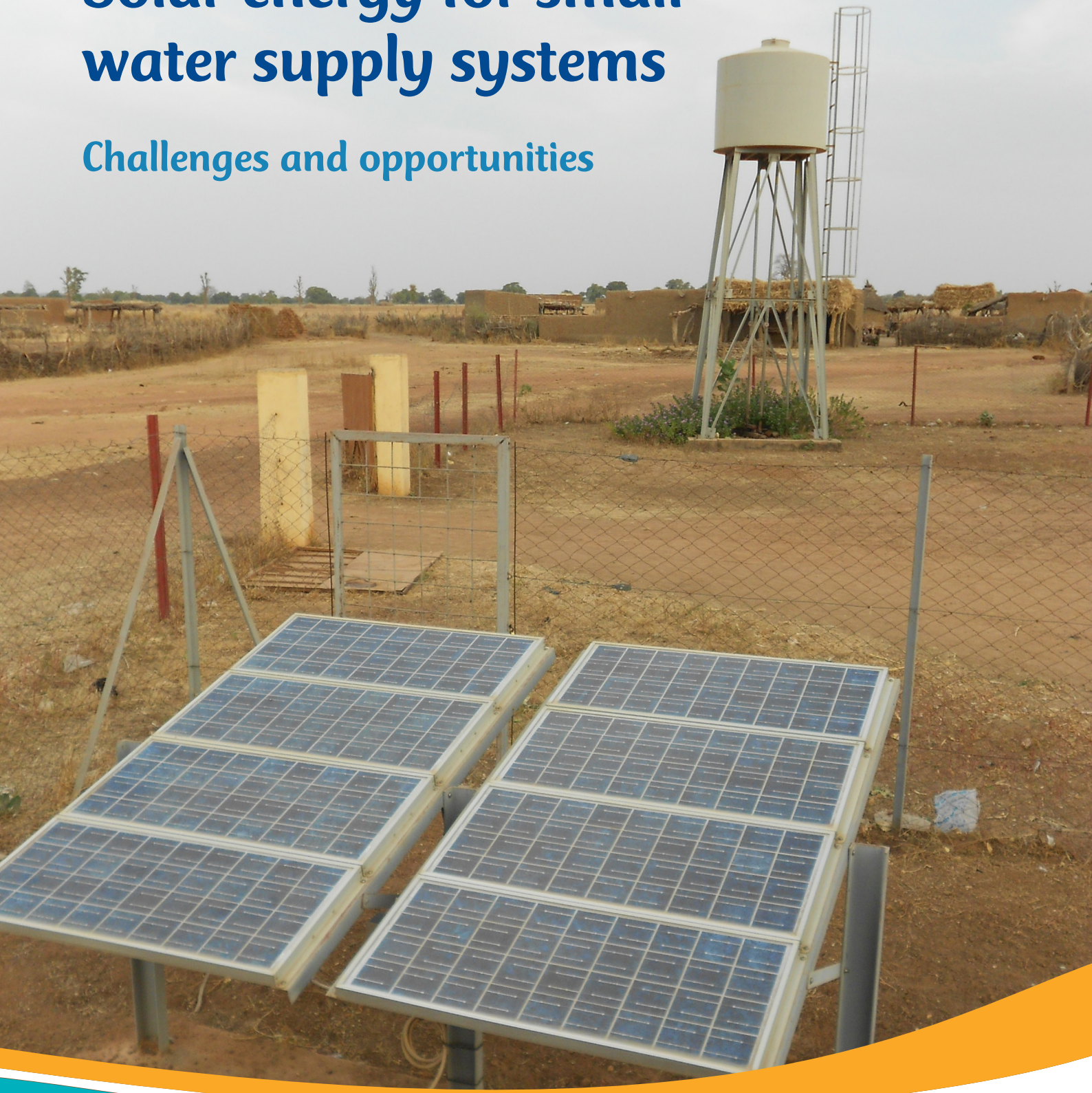
# Solar energy for small water supply systems

## Challenges and opportunities



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# Major technological advances

- The output power of solar modules has considerably increased, rising from 50 Watt peak (Wp) / $m^2$ at the end of the 1970s to 300 Wp / $m^2$ in 2017.
- The cost of a solar module has fallen tenfold in 30 years, dropping from around €10/Wp to nearly €0.5/Wp.
- It is now possible to extract groundwater from depths of over 100 meters using the new generation of submersible pumps.
- Hybrid pumps (thermal and solar) and advanced inverters are now available. Technological advances mean that solar energy can be used to cover a significant proportion of the demand for water. Suitable for use as the only source of power on small-piped systems, photovoltaics can be combined with other energy sources (predominantly thermal power and electric power) on larger systems to offset periods of reduced sunlight or hourly water flow rate constraints.

**There are usually three options available for hybrid (or combined) systems:**

1. Full solar power: solar pumping only.
2. Hybrid with 75% solar: the solar pumping system generates 75% of the power required and is supplemented by an auxiliary energy source that produces the remaining 25% (thermal power or electric power).
3. Hybrid with 50% solar: the solar pumping system and second energy source (thermal power or electric power) are both used equally.

## Criteria for determining the suitability of the solar option for different sized settlements

Recommended | To be assessed | To be discounted

| Settlement Size | Average water demand (15l/c/d) $M^3$/day | Full Solar Power | Hybrid: 75% Solar | Hybrid: 50% Solar | Electric power |
|---|---|---|---|---|---|
| Less than 400 to 1,000 inhabitants | 9 | | | | |
| From 1,000 to 2,500 inhabitants | 26 | | | | |
| From 2,500 to 6,000 inhabitants | 60 | | | | |
| From 6,000 to 10,000 inhabitants | 120 | | | | |
| From 10,000 to 20,000 inhabitants | 250 | | | | |

# The solar pumping system, an affordable and cost-effective investment

## Cost of photovoltaic equipment for pumping systems

| Settlement Size | Average Water Demand (15l/c/d) | Estimated Cost | | |
|---|---|---|---|---|
| | $M^3$/day | Low TDH 30-50 | Average TDH 50-80 | High TDH 80-120 |
| From 200 to 1,000 inhabitants | 9 | from €1,500 to €2,000 | from €2,200 to €3,500 | from €3,500 to €5,200 |
| From 1,000 to 2,500 inhabitants | 26 | from €3,000 to €4,000 | from €6,200 to €10,000 | from €10,000 to €15,000 |
| From 2,500 to 6,000 inhabitants | 60 | from €5,500 to €6,000 | from €12,000 to €18,000 | from €18,000 to €22,000 |
| From 6,000 to 10,000 inhabitants | 120 | from €10,000 to €12,000 | from €22,000 to €25,000 | from €25,000 to €30,000 |
| From 10,000 to 20,000 inhabitants | 250 | from €25,000 to €30,000 | from €30,000 to €33,000 | from €33,000 to €37,000 |

**Note :** The increase in the use of solar pumping systems is resulting in sustained water production, better service continuity and lower production costs (for energy, staff, and depreciation).

# The quality of solar equipment and installation: a challenge that needs to be addressed

The upscaling of equipment and expansion of the solar energy market have given rise to counterfeits and poor quality equipment, which have been allowed to enter the supply chain through lack of market regulation and supervision.

The authorities and operators within the sector frequently highlight the poor quality of equipment and of equipment installation. Recommendations to address this include:

- Systematically conducting a comparative analysis of the various energy solutions as part of projects' technical studies.
- Prioritizing the technical capabilities and traceability of equipment over price.
- Developing training courses/modules on pumping and photovoltaics (installation, maintenance, monitoring).



For more information : www.pseau.org/en/solar-energy-for-water-supply

Contact : pseau@pseau.org

*Scan this QR code for more information.*

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