

Engineers Without Borders Denmark: Renewable Energy in the West Bank

Lessons in Renewable Energy Service Provision in a Conflict Zone

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Abstract

The following development project was carried out between 2009-2010 in various stages. The thesis submitted represents only the initial development phases in which the feasibility of installing a hybrid renewable energy system and stakeholder analysis were determined for two remote Palestinian villages in the West Bank. This project was carried out and documented by a group of students from Aalborg University in Denmark representing Engineers Without Borders Denmark (EWB-Denmark).

After writing the thesis, the students have since returned for implementation alongside the village inhabitants and project partners. Furthermore, additional EWB-Denmark project representatives returned post-installation for evaluation and mediation activities.

This summary report therefore aims to shed light on the other development phases in order for the readers to gain a more encompassing understanding of the challenges faced by project members, particularly the issue of political neutrality, while trying to collaborate with both Israeli and Palestinian project partners in a politically contested territory.

The utilization of environmentally appropriate technologies and the benefits that can be achieved via them is the underlining theme, which provides not only electrification but also energy independence for the village inhabitants.

Historical and Political Context

Bedouins in Masafer Yatta

All of the villages discussed in this paper reside in the Masafer Yatta area, which is located within the South Hebron Hills and contain some 50 rural communities. The inhabitants, often referred to as 'cave-dwellers', have lived in the area continuously since the early nineteenth century. Most are Palestinian farmers and shepherds living in remote villages consisting of both caves and tents. They are a very traditional population subsisting on non-mechanized agriculture and herding.

Since the War in 1948 however, Israeli authorities have constrained the Bedouins to the point of eviction, overtaking the fertile land in order to build settlements. Over 3,000 Bedouin property claims have been set forward in the past 20 years with no victories.

Overview of Settlement Expansion in Palestine

According to the UN OCHA report (2007), Israeli settlement construction in the West Bank has taken place under every government since the beginning of Israel's occupation following the 1967 Arab-Israeli War. Early settlement development concentrated around East Jerusalem, the Jordan Valley, and the northern West Bank Mountains while subsequent settlements were established in and around Hebron and the southern Hebron hills., segregating the various rural Palestinian communities.

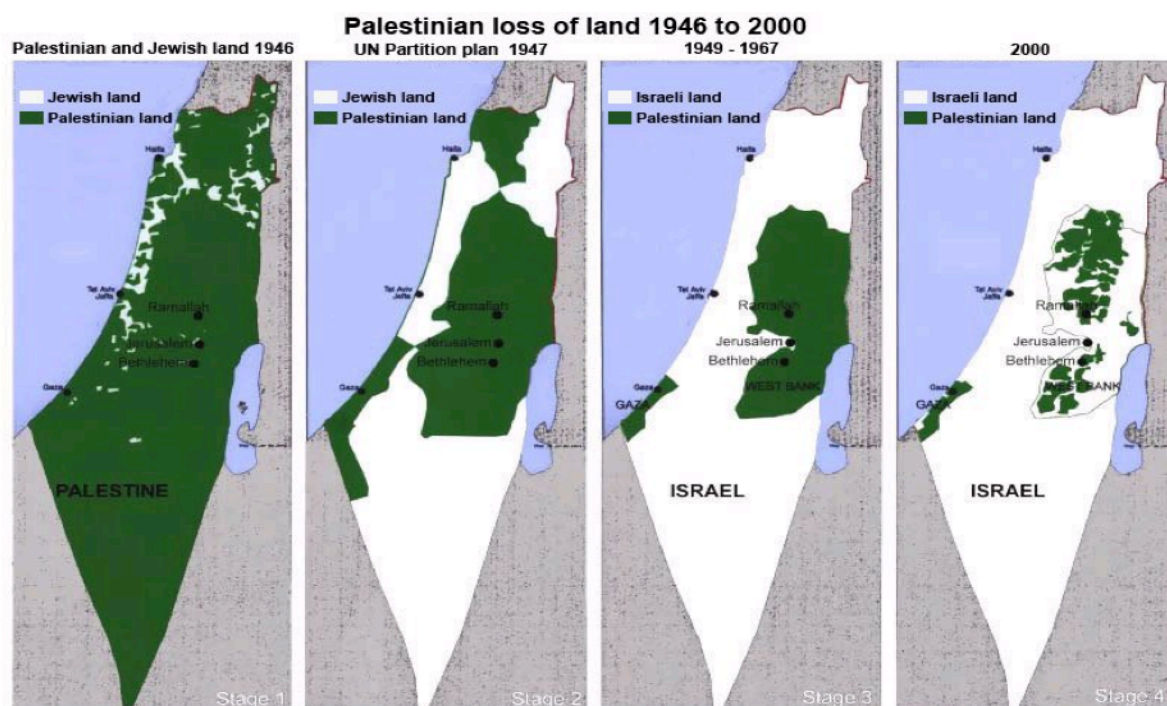


Figure 1 – Palestinian Loss of Land 1946-2000 (Medicks, 2005)

Overview of the Energy Supply in the West Bank

For more than 40 years, the Palestinian economy has been highly dependent on the electricity supplied and controlled by Israel. Palestine's electricity problems and priorities can be summarized as follows: *"the lack of investment and public expenditure, inflated prices and high transmission losses constitute fundamental problems for the electricity sector. The quality of the electrical services is inadequate and below standard"* (Alkhair, 2006). Remote Palestinian communities are restricted from connecting their villages to the national grid causing adverse effects such as poverty and limitations to economic development. Furthermore, according to Abualkhair (2006), there are 65 village localities within the Palestinian territories whom are not yet connected to the public energy network.

Project Background

Community Needs and Project Goals

The project goals are directly reflective of the community needs and are intimately intertwined and complementary in the true spirit of sustainable development. A joint thinking process between the local community and the project participants defined four main needs for the project, including:

1. Basic and clean energy services to support basic human needs; particularly for night-time illumination and safety.
2. Improved livelihoods through revenue-generating mechanisms.
3. Social and economic empowerment of the target communities through material support.
4. Environmental sustainability in the Masafer Yatta communities, via clean energy sources that replace polluting, oil-burning lamps or diesel generators.

Student Field Mission (November 2009)

Mission: fact-finding, stakeholder negotiations, project design

EWB-Denmark Team:

- Jozsef-Bartha Attila
- Paw Stefan Jensen
- Katja Lähdesmäki
- Jules Risser
- Kristen Skelton

Implementation of Haribat an-Nabi (May 2010)

EWB-Denmark Team:

- Paw Stefan Jensen
- Katja Lähdesmäki
- Kristen Skelton
- Jesper Rost Villumsen (New – from Engineering College of Aarhus)

Evaluation and Mediation Trip (August 2010)

EWB-Denmark Team:

- Fridolin Müller Holm (Project Manager)
- David Christensen (Project Manager)
- Bissan Zamzam (New – from AAU Esbjerg)

Project Chronology

May 2009 – International Engineers Without Borders conference in Sweden, including participants from EWB-Denmark and EWB-Palestine. Joint venture project proposed for students from EWB-Denmark, EWB-Palestine and EWB-Israel.

June 2009 – Preliminary field study undertaken by EWB-Denmark engineer Fridolin Müller Holm on the feasibility of renewable energy projects in the West Bank.

September 2009 – EWB-Denmark project team established with AAU students supervised by David Christensen, Fridolin Müller Holm as project manager. Contact initiated with Comet-ME, an Israeli NGO specializing in renewable energy installations in the same area of operations.

November 2009 – Student team carries out field mission in the West Bank to carry out further feasibility studies and negotiate with stakeholders. Departure from original project idea – two projects proposed with Comet-ME and EWB-Palestine respectively.

December 2009 – Project fundraising an overwhelming success with original budget surpassed.

May 2010 – Completion of hybrid renewable energy installation in Haribat an-Nabi in partnership with Comet-ME, EWB-Palestine as observers. Relations between Comet-ME and EWB-Palestine break down. Completely.

August 2010 – Fridolin Müller Holm, David Christensen and Bissan Zamzam (Danish-Palestinian AAU student) carry out last-ditch mediation attempt, which ultimately fails.

November 2010 – New EWB-Denmark project team established who decides to exclusively partner with EWB-Palestine for the second project.

Appropriate Technology

The provision of energy to the community of Haribat an-Nabi will allow the community to use devices such as an electric butter churner to make butter from their 250 heads of goats and sheep. The system will support three refrigerators to store the dairy products and to market it to the nearby villages and towns.

Many other trivial modern-life appliances such as light, radio, television and mobile devices, will support the daily life of the community. These in turn will make the life of the people in the community a little easier and help to remain on their land.

Power Generation Design Goal

A group of students from Aalborg University, on behalf of EWB-Denmark and in collaboration with Comet-ME designed and installed a hybrid renewable power system. Included in the system were:

- 8 solar panels of 135 Wp each, which could provide between 4-6 KWh of daily (winter and summer time) energy. Since Haribat an-Nabi is located in the desert, there are more than 85% sunny days throughout the year.
- 1 KW, 3 m diameter, home-brewed wind turbine, which could provide an average of 2 KWh per day. On cloudy and winter days, the turbine can provide 4-10 KWh per day due to strong winds. Average wind does not change much in the area. Previous installations and wind surveys conducted in the area found that the relative high community locations (>800 m) are very promising.

It is assumed that the solar panels will provide the majority of the daily consumption. Wind power will boost the system and provide the optimal conditions for extended battery lifetime. In the area the wind starts to increase usually around noon, thus complimenting the solar production after sunset.

Consumption Design Goal

The system was designed to support each of the 4 families that live throughout the year in the Haribat an-Nabi with the provision of 1.5-2 KWh daily. Families that will come to stay for shorter periods during the year in the community will consume much less power and only basic needs will be supported (e.g. illumination, mobile charging, radio).

The total average energy capacity is designed to be of the order of 6-7 KWh daily.

This energy will be consumed daily as follows:

- 3 refrigerators – 3 KWh
- Illumination – up to 0.6 KWh
- Electric butter churner – 1 KWh
- Radio, t.v. – 1.2 KWh
- Washing machine (every third day) < 200 Wh average daily use

Challenges and Contention Points

A very tangible “Tragedy of the Commons”

- System dimensioning OK in theory; But in practice, could not take into account bad neighbourly relations within the community itself
- Three families cannot agree on sharing the power load. One family over consumes. Result: battery is depleted and days go by without power
- Refusal of payments: Inability on the part of the community to understand payment mechanisms and/or unwillingness to accept treating electricity as a paid-for commodity

Two Diverging Viewpoints

EWB-Palestine

- An Israeli NGO will never have the legitimacy required to conduct even humanitarian aid work in the Palestinian Territories. Such activities perpetuate the occupation and still place Israelis in a position of power to decide the fates of Palestinians. EWB-Denmark is folly to partner with Comet-ME.
- It is unacceptable that payment for energy service provision in the West Bank goes to anything other than Palestinian bank accounts.
- EWB-Palestine insists that Palestinian energy service companies should handle payment matters for the installations, and handle system maintenance.

Comet-ME

- EWB-Palestine, or any other Palestinian NGO for that matter, has absolutely no on-the-ground track record of continuous engagement with communities in the area like Comet-ME has. Comet-ME may not be Palestinians, but they are more deeply tied in with the communities.
- Comet-ME insists that based on experience, immediate handing-over of control of payment services to a community doesn't work.
- Comet-ME insists that Palestinian energy service companies have no mandate for operating in Area C and will not do so. They will not be able to provide the same level of service that Comet-ME can provide, and Comet-ME has better knowledge than anyone on how to maintain the system.

Despite all of this:

“Never doubt that a small group of thoughtful, creative, committed citizens can change the world.

Indeed, it is the only thing that ever has” - Margaret Mead



Figure 1: Palestinian Children from Umm el Kheir Village (Skelton, 2009)



Figure 2: Wind Turbine Installed in Susya Village (Skelton, 2009)



Figure 2: Installation in Haribat an-Nabi (Skelton, 2010)



Figure 4: Bedouin Shepherd in the Village of Susya (Comet-ME, 2009)