2012 INTERNATIONAL YEAR OF SUSTAINABLE ENERGY FOR ALL

Open ideas

ACCESS TO WATER THROUGH AFFORDABLE ENERGY

ISSUES & PROMISING INITIATIVES

MARCH 2012

Extract from the final report addressed to the TSG 2.3.3 of the 6th World Water Forum

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ENERGY POVERTY IMPACTS ON WATER ACCESS

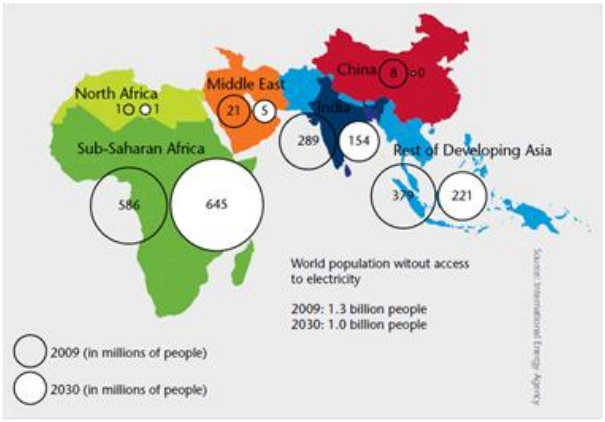
Acknowledgment

Water and energy are closely related, water is a precious source of energy production while energy is a basic requirement for water access.

As a matter of fact, the World Water Forum puts emphasis on these interactions and dedicates a specific "core group" to lead reflections about this relationship. As part of the 6th World Water Forum core group "2.3 Harmonize water and energy", the Target Solution Group (TSG) "2.3.3 Isolated communities are powered by affordable energy sources" intended to highlight promising initiatives propelling water access in developing countries.

Powered by Electriciens Sans Frontière (Philippe Desroques) with the support of ENEA Consulting as part of its volunteering activities, the Target Solution Group reflections relied on precious insights from its members : Christelle Huré (Secours Islamique France), Matthieu Buono (Photalia), Luis Peinado & Jean-Claude Clermont (Aquassistance), Marie France Roy (Energy Assistance), Elsa Favrot-Monier (GDF SUEZ), Caroline Mairesse as a representative of the "Core Group" (SUEZ ENVIRONNEMENT).

Key facts on energy poverty and off-grid communities



Worldwide energy poverty repartition – South America excluded *(Source: IEA)*

According to the International Energy Agency, between 1.3 and 1.4 billion people have no access to electricity and up to an additional billion only have access to unreliable electricity networks.

The largest lack of access issue is located in the Sub-Saharan region where the rate of electrification is only 31%. Among the region, about 79.5% of the affected population lives in rural areas while the average of the rural affected population in developing countries represents a 85.5% share. The distance from the potential existing grid appears to be one of the main reasons why rural populations tend to suffer from lack of electricity, when it is not due to political matters.

As a consequence, these populations, also called "off-grid communities", have to rely on standalone alternatives such as diesel powered generators for water pumping operations or biomass for cook stoves uses.

In addition to the isolation, off-grid communities also suffer from the so called "double penalty". This implies that communities have to face inefficient energy supply costs, which dramatically increase prices that members have to incur. Assuming off-grid communities' main uses of energy are oil lamp or diesel powered generators, the "double penalty" could be even bigger due to the volatility of the resource's prices as well as related health and environmental hazards…

ENERGY POVERTY IMPACTS ON WATER ACCESS

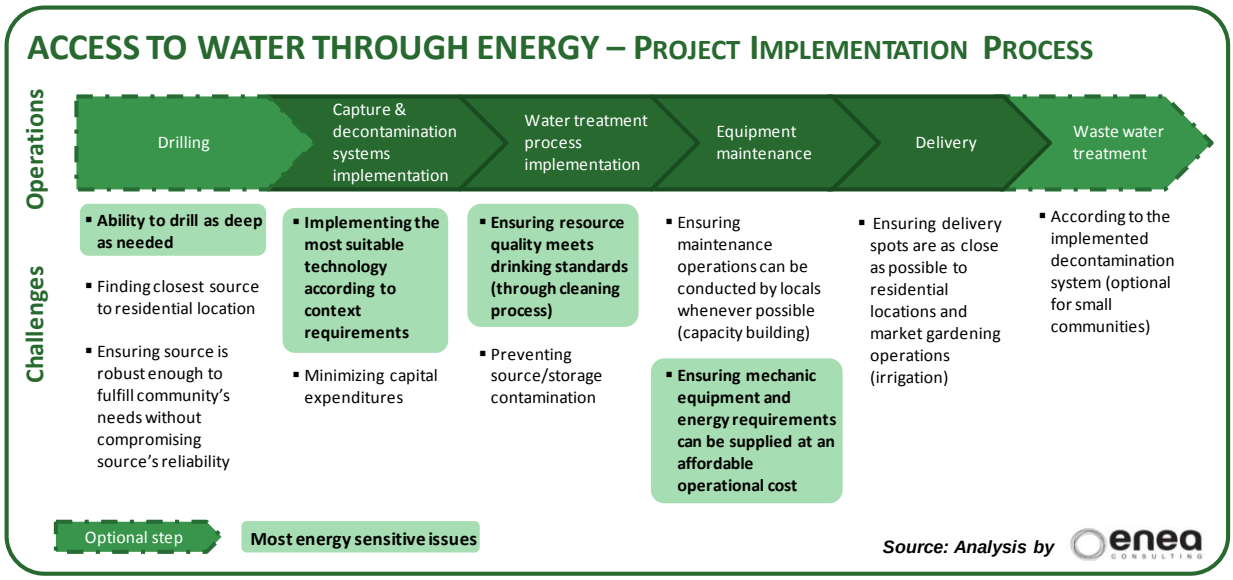
Water access key challenges for off-grid communities

Communities that are not connected to the public water networks are forced to hold water supplies by themselves. Furthermore, paired with limited access to a suitable energy source, water access issues become one of the ripple effects of energy poverty.

The limited ability of off-grid communities to answer their water needs is taken into consideration with the following:

- Unsuitable energy sources which suggest to rely on self-capture methods for needed supplies of water.
- Technical issues regarding needed maintenance's materials and energy supplies.
- Economic issues related to operational expenditures (energy and maintenance's requirements).

As a consequence, and based on this specific off-grid context, it is important to acknowledge the alternative water access process of development and the main issues along its implementation (see here below).



Energy issues can rise on major steps of the project's implementation process and therefore spoil communities' access to safe water:

- **Drilling operation** (only for underground water capture): the operation can require an important source of energy in case of deep underground water location (over 40-50 meters).
- **Capture system implementation**: this development step is a neuralgic point in the community's energetic ability to access to water. Chosen system implementations will impact on the energetic and technical needs (maintenance) during the operational phase and, as a consequence, on the ability to access to water in an affordable way.
- **Water treatment** (cleaning process): when a community's only access to water is a brackish source, it is necessary to implement a treatment process to reach minimal drinkable standards. To do so, the capture system needs to be combined with a purification system which possibly requires energy.
- **Equipment maintenance**: according to the implemented system, access to water equipment may require maintenance operations and energy sources which would have to be viable in terms of: expected energy flows (continuity, quantity, quality) at an affordable rate; maintenance operator qualifications; availability and affordability of the required materials for maintenance operations.

PROMISING INITIATIVES

How to deliver a sustainable and affordable access to water ?

In order to sustainably curb the issue, it is necessary to encourage systems' implementation which would be resilient to prices volatility and allow a fair access to beneficiaries (based on the global implementation costs).

To do so, several options exist and show sufficient maturity to be developed on the field (see the illustration here below).

Stand-alone systems' prices compared to a regular access in Senegal

Village in Senegal

Access through wind energy

0,76 € for 1m3

Source: GRET

Suburban area of N'Djamena (Tchad)

Access through solar energy

2,08 € for 1m3

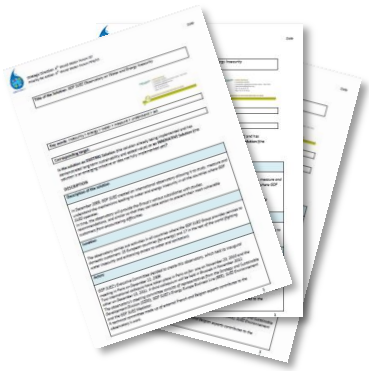
Source: ©SIF/Tchad/2011

Dakar downtown

Household access

0,29 € for 1m3

Source: SDE/Pricing "TS"



Submitted solutions to TSG 2.3.3

The Target Solution Group 2.3.3 (TSG) received sixteen propositions from which it could based its analysis.

These initiatives, carried out by private companies or NGOs, presented various technical and organisational options, such as:

- Drilling methods,
- Gravitational systems,
- Solar energy,
- Wind energy,
- Powered cleaning processes,
- Capacity building insights or,
- Financial leverage approaches.

Every submitted solution has been characterised in order to extract its main contributions to a project development on water access. Four of them are presented to you over the next pages.

PROMISING INITIATIVES

Building capacity of a local entrepreneurs' network BY *ATPESFORC*

Manual Well Drilling

PROJECT MATURITY *PILOT* *REPLICATED* *LARGELY SPREAD*

SUITABLE CONTEXT

Located in N'Djamena (Tchad), the association's technique is used over the country and soon in Guinea. It requires good initial hydro geological conditions to reach a water source located below a 60 m depth .

SOLUTION'S DESCRIPTION

In Tchad, local entrepreneurs use the "rotary" drilling process which enables them to execute low-cost drilling up to a 60 m depth in only 2 working days. In order to be stronger and to expand good drilling practices, several entrepreneurs decided to combine their strengths into a professional association called *ATPESFORC*.

Based on member capacity building, the association is able to promote its expertise and be mobilized on responses to tender toward international organizations such as *UNICEF* or *Secours Islamique France*.

ATPESFORC contribute to water access through its drilling operations, however we can assume part of their innovative solution comes from the development model as well.

KEY LEARNING

1. **To scale up, an organizational initiative needs to be recognized and promoted by public authorities at a local and national level.**
2. **This experience shows how strong drilling entrepreneurs can get when united (lower production costs, more knowledge, more income and higher quality delivery which propels well durability).**
3. **A facilitating factor for such a solution is that the association also assumes a micro-credit role by propelling young entrepreneurs whom, without any initial capital, are not able to get into the business.**

CAPACITY BUILDING & SOCIAL IMPACT

ATPESFORC's strength relies on its capacity building insights towards its members. The association provides entrepreneurs with :

- Training sessions,
- Drilling material (which are purchased by the association and loaned to entrepreneurs),
- Systematic work control (in collaboration with the Water Ministry) to deliver quality certificates.

ECONOMIC FACTS

Besides initial funding from *UNICEF* and the Water Ministry, ATPESFORC seems to be a model which relies on its own growth:

- Entrepreneurs' membership fees.
- 1% fee on every successful response to tender revenue which were sent through the association name.

On the other hand, the entrepreneurs provide good quality work with a drilling cost 3 to 6 times lower than previous processes.

Source: *ATPESFORC* - Analysis by enea CONSULTING

Drinkable water conveyance to bush located villages BY *Electriciens Sans Frontières*

Gravitational

PROJECT MATURITY *PILOT* *REPLICATED* *LARGELY SPREAD*

SUITABLE CONTEXT

Project was developed in Skalalina (Madagascar) in a bush ecosystem. Its implementation requires a 20-30 m change in altitude and a consequent number of beneficiaries (>3500 people).

SOLUTION'S DESCRIPTION

From 2007 to 2010 Electriciens Sans Frontières (ESF), supported by financial partners and local actors, developed a gravitational system to provide a 3500 inhabitant village with safe water.

The project included a 5 kilometers underground canal to supply water from mountains to 20 public fountains among the village, a concrete dam, a treatment structure (3 filtering vats), a water tower and various equipments (such as taps).

KEY LEARNING

1. **Water committee is needed to enhance community benefits. However, social actors such as NGOs are needed to coordinate committee's structuring (from a financial and technical standpoint).**
2. **In order to perpetuate installations' operative conditions, it is crucial to make economic participation compulsory for community members.**

CAPACITY BUILDING & SOCIAL IMPACT

The solution's implementation brought less water related diseases, agriculture empowerment and teacher settlement, and saved time for women who used to carry water on long distances.

To develop the project, ESF involved local inhabitants to dig canals and trained local technicians in order to take over maintenance operations on behalf of the water committee.

ECONOMIC FACTS

Overall costs were about 79,000 € which implies beneficiaries have to be large enough in order for the project to be economically viable.

Households have been required to financially commit to the project they will benefit from through a yearly participation of 1 €. However, this "fee" is only equivalent to the global maintenance costs, including technicians' salaries.

Source: *ESF* - Analysis by enea CONSULTING

PROMISING INITIATIVES

Alizés: water access through wind pumping — BY *GRET*

Wind Energy

PROJECT MATURITY — *PILOT* / *REPLICATED* / *LARGELY SPREAD*

SUITABLE CONTEXT

Projects fit villages with less than 1000 inhabitants, with underground static sources located at 30-45 meters depth, in windy regions.

SOLUTION'S DESCRIPTION

Program Alizés is conducted by the NGO *GRET*. Its purpose is to propel water access through wind energy supply. After a pilot in Mauritania, *GRET* (in association with a local engineering company, *EER* and *Aquassistance*) launched a new version in the north of Senegal: Alizés II. This second implementation occurred between 2004 and 2008, it relied on a local project undertaking for the development of 8 water treatment plants, 31 wind pumping systems and a storage/distribution system in order to foster water access for 15.000 inhabitants.

To be effective over a long term period, Alizés II has been developed around capacity building principles: local actors have been involved into a consultation process, people have been trained in order to be independent regarding system management and maintenance.

KEY LEARNING

1. **Project's success depends on the project appropriation by the community (early consultation, economic and technical involvement).**
2. **Community's local water management organization can be supplied by recognized associations to ensure its efficiency.**
3. **It is necessary to involve a neutral third party in charge of the project's evaluation to bring suitable indicators and an external point of view regarding project performances.**

CAPACITY BUILDING & SOCIAL IMPACT

Besides the co-creation process, the *GRET* developed several training sessions to empower the local community: about hygiene related to water; on equipment production/installation/maintenance for local entrepreneurs; on water management in order for the community to develop a good technical and economic management of the installations.

Through these initiatives, local communities can rely on themselves to develop and maintain the installation.

ECONOMIC FACTS

A windmill equipments (drilling excluded) cost about 3500 to 6400 euros with relatively low installation and maintenance expenditures.

Project relies on community's contribution. Community's members are asked to pay the service according to their consumption. This element is part of the project organizational plan which suggests raising community's implication through an economic involvement.

Source: *GRET* - Analysis by enea CONSULTING

GDF SUEZ Rassembleurs d'Energies: a tool to fight energy poverty — BY *GDF SUEZ*

Social Investment

PROJECT MATURITY — *PILOT* / *REPLICATED* / *LARGELY SPREAD*

SUITABLE CONTEXT

Any place in the world: either in developing or developed countries. Investments will be attracted by high potential positive ripple effects from a social standpoint while being economically viable.

SOLUTION'S DESCRIPTION

GDF SUEZ created in 2011 a program to contribute to social entrepreneurship development through investment, volunteering and/or subsidies. Grants are allocated by the *GDF SUEZ* Foundation : *Energy Solidarity program*. The fund called *GDF SUEZ Rassembleurs d'Energies* will progressively increase to an average of € 100 million capacity in 2013, from which 10% will go to social businesses related to energy access.

However, *GDF SUEZ Rassembleurs d'Energies* does not limit its contribution to financial support: every investment/subvention is associated with technical insights and support from *GDF SUEZ*'s employees through a skills sponsorship.

The program invests in projects such as the electrification of small villages and small-scale hydroelectric projects, lead by social entrepreneurs. To assess the investments opportunities, *GDF SUEZ Rassembleurs d'Energie*s follows a set of criteria including economic, social and environmental impacts.

KEY LEARNING

1. **In addition to the classic Return On Investment Capital indicator, criteria assessing the investment's social impact can highlight access to water initiatives.**
2. **Programs such as *GDF SUEZ Rassembleurs d'Energies*, can heavily contribute to propelling water access by scaling up clusters through investments and subventions in entrepreneurs' projects.**
3. **Financial support associated with technical support contribute to capacity building.**

CAPACITY BUILDING & SOCIAL IMPACT

At the community level, assessing investment opportunities through social impact criteria enables *GDF SUEZ Rassembleurs d'Energies* to contribute to scale up projects, implying social value creation (job creation, number of people served, etc.). Part of the social impacts of these investments are expected to generate high capacity building among the community.

At the company level, the technical support (associated with financial inputs) that are provided through *GDF SUEZ* skills sponsorships and internals NGOs, enhances *GDF SUEZ*'s employees awareness and capacity building.

ECONOMIC FACTS

With an available 10 million Euros by 2013 for investments dedicated to social businesses, *GDF SUEZ Rassembleurs d'Energies* will focus on potential ripple effects which could generate a strong economic dynamic synonymous with higher community' capacity to answer its own needs.

Source: *GDF SUEZ* - Analysis by enea CONSULTING

RECOMMENDATIONS FOR YOUR PROJECT DEVELOPMENT

Integrate the context requirements & community needs

Even though grid extension should be the first encouraged remediation option, it is not often a cost effective operation. Besides, there is no universal solution which could be implemented in every context. For instance, even though manual pump can appear to be the most affordable option for a 300-400 inhabitants' community with an underground water source located at a 30 meters depth, it is not the case for a 1000 inhabitants' community and/or an available underground source located at a 70 meters depth.

As a result, it is necessary for water access project development to fulfill the context requirements as well as community needs (drinkable uses and/or market gardening uses) before favoring any technologic system option.

Enhance capacity building

Key success factors for the implementation of a water access project rely on community implication. Capacity building enables communities and local project contractors to increase water access around the country in a faster and more independent way. Therefore water access projects through energy systems should consider:

- Developing local technician training sessions is crucial in building a local expertise.
- Adopting a participative approach by setting up a water committee is a good practice as it maximizes communities' involvement through responsibility transferring and generates local activities around operational management. In addition, it enhances communities by encouraging committees to take good care of the infrastructures.
- Developing as many as possible water access systems designed on local resources and opportunities that empower a broader scope of the project life cycle (for instance, system production can be developed locally).
- Authorities and decision makers should be sensitized regarding evaluating systems based on a **global cost perimeter** rather than limiting their evaluation to capital expenditures. This lever would propel sustainable energy alimentation in comparison to diesel systems which can be cheaper to purchase but generate high running costs for communities.

Design a suitable organisation support

In order to maximize social and economic impacts while minimizing the overall system cost for beneficiaries, it is necessary to structure as much as possible both down and upstream aspects of the field chain. This operation requires:

- A holistic approach with ministries, NGOs and professional unions working together to set up operating standards.
- To build an industries' network where entrepreneurs could find required knowledge and support. By working together, local contractors can share good practices and scale up water access to off-grid communities.
- To enhance water committees' access to Credit and Micro-credit. This operation should be encouraged in order to give them the ability to purchase systems with higher capital expenditure requirements (for instance: solar systems).

FURTHER INFORMATION:

Submitted solutions for TSG 2.3.3 - www.solutionsforwater.org/solutions

Full report from TSG 2.3.3 - http://www.worldwaterforum6.org/en/

UN, Sustainable Energy for All - http://www.sustainableenergyforall.org/resources

OECD/IEA, "Energy Poverty - How to make modern energy access universal?"

UNPD, "Energy services for Millennium Development goals"

Author : Thibault Lesueur, ENEA Consulting

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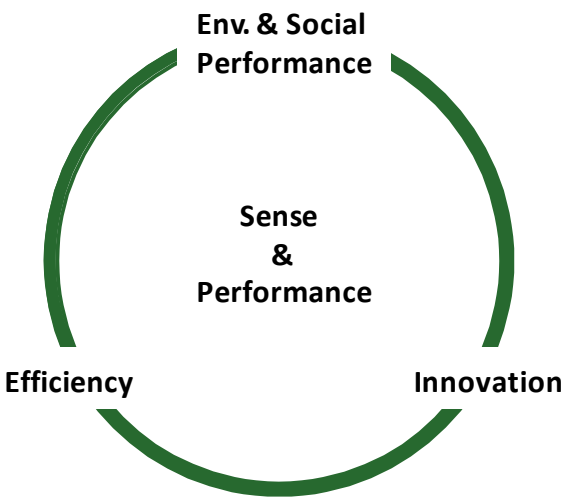

Energy fields and innovations

- Oil & Gas
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- Bioenergy
- PV and concentrated solar
- Hydrogen
- Hydroelectricity
- Energy storage
- Carbon finance

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