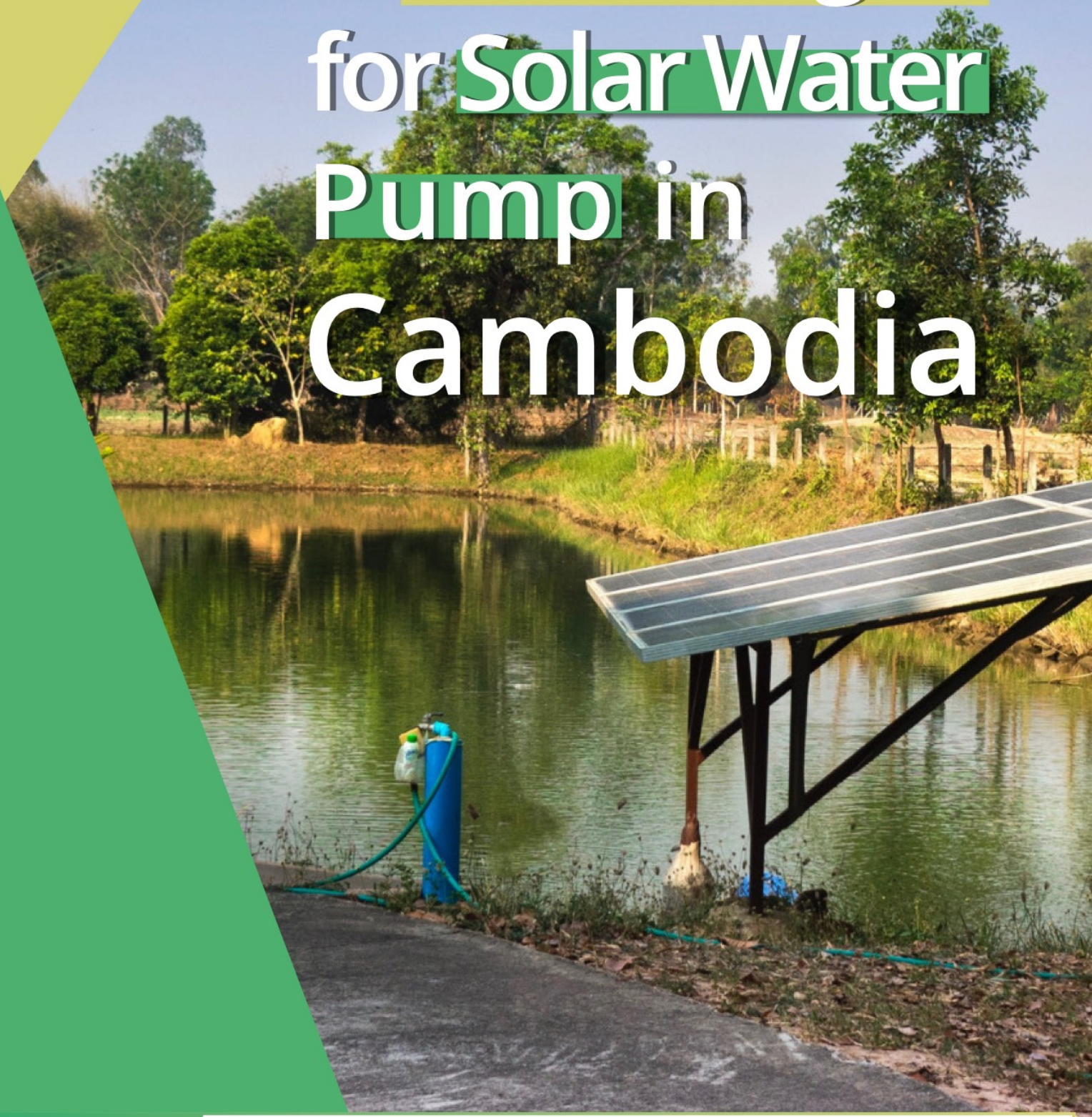
Opportunities & Challenges for Solar Water Pump in Cambodia



SWITCH to Solar

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In recent years, Cambodia's electricity sector has been through outstanding improvements fuelled by the government's success in rapidly expanding access to grid electricity up to 81% of households at the end of 2020. Nonetheless, in light of the relatively high electricity costs, remoteness of farmers and overall low mechanisation of the agriculture sector, solar technologies for productive use have the potential to improve agri-fishery MSMEs competitiveness on the market while reducing their operational costs. This summary provides a short overview of the opportunities and challenges for the adoption of solar water pumping in Cambodia.

Starting by looking at water pumping technologies at large…

The main advantage of water pumping technologies in general and solar water pumps in particular are their **versatility** as they can be used by a wide range of stakeholders, in many value chains and for different types of use.

In the selected value chains of rice, vegetables, aquaculture, pig and fruits, the opportunities for water pumping are very varied and influenced by the needs and requirements of each stakeholder.



Supplementary irrigation during wet season, Full irrigation during dry season.

- Smallholder farmers
- commercial farmers
- Irrigation companies



Daily Irrigation

- Smallholder farmers
- commercial farmers



Pumping to empty and fill ponds before production, and for water exchange during production

- Smallholder farmers
- commercial farmers
- Hatcheries & nurseries



Daily clean-up of pigs and barn

- Smallholder farmers
- commercial farmers



Field Irrigation

- commercial farmers

The consideration of these different needs and requirements reveals both opportunities and challenges to the adoption of solar water pumps, as detailed below.

Opportunities that can positively influence the uptake of water pumping technologies include:

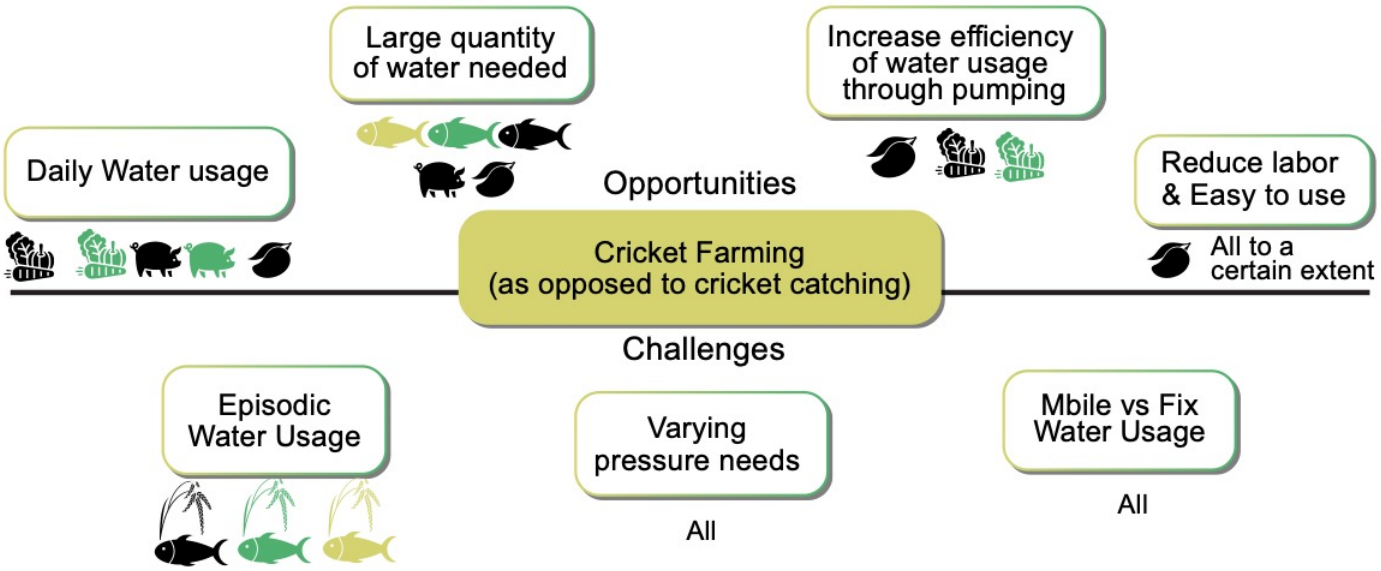
- **Daily and/or large water usage:** the higher the needs for water pumping the more it makes sense to invest in a proper technology
- **Increased efficiency, reduced labor and easiness to use** of water pumps compared to other means of water usage

On the opposite, challenges that need to be considered encompass:

- **Episodic water usage:** opposite to the opportunity that daily water usage represents, the more sporadic the water usage, the less the investment in a technology makes sense
- Pressure and mobility needs: stakeholders' water usage will influence the characteristics of the technology they need, making it more or less suitable for a solar solution

Overall, it appears that investing in water pumping technologies makes more sense for those **using water daily** and/or **using large quantities of water.**





Investing in Water Pumping Technologies make more sense for those **using water daily and/or using large quantities of water**

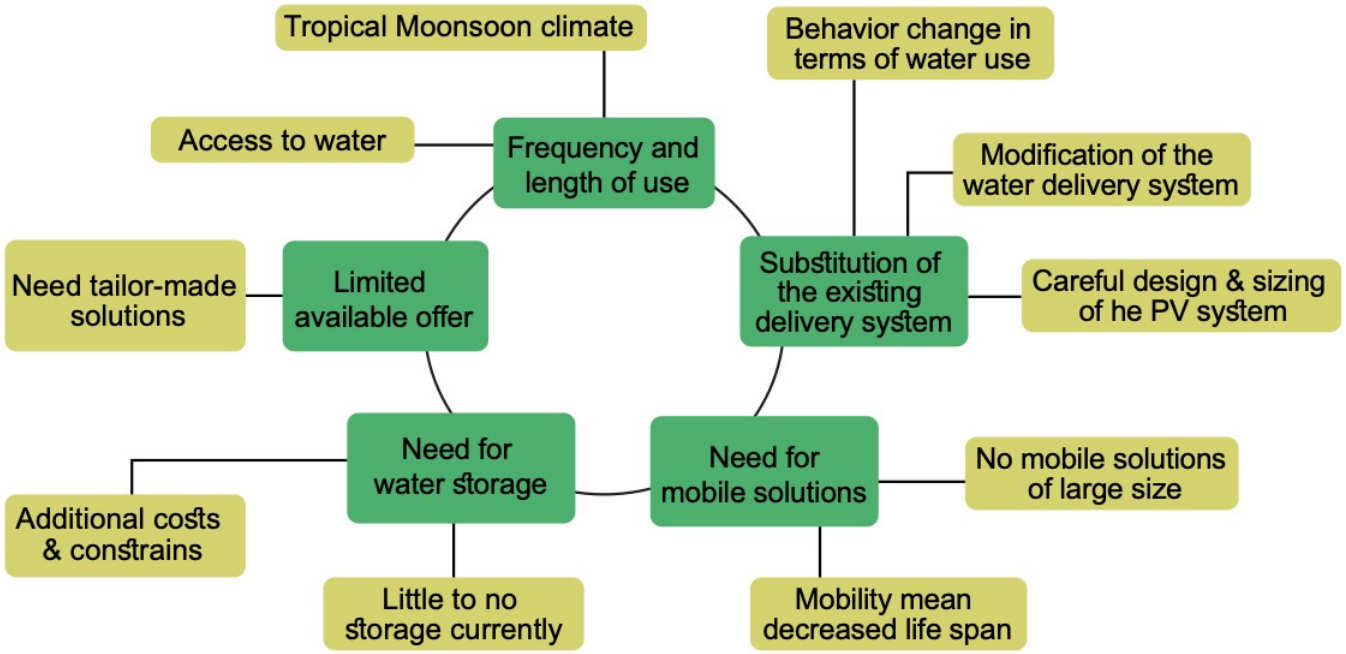
The actors with the potential would be:

Commercial farmers *Smallholder farmers* *Other stake holder (Irrigation companies for rice, Hatcheries/nurseries for aquaculture)*

Technical considerations

Solar Water pumps have the advantage of being a **mature and widely** developed technology, already distributed by several suppliers in Cambodia. There is a variety of models available in terms of capacity, size, mobility and possible architectures, making them adaptable to some extent to the needs of the end-users.

Nonetheless, current water usage practices in terms of **pumping, storage and water delivery** associated to the own limitations of solar water pumps reveal 5 main technical constraints to the adoption of solar water pumps, the key one being, when required **the inability to perfectly reproduce the same level of performance** as diesel- or grid-powered pumps, especially in terms of pressure.



Capacity	Diesel	Grid	Solar
1HP - 3HP	$75-$200	$35-$150	From $600
> 5HP	From $350	From $1,300	From $10,000

Another constraint to the adoption of solar water pumps is their **upfront costs:** purchasing cost is between 5 and 20 times higher than that the ones of current technologies used for pumping water.

As such, they will be more affordable for stakeholders with higher investment capacity like commercial farmers. Nonetheless, it is important to note that solar water pumps allow for great savings in operational costs (no fuel or electricity expenses) and can thus be interesting for smaller stakeholders as well, especially if using them for multi-purposes. Partial subsidies and/or end-user financing mechanisms can facilitate the uptake of solar water pumps by stakeholders with smaller investment capacity.

Recommendations – How to be successful in distributing Solar Water Pumps?

Water pumping needs are important in Cambodia to be able to improve yields and help MSMEs increase their income in an economically and environmentally sustainable way. Yet, there are challenges to overcome to be able to develop such a solar powered solution at scale. Here are a few recommendations to increase the adoption of solar water pumps in Cambodia:

- It is beneficial to create **synergies** between actors with expertise in energy and actors with expertise in agriculture to encompass the full spectrum of knowledge needed to distribute solar water pumps.
- The number of parameters affecting the feasibility and added-value of solar water pump is significant and highly dependent on local conditions. It is important to **evaluate the needs of each stakeholders** and **adapt the design of the system** in terms of size, mobility and pressure, even for an off-the-shelf product.
- Solar water pumps substitute current solutions more satisfactorily with parallel improvement of water storage and the adoption of micro-irrigation practices (e.g. drip irrigation or sprinklers). As such, organisations wishing to improve water usage in Cambodia shall act not only on pumping, but also on **generalising proper water storage** and **improving water delivery systems.**
- Similarly to Solar Home Systems, solar water pumps **require a large and well-established distribution network.** For those not able or not willing to establish such a distribution network, it is recommended to **establish partnerships** with NGOs, cooperatives, associations or development programs with strong local networks to **test innovative distribution models** whereby the partner would help in the identification of end-users and distribution of the technology. Working with intermediaries is also key as they can **help facilitate the acceptance of the technology** by acting as models and advertising, not only the economic aspects of solar water pumps, but also other benefits.
- It is recommended to **focus on stakeholders that have high and regular pumping needs,** whether for single or for multiple activities, and in particular those that have higher investment capacity such as commercial farmers.
- In all cases, it is important **to introduce end-user financing mechanisms** to mitigate the high upfront costs of the solutions. It can be done through partnerships with MFIs, the provision of partial subsidies for smallholder farmers, simple financing mechanisms by technology providers themselves (payment terms), or more innovative models such as leasing.

SWITCH to Solar For a Thriving Agri-Fisheries Market



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