**Technology Recommendation**
**Solar Powered Pump**
**Kapoeta North County – Eastern Equatoria**
**South Sudan**

*How can we understand whether the solar powered pump is a sustainable and scalable technology to provide rural water service in many payams in Kapoeta North County, and if it meets users' needs?*

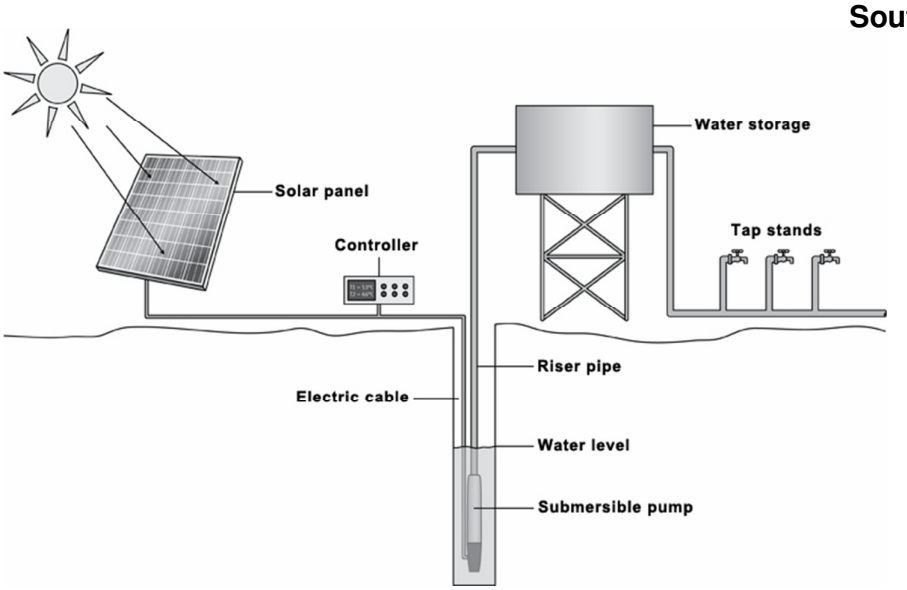
*How can we capture valuable learning and present experiences, drawing together all actors involved in an effective scaling up of the solar powered pump technology for a lasting water service?*

*These are questions the Kapoeta North County Rural Water Service Board seeks to answer in collaboration with VNG and IRC through a Technology Check (using the Technology Applicability Framework (TAF)[1]).*

**This Briefing Note captures the findings of the Technology Check on the solar powered pump in Lokosowan, Nadje payam, Kapoeta North County.**

## Summary of conclusions and recommendations

- Demand in communities for solar powered pumps is high and the technology does satisfy the demands of most if not the entire community. One drawback however is that such systems attract many outsiders (cattle herders).
- The solar powered pump technology in general is aligned with the national policies, strategies and standards.
- The present perceptions, attitudes and behaviours of the communities need to change to have their roles and responsibly on the solar pump accepted and made effective to get a lasting water service. This includes payment for water services, which is currently only done by part of the users.
- Water users through Water Management Committees (WMCs) are responsible for daily operation and minor maintenance. However WMCs are often not present and even if established they lack some technical skills.
- There are no trained technicians in the area to maintain and repair the technology, which jeopardises the sustainability of the service.
- Government institutions exist to support rural water services. However, capacities and resources are insufficient to ensure this effectively.
- A few organisations and private firms in South Sudan procure the solar powered pump. But there is no spare parts supply chain in place; spares are supplied ad hoc, the County or a NGO contacting a supplier or a manufacturer when a part is needed




## Introduction solar powered pump in Kapoeta North County

A solar powered pump is a system designed to lift groundwater, the energy for pumping being provided by the sun through solar panels. The figure above shows a typical solar pumping system. The solar photovoltaic panels convert the sun's energy into electricity. The electricity powers a submersible pump, which lifts water from a borehole up to a storage tank. The water is then gravity-fed through pipes to taps where people collect it. Solar panels are mounted on frames or on poles and are positioned to receive maximum sunlight. Panels are very expensive and can account for 50% to 80% of the overall cost of a system. The pump capacity has to be adequately matched with the size of the panels, to ensure full performance of the scheme. As sufficient sunlight is not always available at peak demand times, enough storage must be included in the design of the system.

11 solar-powered water systems are found in Kapoeta North County. At the time of a baseline survey conducted by VNG in August 2014, three of these were functional, meaning a functionality rate of only 27%. Despite the fact these systems are still fairly new – most of them were installed between 2008 and 2010.

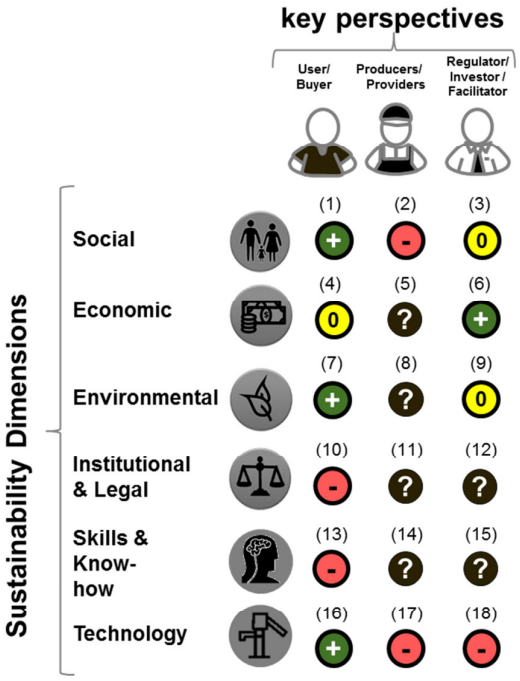
Solar-powered systems have been introduced in the area to ease watering of cattle, as members of the main ethnic group in the area (Toposa people) are cattle herders. The solar powered pumps installed in the County are supplied from Nairobi. According to one the NGOs building such schemes in the area, a submersible pump alone costs about US$5,000 (2014), which is about 20,000 South Sudanese Pounds (SSP). Drilling a borehole about US$10,000 (about SSP 40,000) and the storage tank about US$6,000 (SSP 24,000). Adding the solar panels and distribution network, a whole solar water system is about US$55,000 (SSP 220,000). It therefore is a big investment. When several distribution lines and tap stands are provided, many water users can be served. The annual Operational Expenditures (management, operations, minor repairs and maintenance) are estimated at around SSP5,000 (≈$1250) per year.

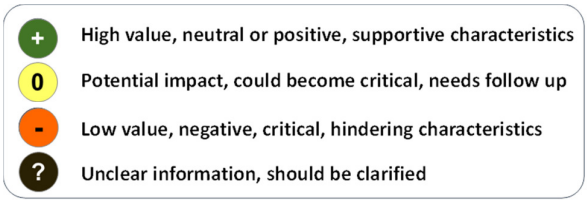
## Technology Check -Evaluation

A 6-person team composed of 4 members of Kapoeta North County and 2 VNG-IRC facilitators did the community data collection part of the TAF. VNG-IRC facilitators collected the 'provider' and government/regulator data through interviews with County staff.

## Results of Technology Check on the solar powered pump in Kapoeta North County

The TAF was used to identify obstacles to the sustainability and scalability of this technology in rural areas of Kapoeta North County. The TAF was not used to make a judgment on whether the solar powered pump is a good technology or not. The graphical profile below presents the result of the participatory scoring exercise with members of the County Rural Water Service Board and of one NGO, under the facilitation of IRC and VNG staff. The scoring was done using 6 sustainability dimensions and 3 stakeholder perspectives.




### Social

There is a strong demand from target users for the solar powered pump. They prefer this technology over a nearby hand pump, because the taps are easier to operate. Water users currently contribute SSP 2 per household per week. However this is only paid by non Toposa consumers; member of the Toposa community argue they already paid through giving land for the water system. Although so far this never happened, water users stated they are willing to contribute cash in case of a breakdown. In the area, this technology is usually supplied by NGOs, who strongly subsidise it. Until recently, local communities had little exposure to various water technologies, hence limiting opportunities for technology choices. Some communities in Najie payam, who now have used a solar-powered water system, recently expressed their preference for hand pumps, as solar pumps attract many cattle owners from outside, inducing overcrowding at the water point, loss of animals... Current users do not fully understand how the technology functions, for instance that the pump cannot operate when there is no sun, or that the Water Management Committee (WMC) can stop the supply of water through closing valves at the tank. In Kapoeta North, some changes in attitudes and behaviours are required among local communities, so that they demand for safe water supply and are ready to pay for such service. These changes could be stimulated through awareness raising and continuing catering for watering of animals in the design of the water systems, which is valued by cattle owners. However local government staff stated they lack skills and resources for these.

### Economic-financial

Only part of the users (non Toposa members) pay for the water they fetch. Currently, not enough consumers are contributing to cover the cost of operation and minor maintenance, as they are supposed to. Most users are only willing to contribute cash when there is need for a repair, up to SSP 5 per household. However,

if 50 households did pay the above weekly tariff, this would generate SSP 5200 per year, which would be sufficient to cover operation and minor maintenance. Water users obviously cannot afford to pay for the full capital cost of this technology, and probably for major maintenance costs either. These costs are strongly subsidised by government and NGOs. It is unknown whether the producer generates sufficient revenues from sales to cover costs such as product development, promotion or supply chain development. Given the very low safe water access figures (approximately 34% in rural areas), the availability of groundwater, and the priority given to water services by government many development partners, there certainly is a market for the solar powered pump in the area. There are no financial mechanisms in place in this region allowing potential buyers to purchase this technology.

## Environmental

The solar powered pump does not create any risk for the environment at community level and for the ground water resources. It is unknown whether the process used to produce this water technology harms the environment in any way. The technology also does not present any risk to the users. However its efficiency drops when there is heavy cloud cover.

## Institutional- organisational

Water users through the WMC are responsible for daily operation and minor maintenance, while the County is responsible for major maintenance. However, many water users expect the County to also pay for minor repairs. In practice this intended O&M structure is not fully in place. Most solar systems in Kapoeta North indeed have no WMC established. At the visited scheme, a WMC was formed and trained, but only 2 are remaining out of 7 initially. After WMC formation, they did not get much support. The WMC is currently unable to perform all the required O&M tasks for the technology (e.g. cleaning of the solar panels). The current level of O&M carried out is clearly insufficient to keep the solar pump running in the long term. There is need for structured post-construction support from the County or another body. Worryingly, there is in the area no technician able to carry out repairs on the submersible pump or wiring system; external support (from a manufacturer or supplier) has to be sought. It is unknown how the producers / suppliers ensure that the technology and spares comply with production standards. The South Sudan Bureau of Standards has the mandate to regulate the quality; however it is unknown whether this is really done. There is no formal process for national government to validate a given water supply technology.

## Knowledge and Skills

When present, WMCs have enough capacities to undertake administrative tasks and to operate the system, but members cannot do some preventive maintenance or repairs. The absence of trained technicians in the area to maintain and repair the solar pump jeopardises the reliability and sustainability of the service. There also isn't sufficient capacity and resources at County level to carry out follow-up training (for WMCs or technicians), or other post construction support activities.

## Technological

Water users are satisfied with the service provided by this technology, as it is more accessible than the one provided by a hand pump (no pumping effort). If well used and maintained, a solar-powered groundwater pumping system can have a lifespan of more than 20 years. There is no real supply chain in place for this technology. Spares supply is mostly ad hoc, contacting a supplier or a manufacturer when a part is needed. Only wires and sometimes control boxes can be bought from a nearby town. Water users do not pay anything for spares. The South Sudanese sector has no responsible body to support the private manufacturer in the product development, and there is no need for it, as the technology is already fully developed.