de Playa Blanca, con el objetivo de instalar allí las capacidades y herramientas para realizar el Mantenimiento, y para profundizar en la /Capacitación Local La científica social española que participó del Curso de Construcción y aportó las herramientas metodológicas del Diagnóstico Inicial, realizó capacitaciones para los miembros de WindAid sobre metodología social.
Operation & Maintenance	Los Usuarios pagan una tarifa por el Mantenimiento (valor de una vela-Sol por día), el cual es realizado por el Comité de Energía de la comunidad. El Comité de Energía se encarga de tomar las decisiones sobre la gestión del sistema, como así también se ocupa de la Administración de los fondos recaudados, y del Mantenimiento básico. Esta tarifa no cubre los costos del Mantenimiento totales, los cuales son cubiertos por WindAid.
Financing	Pago Cursos Estudiantes Extranjeros (cubren costos alojamiento, materiales aerogenerador, herramientas). Crowfunding/: onantes diversos (empresas-pequeños donantes). Colaboración-sociedad con Empresas Privadas y Universidades. Una practicante miembro de WindAid se encarga de realizar el foundraising del Proyecto.
Local socio-impacts	
Scaling up	

Appendix II

Interview Guidelines

1. General description of project & General approach

1.1 Technical

- Scale of project
- Number of installations
- Location
- Year commissioned
- Generated power
- Technology
- Type of manufacture (locally manufactured or imported)
- Number and type of end-users
- Metering infrastructure (circuit-breakers, meters)
- Charging method (flat tariff, according to usage)
- Electrical installation and distribution design (if available)

1.2 Location-specific

- How is the country electrified?
-Why is the grid not expanded to all country? (economic, political, other reasons)
- What is the price of electricity in the country?
- Can you describe the country's climate, topography, dispersion of settlements and road network?

- Was the location favourable for wind turbine installation? (wind resource, obstacles)
- Are there other electricity/energy sources?
- Is there water supply network installed? How does it function?

- How are people organised traditionally in the community? (cooperatives, micro-enterprises)
-Which are the traditional economic activities in the community?

1.3 Project Initiation

- How was the project initiated? (Community-initiated or implementing organisation-initiated)
-How was the first contact with the community?
- Why was the location (specific community) selected?
- Why was the technology of SWT selected for this location? (most appropriate for the location, this technology is used by the specific organisation)

1.4 Implementing approach

- Were the community needs & desires assessed at the beginning of the project? How were they assessed?
- Was the community or other stakeholders involved in the project before the implementation?
- Were risk analyses and contingency plans conducted a priori?

2. Enabling environment

2.1 Municipality, Government and Institutions

- What was the relation with the municipality/ government/ institutions before?
- Was municipality/ government/ institutions approached?

2.2 Policy, Regulations

- Is there supportive public policy for rural electrification and renewable systems? (national quality standards, tax exemptions, government subsidies)
- Is there SWT priority in the rural electrification strategy? (wind studies, reduced import tax on wind energy system components, subsidies for wind power systems)
- What is the awareness level in the country about off-grid electrification, renewable energy, wind power and environmental issues?
- Are there national quality standards to ensure product quality?

2.3 Private Sector

- Is the private sector involved (as donors/investors)?
- If not, what are the obstacles? If yes, how was it approached?

2.4 Suppliers

- Where are the closest technicians and suppliers? (in the community, at close towns, inside the country, abroad)

3. Ownership & Management

3.2 Map of Actors & their Roles

- Who are the differents actors that you identify in the management process?
- If external, where are they based? Were they elected?
- Can you identify their roles and responsibilities
- Who is the owner?
- Is ownership and management separated?

3.3 Model, decision-making processes

- How was the model decided?
- Are the forms loose (such as community based organisations) or more formalised (micro-enterprises, cooperatives)?
- Is there rotation of responsibilities?
- What happens in the case of a key person's withdrawal?
- How are decisions taken during/after the implementation?

3.4 Community participation

- How is the relationship between the end-users and the management?
- How can the end-users affect the management process?

3.5 Level of transparency, corruption

- Who controls the management?

- Any corruption issues occurred?
- Are transparent financial accounts kept?

4. Training

4.1 Community capacity

- What was the level of education in the community? (primary/secondary/higher, percentage of educated people)
- Is there access to communications (radio, internet, television)?
- What kind of technical skills did you find in the community? (e.g. electrical, mechanical, carpentry, managerial, etc)
- What was the awareness level in the community about off-grid electrification, renewable energy, wind power and environmental issues?
- How were you informed about the local capacity?
- How were the locals skills involved in the project?

4.2 Training actions

- Did the users receive any training?
- Can you describe the training process implemented? (duration-methodology)
- Was the training pre-planned or adjusted to the users' capacity?
- Was the training addressed to all the community or specific persons that would take responsibilities?
- What percentage of the community participated?
- Did the users participate in the implementation?
- Was there an evaluation for some of them? (like an examination)
- Do you think the training was sufficient/effective?
- Apart from users, did other stakeholders (local authorities, agencies) receive any training?

5. Operation & Maintenance

5.1 Distribution to End-Users

- How does electricity reach the end-users?
- How is consumption measured? (circuit-breaker, meters)
- How do they pay for electricity? (flat tariff, paying according to usage) Who decided?
- What happens if the payments are late?
- Are records kept for consumption and tariffs?
- How are new users added?
- Are there demand growth margins?

5.2 Maintenance

- Who is responsible for maintenance?
- What is the maintenance procedure? (Different levels and process)
- How is maintenance paid?

- How many hours of maintenance work per month? (paid work or donated)
- What kind of resources are needed in the periodic system operation? (example: labour, supplies, tools, workshop, others)

- Was the turbine manufactured with locally available materials?

- Are spare parts ordered from abroad?
- Were any technicians trained locally/in close distance?
- How much is spent on spare parts and how much on paid work (percentage)?

5.3 System performance

- What kind of failures?
-How often during the year?
- How much downtime/uptime during the year?
- Are the failures fixed quickly? Are they delayed due to socio-economic context?
- Voltage drops? Blackouts?

5.4 User satisfaction

- Are the users satisfied? Do they feel proud?
- What do they complain about?
- Have other people moved to the area after the installation?

6. Financing

6.1 Actors involved

- Who paid the capital costs?
- Who pays the operating costs?
- Does the community donate resources other than money (labour, services, others)?

6.2 Financial sources

- Were external funds needed to cover the capital costs? The operating costs? The system's expansion or improvement?
- From whom?(Public/private/NGO/other funds) How were they found?

6.3 Fundraising Community Actions

- Are there communities actions to get resources? Which ones?

6.4 Financial assessment

- Is the service affordable to users?
- Is the system profitable? How is the profit invested?
- Are transparent financial accounts kept?

7. Local socio-economic impacts

7.1 Productive uses and local job creation

- What are the traditional economic activities in the community?

- Are the users motivated to use electricity to create income? (e.g. lower price as consumption increases, business ideas)
- Is electricity used by local businesses?
- Post installation, has any business emerged that depends on electricity?
- Have any local jobs been created due to electricity?

- What percentage of the money paid by the end users is fed back to the local economy?

7.2 Social impact

- How has electricity changed the community's everyday life?

8. Dissemination & Scaling Up

8.1 Strategies and Barriers

- How does your organisation promote the dissemination and replication/scale-up of similar projects?
- Does the community take actions to promote the replication of the project?
- What are the obstacles for such projects to disseminate/scale-up?

8.2 Assessment

- Has this project had a wider impact outside the community?
- Has the awareness and support towards off-grid renewable electrification and environmental issues increased in the region/country?
- Refer to specific examples