PUMPING AND DELIVERING GROUNDWATER TO LAST MILE POPULATIONS

Safely Managed Drinking Water Services for Rural Populations – the Last Mile

2019 SIWI World Water Week
Stockholm, Sweden

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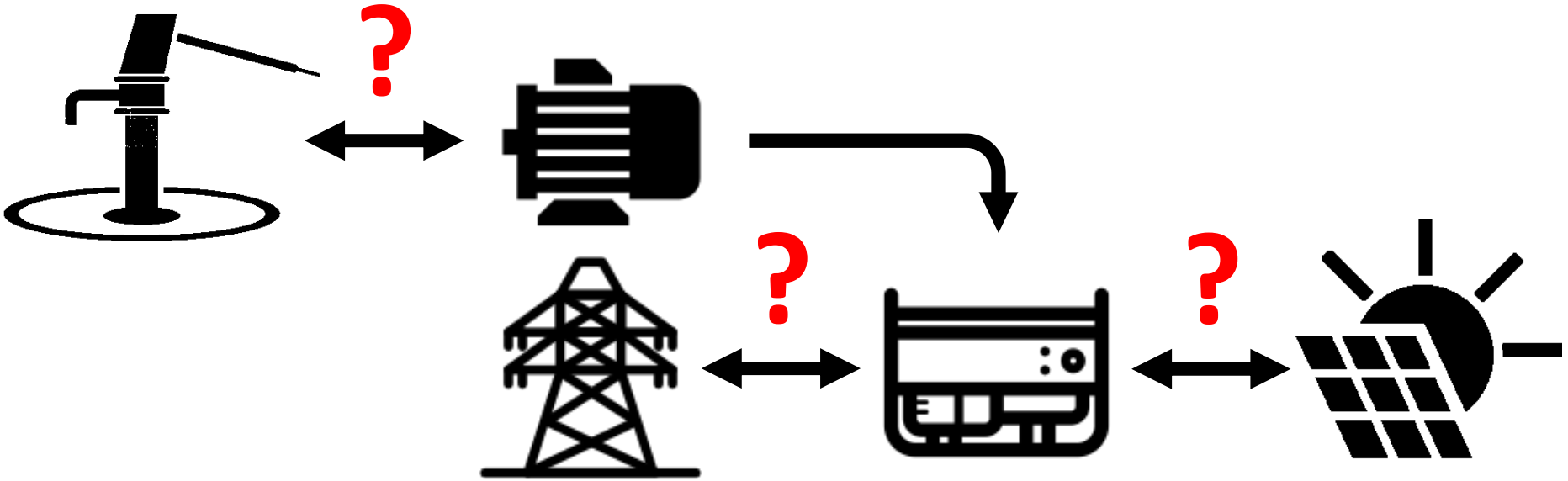
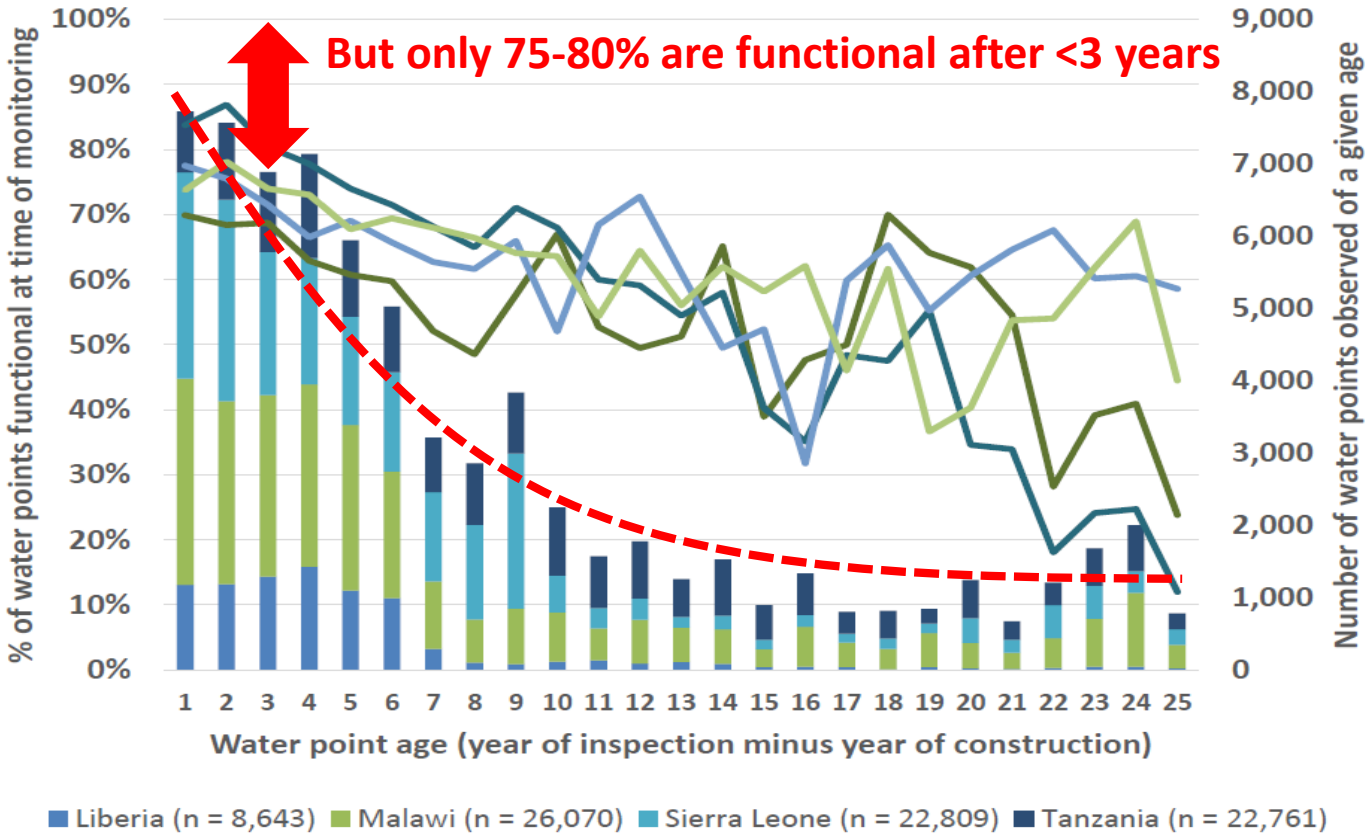
water mission

How can groundwater be **abstracted** in a manner that **protects the valuable resource** while ensuring rural populations enjoy **lasting water services**?

Which technology to choose?



Opportunity: Hundreds of thousands of **boreholes and pumps already exist**



TINCANI, L., ROSS, I., ZAMAN, R., BURR, P., MUJICA, A., and EVANS, B. (2015). *"Regional assessment of the operational sustainability of water and sanitation services in Sub-Saharan Africa"* VFM-WASH project report, August 2015

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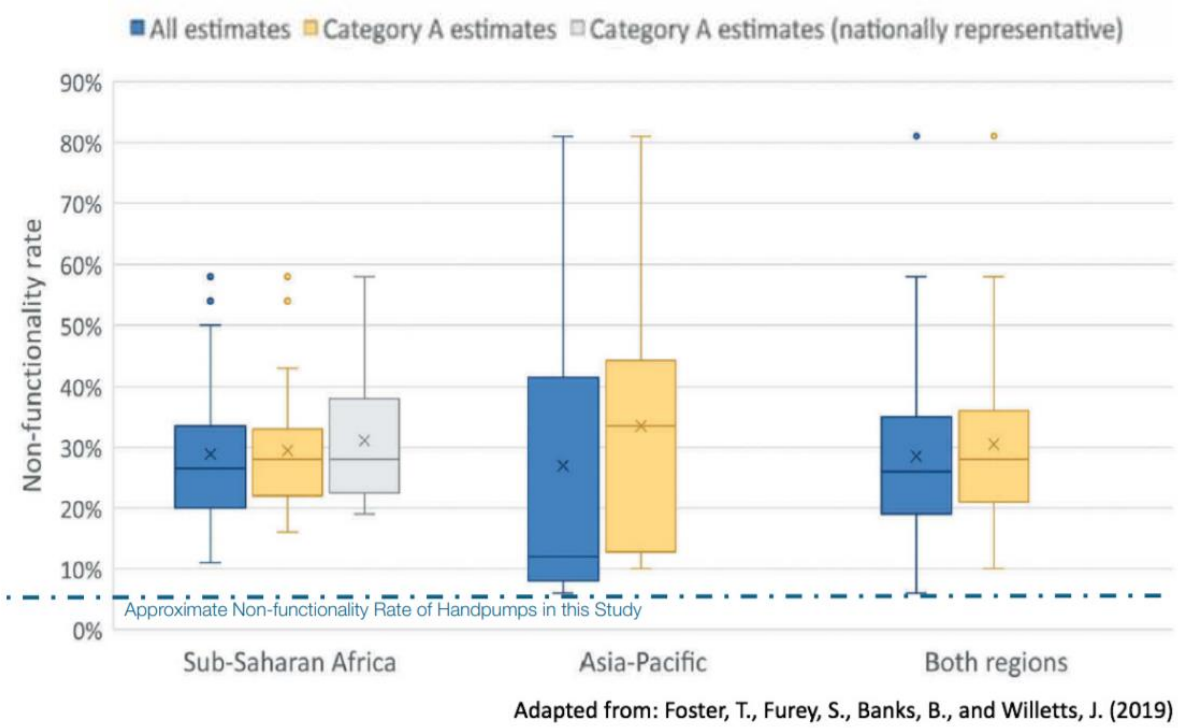

Adapted from: Foster, T., Furey, S., Banks, B., and Willetts, J. (2019)

Preventative and responsive maintenance increases reliability and functionality of pumping systems

MCNICHOLL, D., et al. (2019). *"Performance-based funding for reliable rural water services in Africa."* Uptime consortium, Working Paper 1. Available at: https://www.smithschool.ox.ac.uk/research/water/report-performance-based-funding.html.

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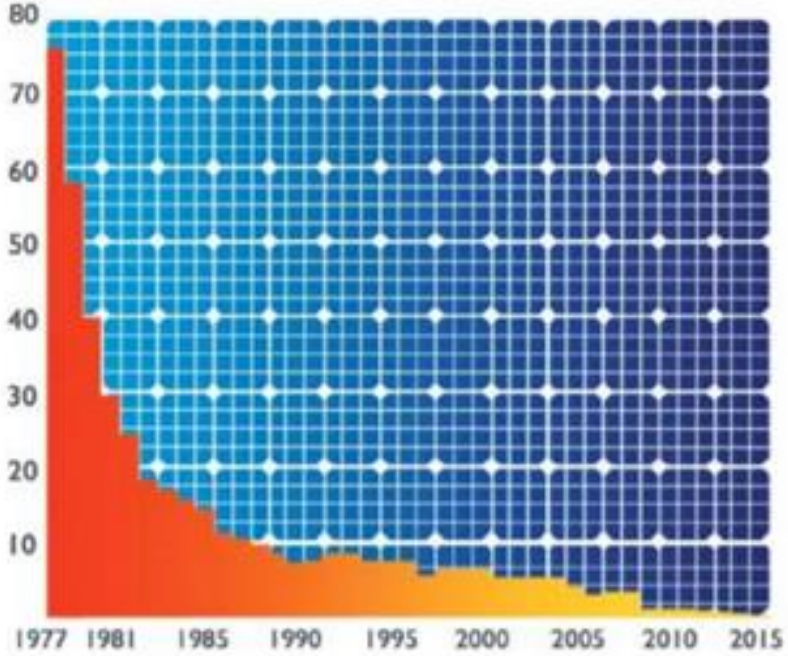
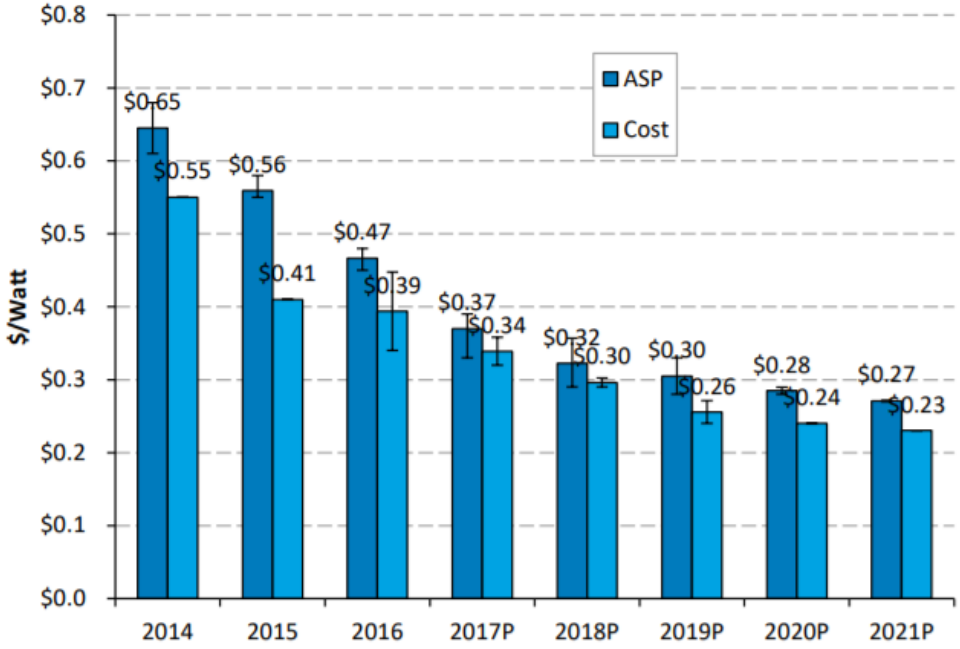
Opportunity: Solar-powered solutions are becoming more **affordable, applicable** and **available**

Historical price (USD/Watt) of PV modules



Projected price (USD/Watt) of PV modules



Source: The World Bank and US National Renewable Energy Laboratory

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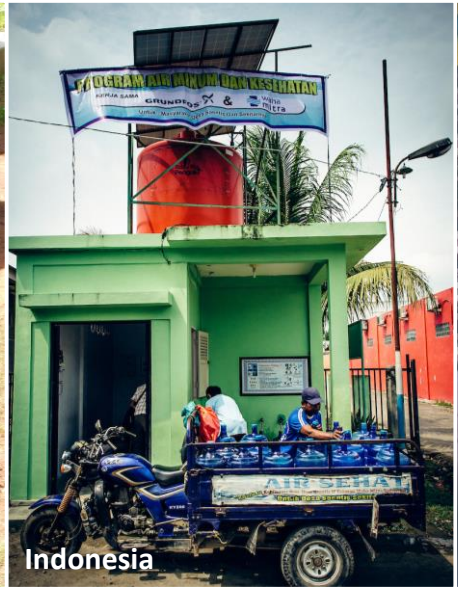
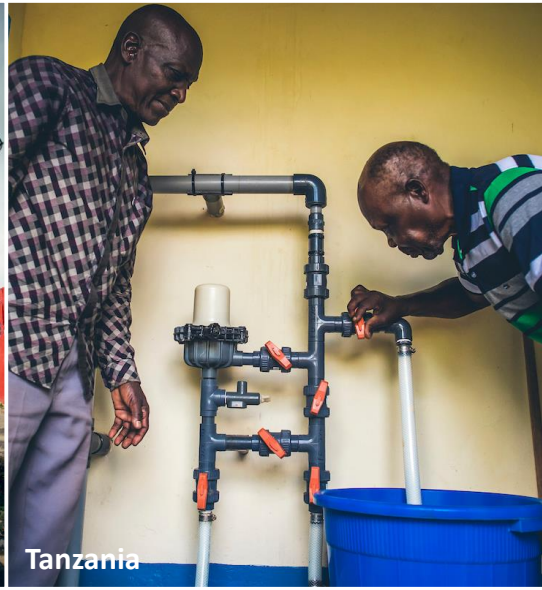
Opportunity: Rural water users are **willing to pay for higher service levels**


Tanzania


Uganda



Indonesia


Tanzania

Source: Water Mission

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Opportunity: Rural water users are **willing to pay for higher service levels**

"The majority of households found these prices ($1.50-$4.50/HH/month) to be affordable, particularly considering the increased convenience and time saving provided by the solar powered systems."

- 2016 UNICEF global evaluation of solar powered water systems

"Safety net" policies ensure people are not excluded if they aren't able to pay

When unable to pay for water from solar powered systems:

BAMFORD, E. and ZADI, D., (2016). *"Scaling up solar powered water supply systems: a review of experiences."* UNICCEF, New York, NY. Available online at https://www.unicef.org/wash/files/UNICEF_Solar_Powered_Water_System_Assessment.pdf.

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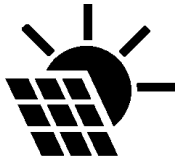
Threat: Current **funding and financing is insufficient** to support groundwater abstraction in the manner required to achieve the SDGs

			
CapEx [USD/person]	$20-$60	$25-$60	$30-$70
OpEx	User Time/Labor	Fuel & Personnel	Personnel
CapManEx	Annual	1-2 years	7+ years
Life-cycle Cost	★		★

ARMSTRONG, A., MAHAN, J., and ZAPOR, J., (2017). Solar pumping for rural water supply: Life-cycle costs from 8 countries. Proceedings of the 40th WEDC International Conference. Loughborough, UK. Available online at https://www.rural-water-supply.net/en/resources/details/822.

IRC, (2012). Providing a basic level of water and sanitation services that last: cost benchmarks. WASHCost global infosheet. The Hague, The Netherlands. Available online at https://www.ircwash.org/resources/providing-basic-level-water-and-sanitation-services-last-cost-benchmarks.

Threat: Service delivery **models and technical skills are often inadequate** to support groundwater abstraction in the manner required to achieve the SDGs

*"The most common causes of malfunction (of solar powered water systems) were the **failure of wiring and electrical components** or more severe issues relating to motor burnout and **boreholes running dry**."*

- 2016 UNICEF global evaluation of solar powered water systems

Established design and installation standards for solar pumping are rarely followed

BAMFORD, E. and ZADI, D., (2016). *"Scaling up solar powered water supply systems: a review of experiences."* UNICCEF, New York, NY.

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Threat: Service delivery **models and technical skills are often inadequate** to support groundwater abstraction in the manner required to achieve the SDGs

Solar piped systems in Mauritania in 2018:

- >90% spot functionality
- Average of 2-3 repairs/scheme/year
- All repairs made in <72 hours

Successful examples of good enabling environment for solar pumping exist

GRET (2018). *"Durabilite Des Services D'Eau en Milieu Rural."* Synthesis Report. Nogent-sur-Marne Cedex, France.

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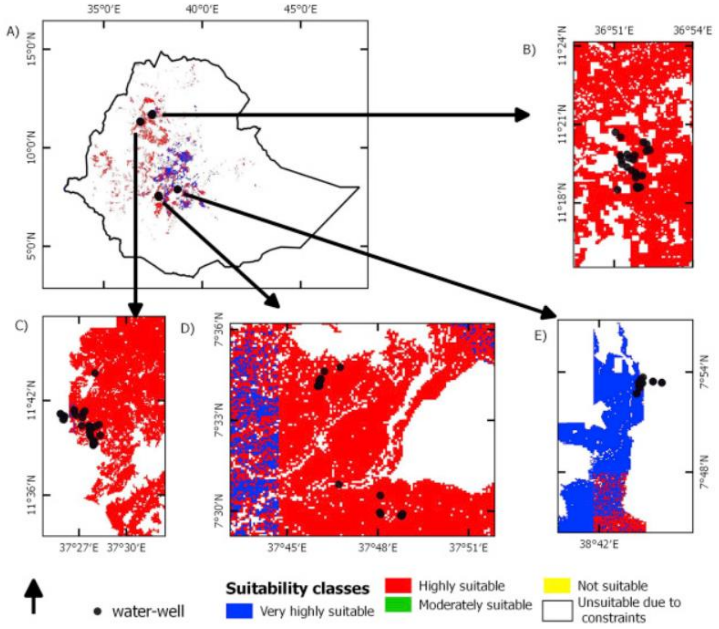
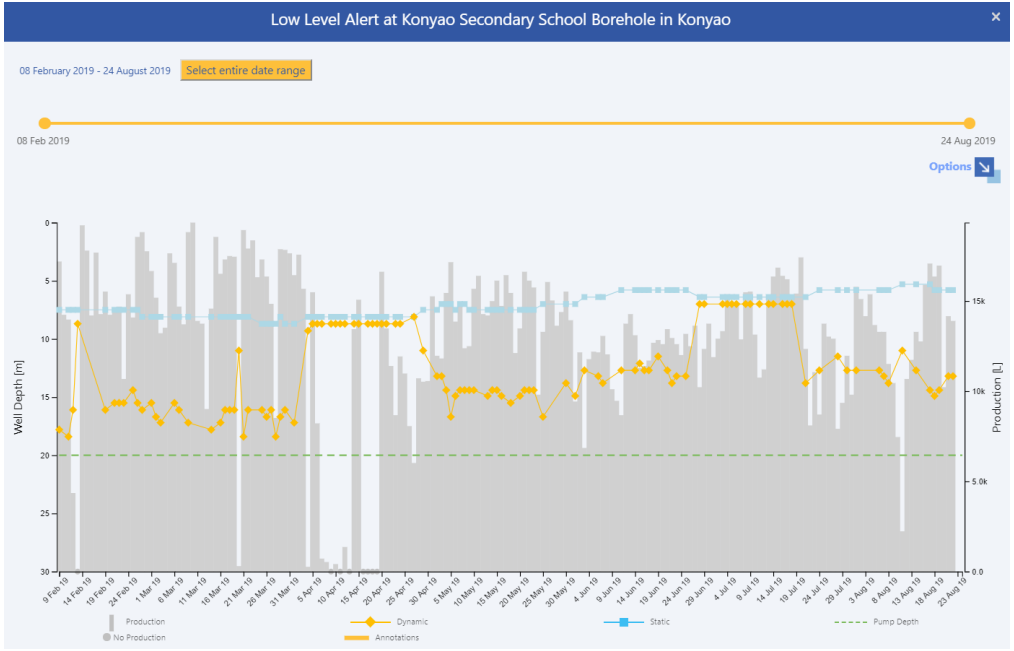
Threat: Groundwater abstraction can exacerbate negative environmental impacts resulting from **climate change and poor groundwater governance**





Groundwater information reduces uncertainty

IWMI. (2018). Mapping the suitability of solar energy-based irrigation pumps in Ethiopia. Technical Brief. International Water Management Institute. Battaramulla, Sri Lanka. Available online at https://hdl.handle.net/10568/97571.

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Recommendations

*How can groundwater be **abstracted** in a manner that **protects the valuable resource** while ensuring rural populations enjoy **lasting water services**?*

When considering groundwater abstraction alternatives:

1. Prioritize maintenance!
2. Leverage willingness-to-pay while protecting the poorest
3. Durability = cost effectiveness
4. Adhere to established design and installation standards
5. Identify, collect and utilize groundwater information

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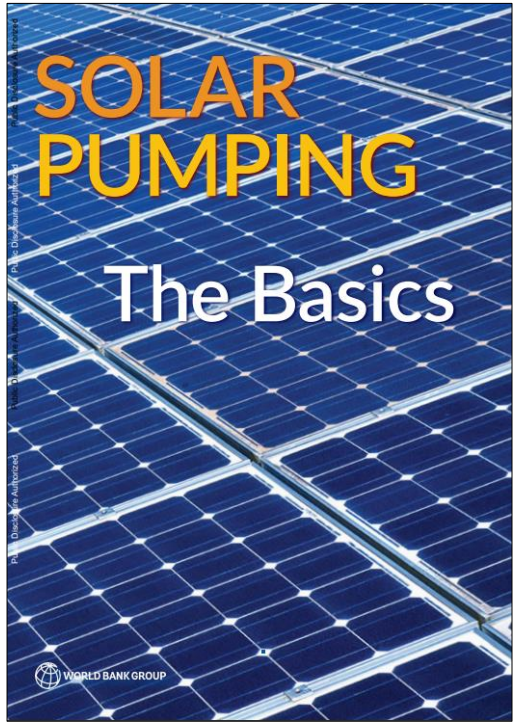
Further information

Join https://dgroups.org/rwsn/groundwater_rwsn for forthcoming solar pumping guidance and training from:



WORLD BANK, (2018). "Solar Pumping: The Basics." World Bank, Washington, DC. Available online at http://documents.worldbank.org/curated/en/880931517231654485/Solar-pumping-the-basics.

WORLD BANK, (2016). Solar Water Pumping Knowledge Base. World Bank, Washington, DC. Available online at http://www.worldbank.org/en/data/interactive/2016/12/08/solar-water-pumping-knowledge-base.

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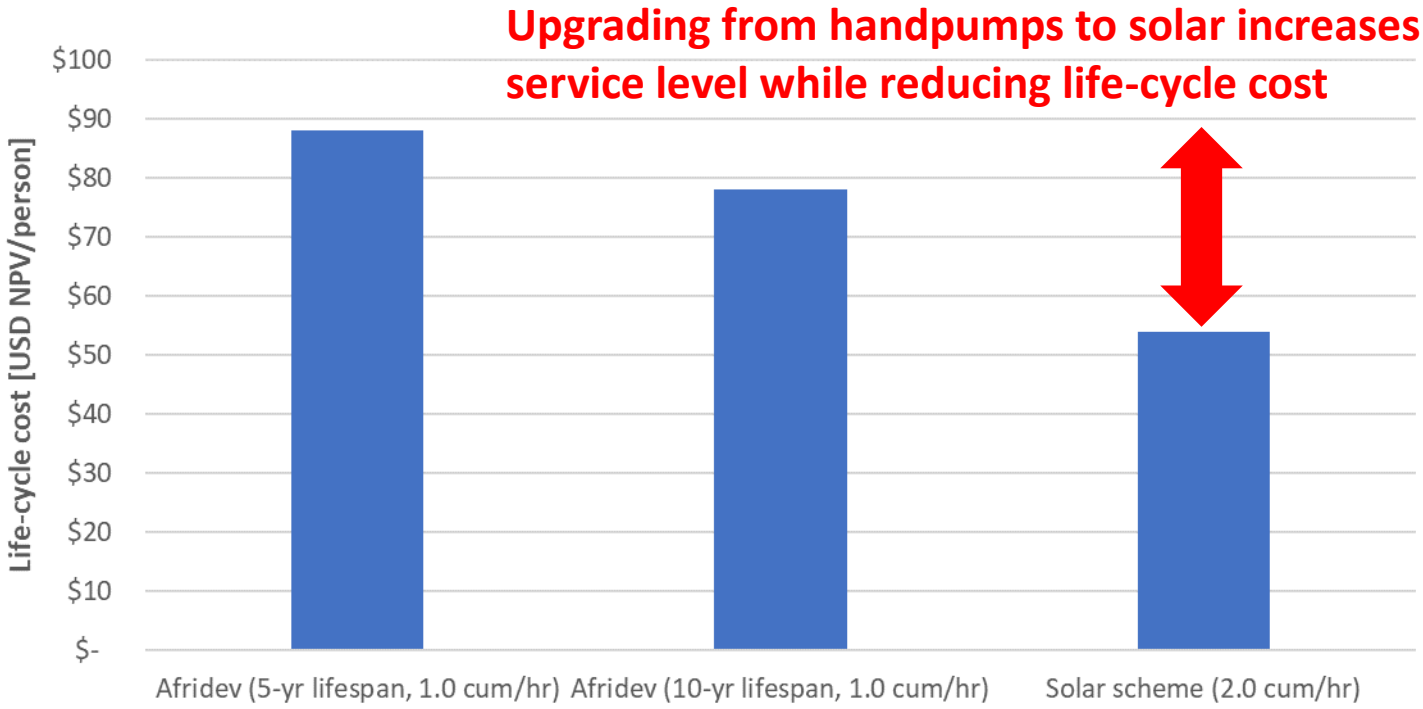

Source: Water Mission internal analysis

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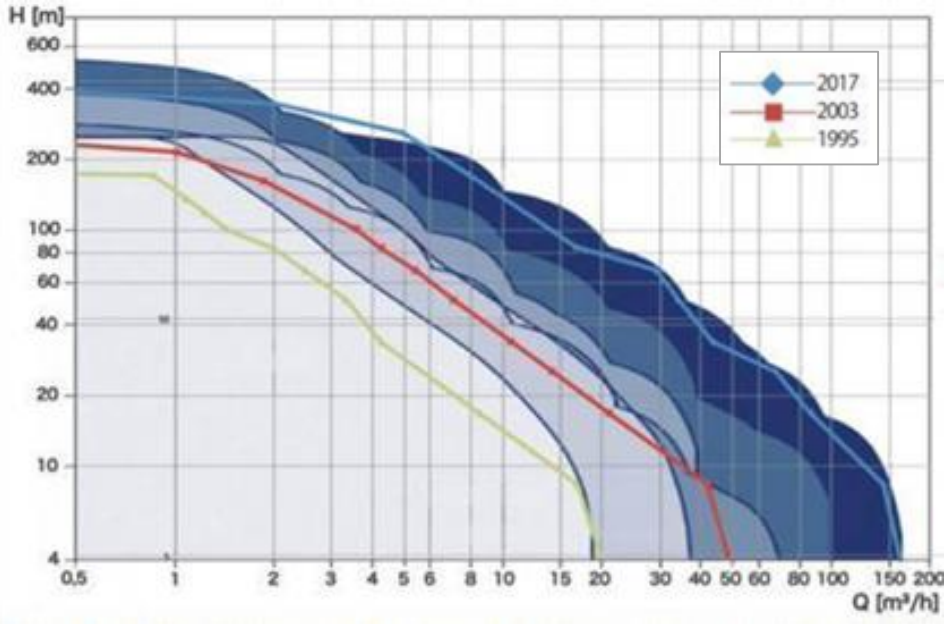
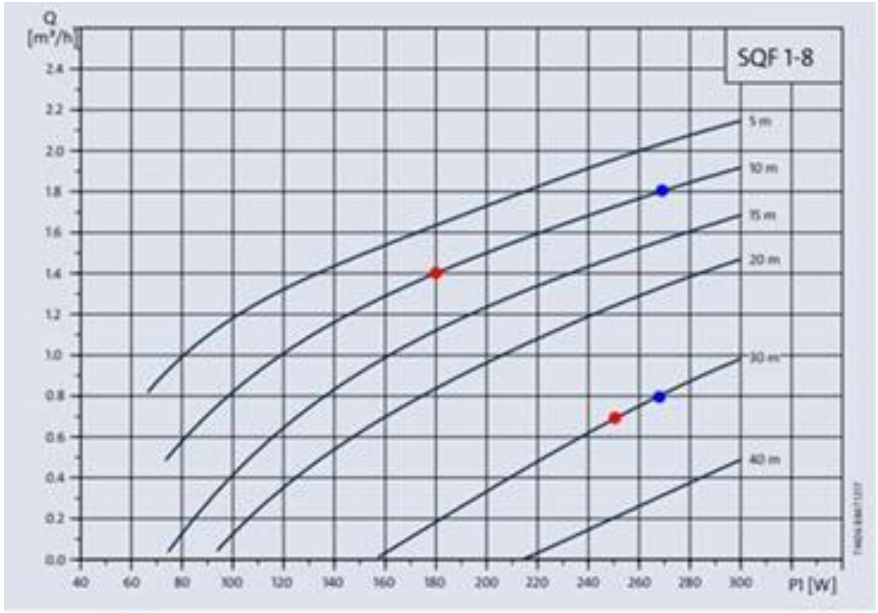
Opportunity: Solar-powered solutions are becoming more **technically applicable, affordable, durable,** and **available**

Solar-powered pumps are applicable in large and small-scale systems

Performance of high capacity solar pumping solutions over time



Handpump performance compared to a small solar submersible pump



Source: Grundfos, RWSN, and the World Bank

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