



Collecting water from a Water ATM in Turkana county. Photo: James Origa

# FUNDING MECHANISMS TO INCENTIVIZE SUSTAINABLE AND INCLUSIVE WATER PROVISION IN KENYA'S ARID AND SEMI-ARID LANDS

In the context of Kenya's arid and semi-arid lands (ASALs), NGOs and donors as well as private sector players are exploring how they can help vulnerable populations to prepare and build resilience to extended drought sequences and climate volatility. The use of solar-powered water pumps (SWPs) is one approach through which partners are helping to do this. This report is a concept-stage exploration of optimal funding mechanisms to accelerate and incentivize the adoption of SWPs in the Kenyan ASALs, alongside accompanying management systems to ensure financial viability, inclusion and accountability.

## ACRONYMS AND ABBREVIATIONS

ATP	Ability to pay
ASALs	Arid and semi-arid lands
CBO	Community-based organization
CG	County Government
DIB	Development Impact Bond
GWSI	Global Water and Solar Initiative
KPI	Key performance indicator
LOWASCO	Lodwar Water and Sanitation Co
NGO	Non-government organization
NRW	Non-revenue water
O&M	Operations and maintenance
PV	Photovoltaic
RBF	Results-based financing
SWP	Solar-powered water pump
TDH	Total dynamic head
TWF	Turkana Water Fund
WASREB	Water Services Regulatory Board
WSB	Water Service Board
WSTF	Water Sector Trust Fund
WSP	Water service provider
WTP	Willingness to pay
WUA	Water User Association

# EXECUTIVE SUMMARY

This paper explores the hypothesis that funding mechanisms such as outcomes-based funding and upfront investment can help to overcome the risk aversion associated with the high capex costs of **solar-powered water pumps (SWPs)** and hence begin to catalyse SWP market growth in Kenya. Evidence for the role of SWPs as a reliable source of water in drought periods has been growing since the 2011 drought, one of Kenya's worst in decades but one during which villages with SWPs set up displayed a self-sufficiency in water supply. Despite the superior economics of SWPs in the arid and semi-arid lands (ASALs) of Kenya, investment in this technology has overwhelmingly been made through NGO grant financing. This can be a hindrance to sustainability – with the handover of systems being the ultimate goal, rather than the finance system or structure set up to manage these systems.

This research paper evaluates **under what conditions SWP systems are commercially viable; what is the impact of non-revenue water (NRW) and the level of tariff on commercial viability; and finally, what are the implications of these findings for the optimal funding mix for the development of sustainable SWP systems.**

It finds that both tariffs and NRW are key determinants of commercial viability in the long term and that, without addressing some of the underlying issues that hinder adequate revenue collection, the market will continue to face challenges in becoming self-sustaining. The funding process for ongoing maintenance and operations can not only provide the finance to ensure a functional service but can also improve transparency and accountability.

For this reason, in designing a funding mechanism it is necessary to think realistically about the level of support that might be required for the projects led by Water User Associations (WUAs), where revenue collection is likely to be more challenging: for example, considering whether conditions for funding should include capacity building for financial management or grant funding for affordable yet viable water access, as well as the role of technology (e.g. water ATMs, electronic billing systems) in overcoming transparency and revenue challenges.

One of the key barriers to sustainability is the fact that the structures of most current funding mechanisms (including grants and donor-led interventions) do not incentivize sustainability, inclusion or transparency.

In response, this paper analyses the optimal funding mechanisms that could be developed to incentivize the long-term sustainability of SWP systems in an ecosystem that is often characterized by poor accountability and limited incentives for cost recovery, environmental sustainability and inclusivity. **It finds that there is a strong rationale for funding mechanisms that reinforce the link between asset provision and accountability for ongoing system operation (which is where results and impact are ultimately generated).**

## Principal findings and conclusions

- **It is essential to recognize the importance of, and to define, a shared set of outcomes for water system sustainability.** A first step in improving funding flows for water access will be to align incentives around more accountable, sustainable and long-term service by providers. This report proposes a three-part water access outcomes framework.
- The evaluation of funding mechanisms suggests that **an Outcomes Fund model could be a feasible way to align funding incentives to desired outcomes.** An Outcomes Fund would pool resources to launch a number of outcomes-based programmes focused on a set of shared results (such as those mentioned in the previous point). Water service providers (WSPs) would submit proposals for the funding of community-based projects, and the Fund would provide a ready pool of capital to pay for the verified outcomes of successful projects. An Outcomes Fund could support water access by paying for a mix of output- and outcome-

focused metrics. Payments from the fund would be made only if these agreed metrics are met, meaning that payments are made only for high-quality, reliable, sustainable, affordable and equitable water access on an ongoing basis.

A WSP could be required to raise investment capital that is tied to outcomes funding commitments made by the Fund. If it is successful in securing investment, the key difference in the approach to implementation that comes with private working capital would be the flexibility for funding to be used for technology or technical assistance, as deemed necessary by local experts on the ground. For example, the provider can use capital to pay for the installation of water ATMs or similar technology focused on distributing water in villages efficiently and equitably, or to test different revenue collection methods.

One other benefit of existing Outcomes Fund models is the ability to introduce a technical arm to the fund that builds the capability of the provider market to design sustainable business models. This is usually administered as a grant from the outcomes funder and can be used, for example, to build the financial capacity of a WSP, develop effective social accountability mechanisms or advise on the most sustainable and suitable choices of technology.

- Now is the time to convene key partners to explore options for outcome-focused financing and, in particular, a Turkana Water Fund (TWF). With the anticipated establishment of the TWF, this could be the right time to convene key partners for a strategic funding discussion and to present new models of funding. Appendix 3 provides greater detail on the potential structure and operations of such a fund, as well as the outstanding questions to be explored in the next phase of discussions. The early-stage development of the role of a county-controlled water fund is an excellent opportunity to orient devolved funding structures around outcomes. The authors of this paper believe that Oxfam can play a role in facilitating this discussion with partners – convening and influencing key market players to work together to a shared definition of outcomes and an outcomes-focused objective for the TWF.

# INTRODUCTION: CONTEXT AND OBJECTIVES

In recent years, there has been increasing focus across the Greater Horn of Africa region on how efforts to tackle humanitarian emergencies can be complemented by measures to reduce vulnerability to future crises. In the context of Kenya's arid and semi-arid lands (ASALs), NGOs and donors as well as private sector players are exploring how they can help vulnerable populations to prepare for and build resilience to extended drought sequences and climate volatility.

The use of solar-powered water pumps (SWPs) is one approach through which partners are helping to build resilience. Oxfam, along with the International Organization for Migration (IOM) and the Norwegian Refugee Council (NRC), is implementing the ECHO-funded Global Solar and Water Initiative (GSWI) in the ASALs (see Appendix 1). This initiative is predicated on the superior economics and sustainability of modern SWPs in comparison with traditional diesel gensets in off-grid rural locations and particularly for water points which pump groundwater from deep underground (high pumping head).

In the 2011 drought in Kenya, SWPs supplied by Oxfam provided an uninterrupted supply of water, without any external support, in the villages in which they were installed.<sup>1</sup> The GSWI has significantly increased awareness of these benefits, as well as the technical and operational capacity to implement solar-powered water pumping projects. Programmes such as this have demonstrated that SWP systems can provide more cost-effective and reliable access to water than other off-grid alternatives, and the capacity exists in-country to design, install and maintain these systems – even in the hardest-to-reach ASALs of Kenya.

The ambition of the GSWI is for SWPs (or at the very least, solar-diesel hybrid pumps) to become the default technical option when any new system needs to be installed. Hence, in order to maximize the impact of the GSWI's work to date – including beyond the current funding programme – this study aims to identify the best funding mechanisms to scale up water access provided by SWPs in a sustainable fashion.<sup>2</sup>

**This report, conducted jointly by Oxfam and Social Finance, is a concept-stage exploration of optimal funding mechanisms to accelerate the adoption of SWPs in the Kenyan ASALs.**

Activities in developing it included the following:

- *Desk-based research:* Identifying relevant research, conducting deep-dive analysis to understand market dynamics (barriers to growth, provider market, funding sources).
- *Quantitative analysis:* Developing a scenario model to determine the impact on cost and revenue of various SWP system components (e.g. pump, head size, non-revenue water).
- *Structured interviews:* Conducting interviews with key stakeholders including county government, DFID Kenya, humanitarian agencies and SWP providers, manufacturers and maintenance committees. Meeting representatives of financial institutions to understand the role of financial intermediation (and constraints) in enabling a market-based approach.
- *Synthesis:* Compiling learning to generate conclusions and recommendations on appropriate funding mechanisms, with a particular focus on outcomes-based financing and upfront investment models, as well as proposing next steps for Oxfam.

## REPORT STRUCTURE AND KEY POINTS

The threat of drought presents an ever-increasing challenge for the livelihoods of communities in the ASALs.<sup>3 4</sup> Research and interviews conducted for this study showed repeatedly that, despite the demand for safe, reliable and affordable water, and the cost-effective advantage that SWPs can deliver, the population is currently under-served and the market is still slow-moving.

Section 1 of this report provides an overview of the current water access ecosystem,<sup>5</sup> and identifies some trends that are likely to affect how access to water will grow and shift over the coming decade. Within that broader ecosystem, it focuses in particular on the 'water market': i.e. the activities of non-state actors, both non-profit and for-profit,<sup>6</sup> in responding to demand for water, including their relationships with state actors.

The current ecosystem is characterized by significant **challenges**: poor accountability for outcomes, a lack of incentives to improve programme results and a relative lack of contestability in the provision of water. Some progress has been made in addressing these issues. Nonetheless, the view of Oxfam and Social Finance is that there are further **opportunities** to improve outcomes in the water access ecosystem of the ASALs on a sustained basis. The first of these opportunities is the potential of new technology to drive cost-efficiency, transparency and measurement; the second is a set of ongoing structural and governance changes, which include the following:

- The rapid reduction in the cost of photovoltaic (PV) modules, accompanied by advances in related technology – such as pre-paid water ATMs (automated water vending machines that dispense potable water, accept mobile-based payments and are linked to a centralized billing system) and metering/sensor technology – is resulting in more reliable access to affordable water. This combination of a fundamental change in the economics of solar water pumping vis-à-vis traditional diesel gensets plus the functionality of water ATMs offers multiple advantages, particularly the targeted, measurable and efficient allocation of water.
- Market players now have experience with new service delivery models and funding structures that can be scaled up, including payment tied to results and performance. Governance and institutional aspects continue to evolve: opportunities arising from the 2011 devolution of decision-making power to counties are now being realized, as exemplified by the proposed county-level Water Fund in Turkana. This implies that there is expanding room for private operators, both as independent operators (as outlined in the Turkana Water Act) and as outsourced service providers.

The rapidly evolving nature of the water access ecosystem demonstrates the need to align key partners – particularly national and county government, providers and communities – around a shared culture of results and to address some of the systemic issues of poor accountability and misaligned incentives. To state the obvious, this means that Oxfam's efforts in this space cannot be undertaken in isolation from the activities of state actors.

Section 2 of the report describes various innovative financing models that could help tackle the accountability and incentives challenges in the sector, as well as take advantage of the emerging opportunities.

The authors' view is that financing models and mechanisms are only ever a means to an end. Any consideration of funding options needs to start with a shared understanding of the ultimate goals. This research report hence proposes three overarching outcomes or characteristics of improved water access in the ASALs:

1. Enduring access to quality water:
  - Reduced downtime for non-functioning water pumps
  - Reduced distance to water for rural households
  - Consistently potable water quality.
2. Sustainable management of water:
  - Sustainable revenue to recover upfront capital costs and cover basic operations and maintenance (O&M) costs
  - Maximized efficiency in water point operations
    - Reduced water wastage (i.e. pricing incentives/escalating block tariffs for efficient usage)
    - Reduced levels of non-revenue water (NRW)
  - Reduced risk of over-pumping and declines in water aquifer levels.
3. Affordability and equity:
  - Equitable pricing for marginalized groups
  - Reduced scope for water access managers (e.g. water management committees) to exclude or disadvantage specific groups.

These proposed outcomes form a starting point for discussion on a set of specific **metrics** around which funders and operators could align.<sup>7</sup> Some of these outcomes are difficult to measure directly and in an attributable fashion.<sup>8</sup> Charting progress against these outcomes is instead likely to occur through a set of operational (or output) indicators that are strong but measurable proxies for outcomes. For example, while reliable water access may be the desired outcome, an operational key performance indicator (KPI) such as time between breakdown and repair of a pump may be used in an agreement as a practical proxy to measure reliable water access.

The outcomes proposed above are only likely to be delivered in an ecosystem that is characterized by higher levels of competition, reduced space for non-performing operators and greater space for more efficient, pro-poor operations, particularly at a community level (e.g. Water User Associations). This is explored in greater detail as the report considers the role of funding mechanisms in incentivizing the market.

Finally, a critical distinction is made in this report between financing instruments that will catalyze net additional investment in the sector (i.e. which deliver a sustained increase in private capital) and instruments that change how funds flow within existing budgets (i.e. with no net additionality of funds). The report evaluates how new funding mechanisms may facilitate the pursuit of the outcomes proposed above; its assessment is that both types of funding instrument have an important role to play. As set out below, current funding instruments tend not to address the lack of accountability for results and poor transparency in on-the-ground revenue management, nor do they put in place incentives to reinforce equitable and inclusive water access. In other words, existing budgets too can be delivered around a shared set of outcomes for greater cost-effectiveness, affordability and sustainability.

# 1 SITUATION ANALYSIS: THE CURRENT ECOSYSTEM OF WATER PROVISION

The current ecosystem for water access in Kenya brings together a multitude of organizations, from funders and implementers to operators and technicians of water systems. These parties vary in location from urban centres to more rural areas (as explored later), which has important implications for the commercial viability of systems in different locations and also for their ownership and for accountability.

The current ecosystem is characterized by poor accountability and limited incentives for improved results (as described under the three outcomes proposed above). Flows of funds – from upfront infrastructure investment down to ongoing revenue collection for service cost recovery – lack the clear lines of accountability that are required for effective and efficient provision of infrastructure and ongoing O&M. The absence of a culture of accountability for results means that current funding structures are not cost-effective: more could be achieved, more sustainably, for the funds that flow into the system. Optimal funding structures need to support the drive for outcomes and results.

## Infrastructure funding and governance

The supply of water in Kenya has historically been governed and regulated by national government body the Water Services Regulatory Board (WASREB) and county-level Water Service Boards (WSBs). Regulation and governance are less formalized in the ASALs, however, where many Water User Associations (WUAs) exist more independently than in the urban areas. Water service providers (WSPs) range from professional water utility companies to small community-based organizations (CBOs). A WSP enters an agreement with a WSB to manage water services in a given area; for the larger WSPs, this may cover the majority or whole of a county. These providers are required to hold a water provision licence (SPA1). County governments are currently working towards formalizing smaller WUAs that operate under more informal agreements, encouraging them to register with the county to participate in water supply via sub-licences (SPA3) under a larger WSP.

Funding sources for both the infrastructure and ongoing maintenance of these water systems can vary in different urban and rural settings. While county governments currently play a more prominent role in urban centres, donors and NGOs tend to take the lead in harder-to-reach or less commercially viable rural settings. In the current ecosystem, international NGOs and development agencies provide upfront capital to install and set up SWPs, but the funder's role ends at the point of installation and handover to the community WUA or WSP.

More recently, infrastructure funding has been based in part on a payment-by-results mechanism. For example, under the SWIFT programme (an Oxfam-led consortium: see Appendix 1), one outcome indicator is 'people having access to the systems 12–14 days out of the last two weeks'. This indicator was measured at two different time points after installation – once after six months and the second after 18–20 months.

Kenya's Water Sector Trust Fund (WSTF) follows a funding model linked to delivery and output, whereby development partners provide subsidies of up to 40 percent (in the case of German development bank KfW) or 60 percent (in the case of the World Bank) of the total amount of commercial loans to service providers, contingent on them delivering on agreed outputs aimed at improving service provision and connectivity.

This attempt to measure outputs and sustainability is a considerable step forward from traditional grant making. Despite this progress, however, it could be argued that the lack of sustainability in water provision is in part due to donors and the WSTF using 'one-off' grant funding for any particular

installation. Programmes to date have hence tended not to emphasize the importance of tracking ongoing cost recovery on a site-by-site basis.

## Operations and maintenance

As outlined above, WSPs can vary from professional water utility companies to small community organizations. In general, while an SPA1 licence held by a water utility company may cover an entire county, the provider will often in reality operate only in urban and peri-urban areas. In rural areas, the operation of a water pump is more likely to be managed by a WUA or self-help group that is typically trained by NGOs to take on the role of operator and revenue collector. Oxfam and other NGOs tend to operate from urban settings in the ASALs (e.g. Lodwar, Kakuma and Wajir Town) and play a capacity-building role for these WSPs during implementation.

Following implementation, assets are handed over and the ongoing cost recovery becomes the responsibility of the WSP or WUA. However, this handover generally occurs without any clear link to results such as access, equity or quality of water. The shared motivation to recover the cost of the asset is lost in this model, creating risks of individuals siphoning off fees for their own gain, the introduction of favouritism and patronage in water access and toleration of non-performing O&M services.

The lack of accountability that results from assets being provided by one stakeholder and the ongoing operation of that asset being the responsibility of another stakeholder has been exacerbated by a reliance on donor-funded programmes implemented by NGOs. In-kind subsidies provided by NGOs – while vital to keep individual water points operating in the short run – appear to have an undesirable impact on incentives and accountability in the longer term. For example, there has been an ongoing tendency for communities in Turkana County, in the northwest of Kenya, to depend on Oxfam to step in when a repair is required, particularly during drought periods.<sup>9</sup> While Oxfam will necessarily continue to play the role of direct provider in humanitarian emergencies in the ASALs, there is a strong rationale for funding mechanisms that reinforce the link between asset provision and accountability for ongoing system operation (which is where results and impact are ultimately generated). An example would be contingent funding arrangements whereby e.g. future funding levels are reduced in cases where replacement costs are not being sufficiently provisioned for by the WSP.

Other than NGOs, several other non-state actors – both non-profit and private market – exist in the ASALs that provide repair and maintenance support for water systems. They include ‘insurance’ providers, such as the Catholic Diocese of Lodwar’s Programme in Turkana, whereby community WUAs contribute regular payments to insure against system repairs (the full cost of the system is subsidized by the Diocese). Further to this, the FundiFix model (see Appendix 1) offers a performance-based approach to the maintenance of water infrastructure, with communities making regular payments in return for guaranteed levels of service provision.<sup>10</sup>

## LOOKING AHEAD: TRENDS IN THE WATER SECTOR

### Funding and governance

The provision of water in Kenya has historically been governed and regulated by national government bodies including WASREB and the WSBs. However, the constitutional reform of 2010 and the resulting devolution process have dramatically changed the political and funding landscape. The Water Act 2016 mandated greater devolved power to Kenya’s counties and sub-counties, resulting in a diminished role for the WSBs and greater autonomy for county governments in service provision. While reform entails some risks, given the generally lower capacity of local government, it has been received by the market with some optimism that bringing services closer to the population will improve regulation and access. This also creates new opportunities for Oxfam. For example, in Turkana, devolution is enabling the development of a local Water Fund to target resources outside of the

existing service provision areas.<sup>11</sup> The Turkana Water Fund initiative is discussed in greater detail in section 2 and in Appendix 3.

New creditworthiness programmes being implemented by USAID programmes KIWASH and Kenya RAPID present an opportunity for WSPs and more formalized water management groups to begin to access commercial funding (see Appendix 1). The KIWASH programme has a particular focus on professionalizing WSP operations, helping them to attract additional investment capital and improve revenues. At the same time, more traditional donor programmes continue, such as the World Bank-funded Kenya Off-grid Solar Access Project (KOSAP), which will provide \$15m of funding for SWP provision and O&M service contracting for public facilities in the ASALs.

There are two implications of these programmes for any future work on sustainable water provision in Kenya. Part 2 of this paper explores outcomes-focused funding mechanisms, in which building the capacity of WSPs to take on investment is likely to be an important activity. The first implication therefore is the need to examine opportunities to align programmes with KIWASH, understanding the linkages between the two and taking the opportunity to explore outcomes-focused investment approaches together. The second implication is the need to explore what impact grant-funding programmes such as Kenya RAPID and KOSAP will have on the likelihood of private operators growing in the ASALs. During interviews for this study, respondents highlighted that donor-funded programmes often act as a deterrent to small private operators, as the space for competition is closed down by large, grant-funded contracts. Section 2 explores upfront investment as a possible funding mechanism to encourage private sector involvement in the water sector, though the continuing existence of large donor-funded programmes will represent a risk to this approach. It will become increasingly important to explore these contradictory funding approaches and the impact on Oxfam's role moving forward.

## **Advances in solar technology**

In the wider solar market the price of photovoltaic power has fallen, from around \$100 per watt in 1975 to \$0.61 per watt in 2015.<sup>12</sup> This declining capital cost underpins the unequivocal economic case for solar-powered water pumping versus diesel gensets. The research conducted for this study across off-grid ASAL areas of Kenya indicates that, with a reasonable capital structure in place (i.e. acceptable loan pricing and tenor<sup>13</sup>), there are few to no situations where a diesel genset is financially superior to an SWP over the lifetime of the pump, when considering the high ongoing maintenance costs of a diesel genset. Concurrently, products such as hybrid solar-diesel systems and water storage facilities are being introduced in Kenya, and these address some of the remaining operational constraints, such as reliable and 24-hour access.

There is also increasing competitiveness in the SWP market driven by low-cost manufacturers which are likely in time to bring SWP prices down further, offering more product options in the ASALs. Providers<sup>14</sup> such as SunCulture, Futurepump (supported by PRACTICA Foundation) and SolarNow are currently focused on pumps for irrigation and smallholder farmers, and their current ranges are unable to provide the pumping capacity or the required pumping head for the majority of non-irrigation water points in the ASALs. However, the technology is constantly improving. Emerging designs aim to allow greater pumping depths while maintaining sufficient flow levels for non-irrigation uses,<sup>15</sup> as well as modularizing system parts to standardize and move away from traditionally custom-built systems.<sup>16</sup>

For now, the feasibility of these low-cost irrigation pumps in the drinking water market remains unproven. Evaluation of new products and models over the next 12–24 months will be required to understand whether low-cost SWP products could be substituted for brand-name systems. It seems likely that the next generation of low-cost SWPs will still only be feasible in locations where pumping head and pumping capacity requirements are relatively low. Quality and reliability will remain lower than for brand-name products. Nonetheless, the price differentials are stark: the next generation of low-cost SWPs are likely to remain priced at less than \$1,000 apiece, while brand-name systems cost from around \$5,000. At this price point, low capital expenditure (capex) submersible pumps represent

opportunities for new private operators and entrepreneurs in the market, for both suppliers and operators of systems.<sup>17</sup>

Finally, new technology has a role to play in improving operational sustainability and transparency, and hence – vitally – increasing accountability for results. Remote sensing of water pump functionality as well as water table height allows a closer focus on sustainable water resource management. Further to this, pre-paid water dispensers (also known as water ATMs) have advantages such as:

- allowing remote and real-time monitoring of system status and water access (both for system operators and donors)
- facilitating pre-payment
- offering new options for water allocation (such as a zero-priced ‘lifeline’ volume for all users)
- offering new approaches to pricing (such as progressive block tariffs and volumetric pricing).

Use of technology can help address the issue of a lack of transparency and accountability in the management of water service access (including embezzlement or inefficient use of revenues, or patronage-based access to water), while increasing revenue generation, reducing volumes of non-revenue water (NRW)<sup>18</sup> and ensuring more equitable distribution and pricing of scarce water resources. It also enables a results-based approach to funding, given that actual volumetric access to water (rather than just provision of water pumps) can be tracked remotely. As such, the authors’ view is that this technology – water ATMs and remote sensors – is a vital element of a new funding approach to improve water access in the ASALs.

## SCENARIO MODELLING OF SOLAR-POWERED WATER PUMPS

There is an increasingly compelling body of evidence for the social and economic benefits of SWPs compared with diesel gensets. Evidence for the role of SWPs as a reliable source of water in drought periods has been growing since the 2011 drought, one of Kenya’s worst in decades but during which villages with SWPs set up displayed a self-sufficiency in water supply.<sup>19</sup> In Kenya and in the wider Horn of Africa region, many case studies and reports, including from the SW&I programme, have been published that demonstrate that while SWPs may have a greater upfront capital cost, the ongoing costs are significantly lower than those of diesel gensets, as there is no fuel consumption, less human resource requirement for ongoing maintenance and a lower likelihood of breakdown.

The research undertaken in this study looked at numerous existing financial models that demonstrate the superior economics of SWPs in a range of scenarios.<sup>20</sup> As a result, rather than comparing SWPs with diesel gensets, this report instead focuses on building the knowledge base on how the economics of SWPs vary in different contexts. The objective of the scenario modelling was to test 1) under what conditions SWP systems are commercially viable; 2) what is the impact of NRW and the level of tariff on commercial viability; and 3) what are the implications of these findings for the optimal funding mix for SWP systems.

The model seeks to test the impact of total dynamic head size, water demand, NRW and tariffs on cost and revenue – and hence commercial viability. It defines commercial viability as a system breaking even within its 20-year lifetime (the average lifetime of an SWP), inclusive of capex, repair and replacement and ongoing maintenance costs.<sup>21</sup> A full list of assumptions is outlined in Appendix 2.

Modelling of costs and revenues is a starting point to inform the funding mix that would need to be mobilized in order to improve access to water that is affordable while allowing for commercial viability/sustainability in different contexts. It also highlights the importance of some of the broader system and governance issues that can undermine revenue collection. While each investment is likely to be unique to the system specification and the local context, it does begin to illustrate which types of funders and investors might need to be involved.

## System requirements and system costs

System requirements including flow and total dynamic pumping head (TDH) (total equivalent height that water must be pumped) affect the size and therefore the upfront capital cost of a water pumping system and, proportionally, the cost of ongoing maintenance and replacement of parts.<sup>22</sup> Given the high number of permutations of different hydraulic requirements, just six scenarios are presented in this report, which are intended to demonstrate the range of system sizes and associated costs that might be typical in peri-urban and rural settings.

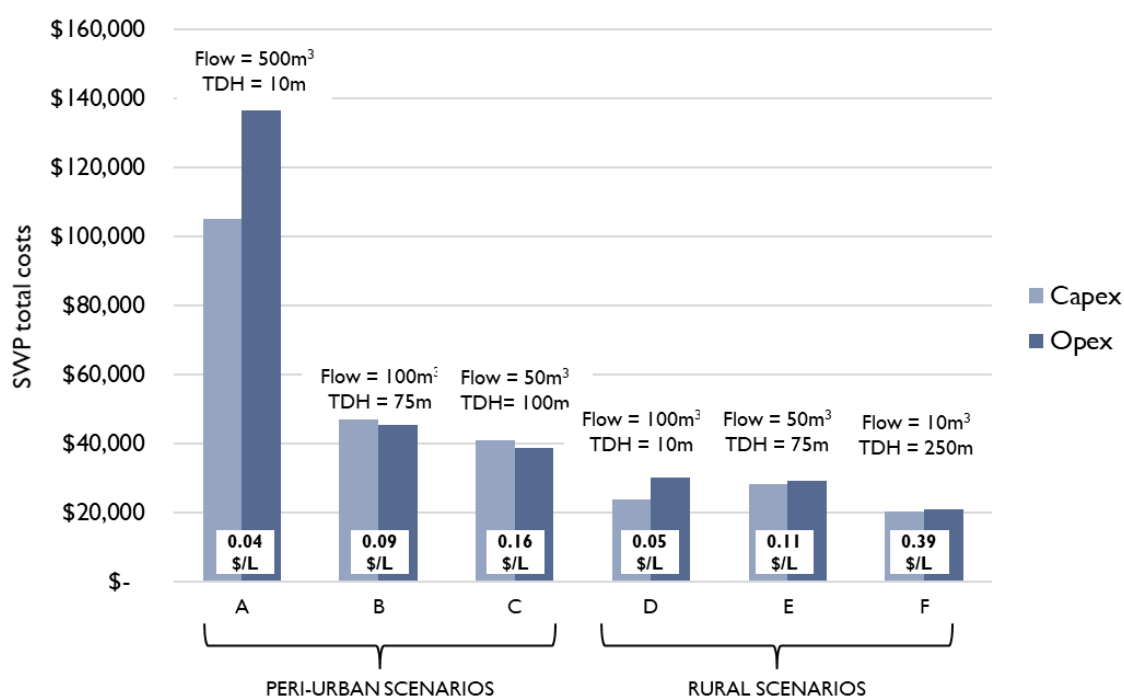
Table 1 and Figure 1 illustrate the range of capital investment requirements and lifetime O&M costs across these six scenarios. Note that the smallest system is not profiled but has an overall capex of \$8,500 and lifetime O&M costs of \$12,000. This, in contrast to the high-flow scenario of 500m<sup>3</sup> per day (scenario A) with a capex of \$105,000 and operating expenses (opex) of \$136,000, demonstrates how variable system costs can be in the ASALs.

The cost per litre of water (i.e. total lifetime costs per litre of water yielded) provides a standard comparator for assessing system viability in the context of affordability and revenue collection rates. This further illustrates how viability may vary across different local contexts.

**Table 1: SWP system scenarios with estimated capex and opex over a 20-year period, for three peri-urban and three rural scenarios**

Settlement type	Flow	Total dynamic head (TDH)	Scenario	Capex	Opex	Cost per litre of water
<i>Peri-urban</i>	High	Low	A	\$105,011	\$136,492	\$0.04
	Medium	Medium	B	\$46,833	\$45,256	\$0.09
	Medium–low	Medium–high	C	\$41,105	\$38,786	\$0.16
<i>Rural</i>	Medium	Low	D	\$23,960	\$30,128	\$0.05
	Medium–low	Medium	E	\$28,287	\$29,106	\$0.11
	Low	High	F	\$20,297	\$20,927	\$0.39

**Figure 1: SWP total system costs over a 20-year period, for three peri-urban and three rural scenarios**



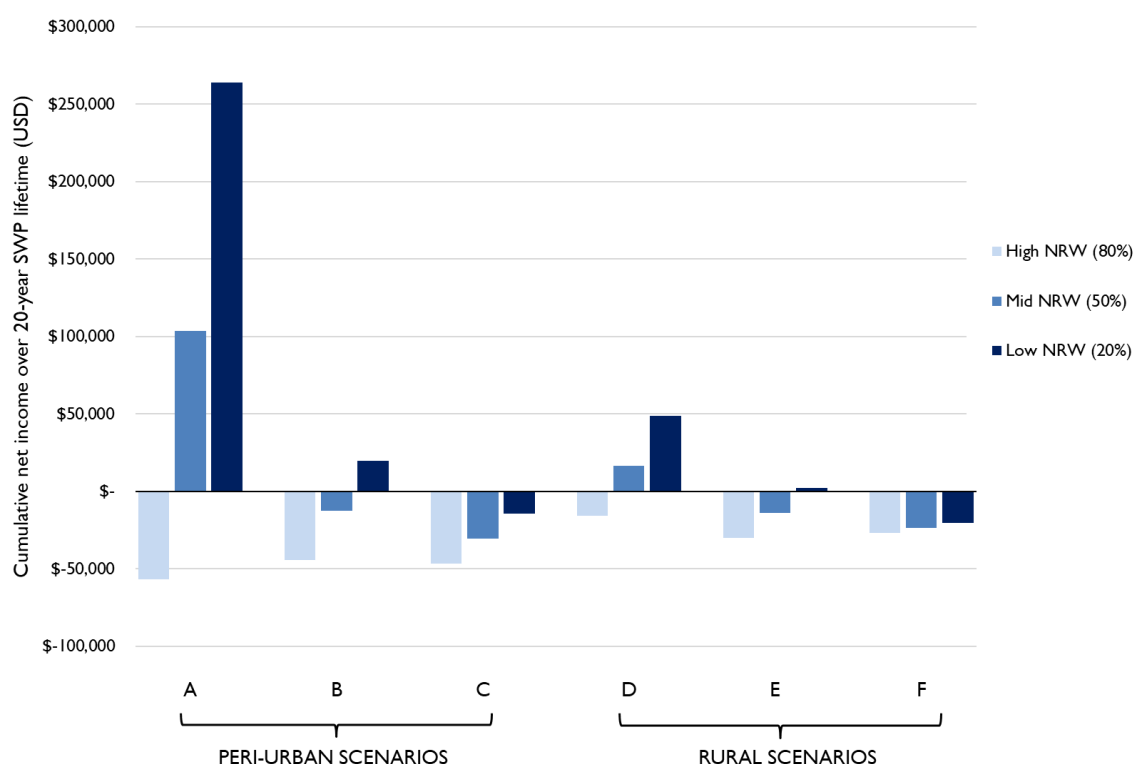
## Tariffs, NRW and commercial viability of systems

In terms of revenue generation, this study hypothesizes that three factors play an integral role: 1) tariffs; 2) non-revenue water (NRW);<sup>23</sup> and 3) ability to pay and willingness to pay (ATP/WTP). With limited data on the third attribute, it aims to model the effect of elements 1 and 2.

While WSBs regulate water tariffs,<sup>24</sup> it is unclear how well enforced these are on the ground. Reports and interviews suggest that outside of water utility companies and systems with water ATMs, there is commonly divergence from this regulated tariff, with some WUAs charging per jerrycan, per month, per livestock usage or, in some cases, only upon breakdown of a system component.<sup>26</sup>

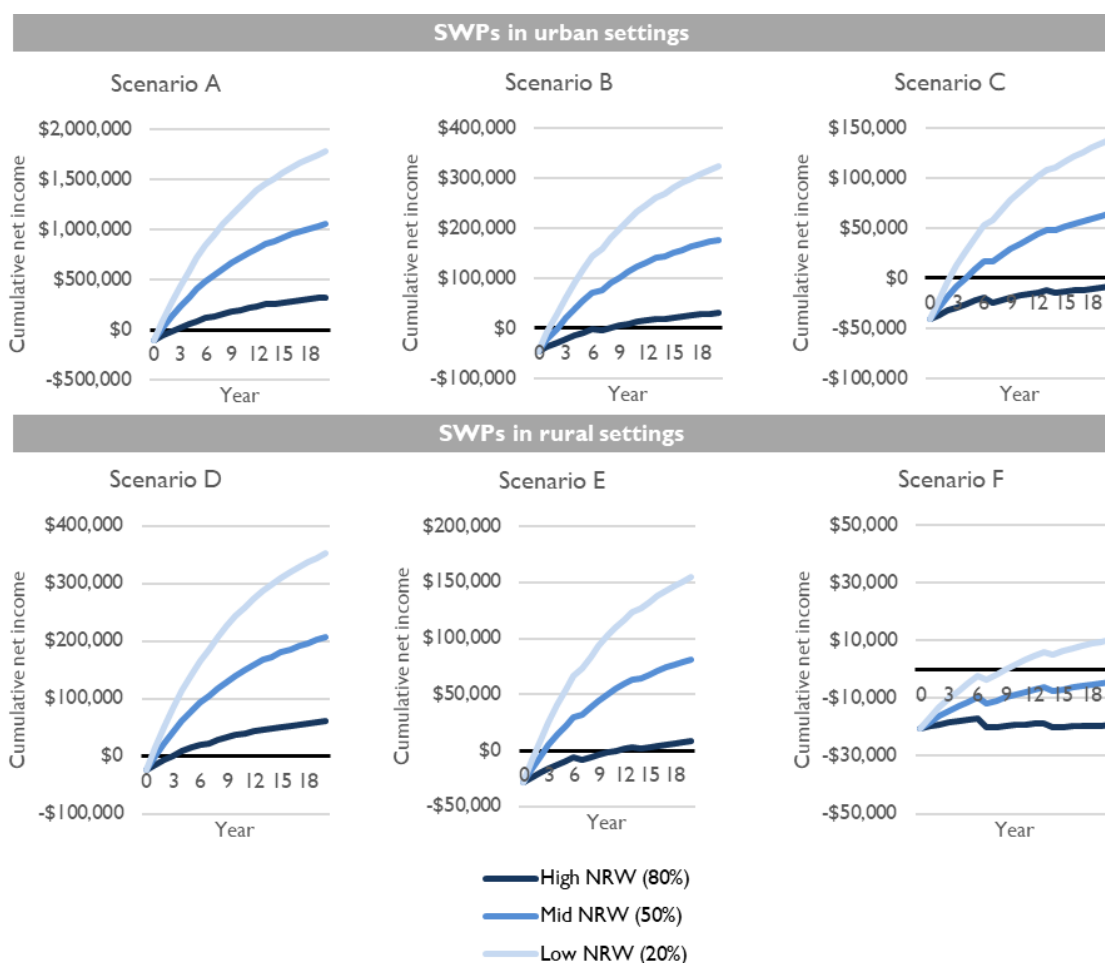
Across Oxfam's SWIFT programme sites in the Kenyan ASALs, in cases where water is charged by jerrycan its price ranges up to KES 5 per 20-litre can<sup>25</sup> – equivalent to \$0.003 per litre.<sup>26</sup> At the time of writing, the Lodwar Water and Sanitation Co (LOWASCO) had one of the lowest tariffs in the country at KES 33/m³, equivalent to \$0.0003 per litre. With water rates set at this LOWASCO tariff, two of the six scenarios are altogether commercially unviable (scenarios C and F); two systems are viable at 50 percent NRW; and no scenarios are viable at 80 percent NRW (Figure 2). Given that NRW ranges from 30 percent to 80 percent in WSPs operating in Kenyan urban areas, and may be even higher in rural settings,<sup>27</sup> this highlights the challenge that water providers face in recovering their costs.

**Figure 2: Cumulative net income over 20-year lifetime of SWPs for six scenarios, with tariff set at KES 33/m<sup>3</sup> at varying levels of NRW**



Next, the impact of NRW on commercial viability was investigated by looking at the viability of the different scenarios with a higher tariff of KES150/m<sup>3</sup>, equivalent to \$0.002 per litre. Figure 3 demonstrates that for scenarios A, B, D and E – when the flow rate is high or medium and the total dynamic head (TDH) is low – a medium tariff is sufficient for a system to be commercially viable at all NRW levels. However, scenarios C and F demonstrate that the associated costs of a high TDH are not offset sufficiently by revenues at mid to high NRW levels. For the modelled peri-urban scenarios, NRW levels must be kept below around 75 percent to be commercially viable, whereas in the smaller-scale (likely rural) scenarios, this must be below around 40 percent. Other economic analyses, and sector players like Maji Milele ('Water Forever'),<sup>28</sup> estimate that smart water meters can reduce current rates of NRW by at least 50 percent. Note that data for this does not yet exist; however, there is an underlying assumption that pre-paid meters can have a significant impact on NRW rates. As such, water ATM technology has been costed into the model for the lower NRW scenarios.

**Figure 3: Impact of NRW levels on net income over 20-year SWP lifetime, under different scenarios**



## Implications for funding mechanisms

The wide-ranging capex and opex costs identified in the scenario modelling suggest that, in designing a funding mechanism for the scale-up of SWPs, there is a need to administer funding flexibly for different project sizes and costs. In addition to understanding the projected cost and revenue of a system, consideration of the cost per litre will provide a standardized metric for understanding the affordability of water in any new system. As highlighted above, the price of water across SWIFT sites varies up to KES 5 per 20-litre jerrycan. This, in contrast to the costs per litre for the six scenarios modelled (which vary between \$0.04 and \$0.39), demonstrates a fundamental mismatch between the ability to charge for water at a rate that is commercially viable while ensuring user affordability – particularly in rural communities. As outlined under the possible funding mechanisms in section 2, this research builds on this metric as a means of differentiating systems that may require a level of concessionality or grant-funding to allow for operational sustainability over the system's lifetime.

These findings also suggest that both tariffs and NRW are key determinants of commercial viability in the long term, and that without addressing some of the underlying issues that hinder adequate revenue collection, the market will continue to face challenges in becoming self-sustaining. For this reason, in designing a funding mechanism it is necessary to think realistically about the level of support that might be required for the projects led by WUAs where revenue collection is likely to be more challenging: for example, considering whether conditions for funding should include capacity building for financial management, or grant funding for affordable yet viable water access, as well as the role of water ATM/e-billing technology in overcoming transparency and revenue challenges.

## SUGGESTED FURTHER ANALYSIS

### Settlement type

Many of the conversations the research team had in Kenya suggested an implicit assumption that rural settlements are less commercially viable than urban ones. They attempted to distinguish the nuances of peri-urban and rural types of settlement to test the greatest determinants of commercial viability for SWPs and, in so doing, to understand whether a blended finance model might be a more suitable option for funding in the ASALs.

The key differences in assumptions made for rural versus peri-urban settings were around the flow of water (used as a proxy for population and therefore water demand), per capita daily consumption and the number of households per kiosk. However, modelling for these differences showed negligible variations in system costs when comparing like-for-like systems in rural and peri-urban environments. Further analysis is required to understand how other factors – including willingness to pay, ability to pay, demand for water and the professionalism of water management committees – may vary across settlement types.

### Hybrid solar-diesel pumps

The final question the research team hoped to address was the difference between solar and hybrid solar-diesel water pumps. In many instances, a solar-diesel hybrid pump may be the only viable or preferred choice in the ASALs. A hybrid pump enables 24/7 water access, as it obviates the need for daylight operations that solar-only pumps are limited to. While less likely to be used in remote rural settings where water demand and expectations tend to be lower and the cost of diesel higher, this is a system commonly used in peri-urban settlements.

The modelling for a hybrid system incorporated four hours per day of diesel costs. This had only a small impact on whole system costs, providing limited insight into the viability of hybrid versus pure solar systems. Further research and analysis are required to understand the impact of 24/7 availability on daily consumption and willingness to pay. These factors may be sufficient to offset the extra cost of diesel and ongoing O&M in the long run, and further testing would be required to understand whether there is good reason to prefer solar-power only to hybrid, or whether either form of pump can be funded without taking this issue into account.

## 2 FUNDING MECHANISMS

The rich insights gathered through extensive interviews, research and analysis, outlined in section 1, have shaped some key principles that are used to evaluate new funding mechanisms in section 2. These principles include the following.

**1. Facilitating market structures to improve ownership and accountability:** Evaluations show that there is a lack of sense of ownership of infrastructure following the handover of donor-funded systems to WSPs (whether an informal CBO or more formally constituted WUA). This in turn is a key driver of non-functioning water points and low WTP for water access. There is a need to make it clear upfront that the relevant county owns the infrastructure and therefore is responsible for the management architecture in place. High-level topics to explore further include:

- *WUA registration:* Ensuring that the county government simplifies the process for WSPs or WUAs to become formally registered and enabling the county government to monitor operators with greater transparency and oversight.
- *Funding of technical assistance and sensitization:* Providing capacity building for better financial management for WSPs to ensure the long-term and effective O&M of systems and thus reliable supply.
- *Involving O&M providers alongside WSP management:* Bringing in e.g. the Catholic Diocese of Lodwar's insurance programme in Turkana and private operators (e.g. the evolving FundiFix model) from the outset of a programme to design the operating and revenue model, including budgeting and outcome delivery.
- *Enabling market building:* Increasing the operating space for private operators, both as outsourced O&M providers to WUAs and as small-scale entrepreneurs in their own right (e.g. piloting lower-cost SWP providers to deliver more reliable and lower-priced water supply to smaller communities where appropriate<sup>29</sup>).

**2. Improving long-term financial viability to reduce barriers to scaling up:** Particularly in rural areas, there is a widespread belief that most water systems are not economically viable (i.e. breaking even in cash terms). However, there is recognition that there exists a spectrum of WUA operations, with some delivering positive net income as a result of strong management – which suggests that proper accounting for revenues could show viable self-sustainability. The key difference between ATP versus WTP was highlighted to the research team several times. In many rural settings, due to poor reliability and quality of water supply, WTP is very low. Yet many stakeholders emphasized that it would be higher if safe, reliable and clean water were available: in other words, WTP is not necessarily a binding constraint. With initiatives such as water ATMs and e-billing, WSPs will be better able to collect revenue through transparent measures (and be able to demonstrate that they are doing so with hard data). High-level topics to explore further include:

- *Sustainability and terms of funding:* Understanding project specifications to determine terms of funding e.g. linking pump sizing and costing toolkits to loan terms, ensuring long-term feasibility based on the proposed business case.
- *Regulation of water tariffs:* An important finding of the scenario model is that regulated tariffs are a key determinant of the long-term viability of a system. Conversations with LOWASCO as well as with many SWP providers reinforced this point and suggested that WSBs have a vital role to play in enabling the self-sustainability of water systems. There is a crucial need to evaluate how to ensure affordability of water tariffs (e.g. through lifeline tariffs<sup>30</sup>) and equitable water access without jeopardizing revenues for O&M.

**3. Linking funding to outcomes and results to ensure affordability and inclusion:** The lack of incentives in the market to deliver outcomes for the community was noted in multiple interviews, and

interviewees showed a keen interest in realigning funding and operations to social outcomes. High-level topics to explore further include:

- *Outcomes framework:* Working across the market (e.g. with county governments, WSPs and maintenance providers) to agree shared target outcomes. These should set out clear and measurable metrics – both the broad outcomes sought and operational KPIs – across the community, county government and WSPs to build a shared/collaborative model of delivery.
- *Risk transfer:* Determining the role of de-risking instruments that transfer risk to an investor and ensure access to working capital on reasonable terms.
- *Role of NGOs:* The primary ambition of NGOs in the water sector in Kenya is to ensure that all communities have access to reliable, equitable and affordable water. Given the mis-incentives and challenges that exist in the current ecosystem, until partners begin to align to these desired and shared outcomes, NGOs have an important role to play in building consensus and should play a facilitation role in moving this effort forward.

## TYPES OF FUNDING MECHANISM

There are numerous financing mechanisms that could play a key role in developing a market for water access in Kenya, including funding pools for upfront capital investment, blended finance and results-based financing models.

This analysis focuses on different modalities of results-based funding, given the emphasis placed in discussions with stakeholders on mechanisms to improve accountability and create incentives for better performance. Many stakeholders acknowledged this need for change and displayed a keen interest in an outcomes-focused approach to water access. The largest area of reluctance was in understanding the details of potential funding mechanisms, what roles each partner would play and how to get there.

This section outlines the basic structure of the most appropriate funding mechanisms identified, while Appendix 3 provides an illustrative example in the case of Turkana County, where the county government is designing a water fund to finance future infrastructure projects.

### Results-based financing

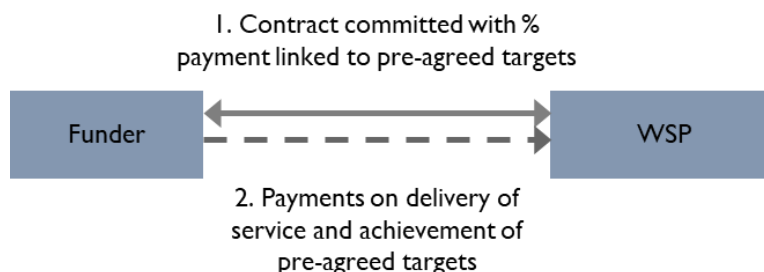
In a simple results-based financing (RBF) model, WSPs and funders (government or donors) would require a clear definition of targeted results, and a percentage of the WSP's remuneration from the funder would be linked to achieving those results. Upfront, both parties would agree how results would be measured and at which milestones.

A key differentiator between the various results-focused models is the measure that is used to determine success in these contracts. Results may be defined as **outputs**, such as project completion or time between pump breakdown and repair, or **outcomes**, such as the proportion of a target population with constant access to water. Most results-based contracts include a combination of outputs and outcomes, with the output agreed between partners on the assumption that these operational KPIs are strong proxies for outcome delivery. For example, while reliable water access may be the desired outcome, an operational KPI such as the time between breakdown and repair of a pump might be used in an agreement as a practical proxy to measure that outcome. Ongoing performance management and methods for verifying outcomes will vary by contract; however, in this model an agreed percentage of contracted remuneration is linked to these targets.

As outlined in section 1, this model has been explored through various donor-funded programmes in Kenya with a mixed degree of success. In this model (**Error! Reference source not found.**), providers inevitably take on substantial risk for long-term projects, as there is no guarantee of recovering the costs incurred through the project. This poses the risk of precluding smaller

organizations from delivering projects due to a lack of working capital or inability to absorb the risk of results-linked payments. A further challenge for SWPs in meeting objectives of sustainability is that providers may find it challenging to wait for these long-term or even medium-term gains to be measured before receiving payment.

**Figure 4: Results-based financing model**



## Development Impact Bonds

Designed to overcome the various challenges in risk and performance management highlighted above, a Development Impact Bond (DIB) is a model that introduces a social investor to the service model (**Error! Reference source not found.**). Outcome funders (usually government or donors) pay for results as with other forms of results-based financing, but DIBs involve a source of pre-financing for service providers. Further to this, the pre-agreed results are outcome-focused, rather than output-focused.

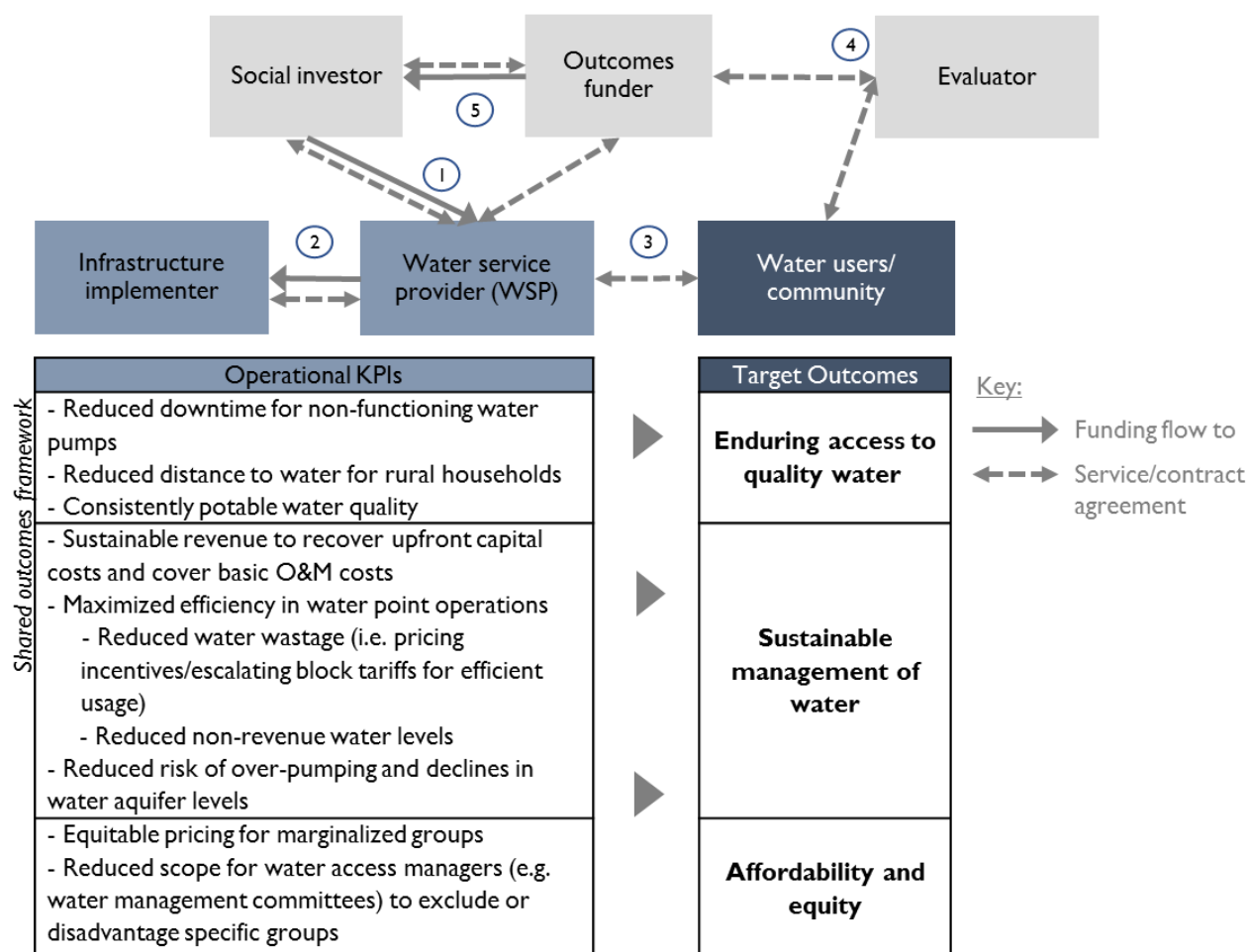
Investors pay in advance for the capital required by the WSP to install and operate the water system, and are repaid by the outcome funder upon achievement of agreed development results. Investors work with WSPs to ensure that results are achieved efficiently and effectively; outcome funders make payments to investors if the WSP succeeds in meeting set outcomes, with returns linked to results and outcomes achieved.

Investor involvement is expected to create more rigorous performance management systems and transfers the risk of non-payment from the provider to an investor that is willing to accept the risk for a return. An investor's relationship with the WSP may include challenging and quality-assuring the WSP's performance and providing helpful advice and an external viewpoint on operational challenges that may arise, as well as offering more strategic views on long-term sustainability of the system and finances.

**Figure 5: Development Impact Bond (DIB) model**

Following agreement of a shared outcomes framework (example illustrated below):

1. Investor provides the WSP with the upfront capital expenditure for the water system
2. WSP uses investment capital to install and set up water infrastructure
3. WSP operates water system, collects fees from users and manages O&M according to agreed outcomes framework
4. Evaluator verifies outcomes that are achieved
5. Outcomes funder disburses outcomes payments to investor.



Under a DIB model, ideally the county government would become the outcomes funder; however, in the initial stages of developing the DIB market, it is possible that Oxfam would become the outcomes funder together with the county government (e.g. covering the DIB management costs or the cost of performance management). While a feasibility study would be required to identify the exact value of these outcomes payments and the most sensible split between county government and Oxfam, the involvement of Oxfam initially might provide extra incentive for a government to engage in the model, adopt an outcomes-focused approach to water access and improve the performance of local WSPs.

Table 2 outlines a list of possible outcomes that a WSP might consider, although it is not recommended that a framework should be over-complicated. In developing a DIB, a prospective WSP would agree with the outcomes funder which outcome metrics would be targeted and how it proposed to achieve these. Output payments would help to ensure that installation costs are recovered quickly, and outcome payments for sustained and equitable water availability would help to create strong incentives to focus not simply on installation but also on adequate distribution, sustainable hydrology and timely maintenance.

In order to measure the outcomes achieved, a baseline for each metric would need to be agreed: for example, to determine whether a reduction in downtime for an SWP that has broken down was being achieved, an understanding of the current time for repair would need to be determined. Taking a

sample of cases and understanding the current time from breakdown to repair would enable this baseline to be established.

**Table 2: Potential metrics under the DIB model**

Outcome sought	Possible operational KPI	Example of specific indicator
<i>Enduring access to quality water</i>	<ul style="list-style-type: none"> <li>Reduced downtime for non-functioning water pumps</li> <li>Reduced distance to water for rural households</li> <li>Consistently potable water quality</li> </ul>	Days between breakdown and repair To be determined (TBD)  Defined by WASREB <sup>31</sup>
<i>Sustainable management of water</i>	<ul style="list-style-type: none"> <li>Sustainable revenue to recover upfront capital costs and cover basic O&amp;M costs</li> <li>Maximized efficiency in water point operations               <ul style="list-style-type: none"> <li>Reduced water wastage (i.e. pricing incentives/escalating block tariffs for efficient usage)</li> <li>Reduced non-revenue water level</li> </ul> </li> <li>Reduced risk of over-pumping and declines in water aquifer levels</li> </ul>	Net profitability   TBD  % of revenues collected TBD
<i>Affordability and equity</i>	<ul style="list-style-type: none"> <li>Equitable pricing for marginalized groups (such as zero-priced 'lifeline' tariff blocks)</li> <li>Reduced exploitation or control of water points for political economy purposes</li> <li>Reduced scope for water access managers (e.g. water management committees) to exclude or disadvantage specific groups</li> </ul>	TBD – cost per litre of water  TBD  TBD

## Outcomes Funds




An Outcomes Fund would pool resources to launch several outcomes-based programmes focused on a set of shared results, such as the characteristics outlined above. WSPs would submit proposals to have community-based projects funded, and the Fund would provide a ready pool of capital to pay for the verified outcomes of successful projects. An Outcomes Fund, like the DIB model, could support water access by paying for a mix of output- and outcome-focused metrics.













A WSP could be required to raise investment capital that is tied to outcomes funding commitments made by the Fund. If successful in securing investment, the key difference in the approach to implementation that comes with private working capital is the flexibility for funding to be used for technology or technical assistance as deemed necessary by local experts on the ground. For example, the provider can use capital to pay for the installation of water ATMs or similar technology focused on efficiently and equitably distributing water in villages.

One other benefit of existing Outcomes Fund models is the ability to introduce a technical arm to the fund that builds the capability of the provider market to design sustainable business models. This is usually administered as a grant from the outcomes funder and can be used, for example, to build the financial capacity of a WSP or to educate the water user/community on the need to pay for water.

In Turkana, the proposal for a county-level Water Fund is a prime example of how funding could flow more specifically to SWP initiatives by defining the criteria and applying conditions for funding. It is also possible to have a lead contracting organization that is responsible both for upfront infrastructure set-up and financing and also for ongoing maintenance costs and revenue collection. Early thoughts on the structure and design, partners and implementation of Turkana Water Fund are expanded upon in Appendix 3.

**Table 3: Initial evaluation of funding mechanisms**

-  Not recommended  
 Recommended with reservations  
 Recommended

		<b>Results-based financing (RBF)</b>	<b>DIB model</b>	<b>Outcomes Fund</b>	<b>Upfront investment</b>
<b>Accountability and ownership</b>	<i>Ops and maintenance</i>	Results-focused, thus greater opportunity to link effective O&M to payment incentive  Less flexibility for technical assistance programme 	Outcomes-focused, thus greater opportunity to link effective O&M to payment incentive  Greater flexibility for technical assistance programme 	Outcome-focused, thus greater opportunity to link effective O&M to payment incentive  Greater flexibility for technical assistance programme 	No result tracking thus lost opportunity to incentivize effective O&M  Less flexibility for technical assistance programme 
	<i>Access to finance</i>	Does not support loan beneficiary to improve creditworthiness rating for future financing 	Can be a more onerous process to secure an investor that is willing to sign up to outcomes  Does not support loan beneficiary to improve creditworthiness rating 	Can be a more onerous process to secure an investor that is willing to sign up to outcomes  Does not support loan beneficiary to improve creditworthiness rating 	Generally greater pool of finance available i.e. more providers of finance  Supports loan beneficiary to improve creditworthiness rating 
<b>Long-term commercial viability</b>	<i>Sustainability of financing</i>	Likely to operate similarly to existing government contracts – likely to be sustained as long as results are met  Low sustainability if blended with grant funding – creates reliance on donor 	Involvement of external social investment provides upfront working capital  One-off upfront funding mechanism  Possible to link to long-term cost recovery outcomes 	Pooled fund could provide opportunity to bid into Outcomes Fund more than once – rather than one-off funding mechanism  Possible to link to long-term cost recovery outcomes 	Upfront financial assistance incentivizes new private actors to enter the SWP market, who would otherwise be deterred by the significant capital expenditure requirements 

	<i>Commercial viability</i>	<p>Risk to provider in taking RBF – may impact operational feasibility in first few years without guarantee of remuneration</p> <p>Risk associated with unplanned maintenance/repairs needs of SWPs that are not factored into regular investment repayments</p>	<p>Greater degree of flexibility to meet outcomes targets makes the DIB model more operationally feasible</p> <p>Option for education programmes, technical assistance training and water ATMs to be introduced upfront</p>	<p>Greater degree of flexibility to meet outcomes targets makes the DIB model more operationally feasible</p> <p>Option for education programmes, technical assistance training and water ATMs to be introduced upfront</p>	<p>There may be risks associated with unplanned maintenance/repairs needs of SWPs that are not factored into regular investment repayments</p>
	<i>Risk management</i>	<p>Greater risk to providers as payment not guaranteed</p> <p>May exclude small providers that cannot take on the financial risk of RBF</p>	<p>Involvement of social investors de-risks the financial pressures on service providers</p> <p>Investor provides some flexibility in unplanned maintenance needs</p>	<p>Involvement of social investors de-risks the financial pressures on service providers</p> <p>Investor provides some flexibility in unplanned maintenance needs</p>	<p>Risk is absorbed by the provider accepting the upfront payment – return is paid through revenue as opposed to outcomes contract, making it riskier than the DIB model, especially in areas of low ability/willingness to pay</p>
<b>Affordability and Inclusion</b>	<i>Affordability for users</i>	<p>Metric for success payment can be aligned to affordable and equitable access to water</p> <p>Possibly constrained on capex for water ATMs</p>	<p>Metric for success payment can be aligned to affordable and equitable access to water</p> <p>Options to fund water ATMs or similar technology as part of investment</p>	<p>Metric for success payment can be aligned to affordable and equitable access to water</p> <p>Options to fund water ATMs or similar technology as part of investment</p>	<p>No contracted process to ensure affordability built into this approach – less control over access to water</p> <p>Up to WSP to factor in water ATM costs (and thus see their value)</p>
	<i>Outcomes focus</i>	<p>Delivers greater value for money through results/outcomes tracking than traditional fee-for-service contracts</p> <p>Smaller percentage based on results than in a DIB model, so less accountability built into model</p> <p>No investors involved to track and ensure success</p>	<p>Focuses accountability more strongly on desired outcomes</p> <p>Shifts focus away from whether particular inputs are being delivered, focusing rather on what is and is not working to achieve the agreed outcomes</p>	<p>Focuses accountability more strongly on desired outcomes</p> <p>Shifts focus away from whether particular inputs are being delivered, focusing rather on what is and is not working to achieve the agreed outcomes</p>	<p>Outcomes are not necessarily built into the investment model – this removes focus from the desired outcomes</p>

# 3 RECOMMENDED NEXT STEPS

The evaluation of funding mechanisms suggests that an Outcomes Fund model could be a feasible way to align funding incentives to desired outcomes. This should be explored in greater detail, potentially considering a DIB pilot as a starting point.

## **Recognize the importance of a shared set of outcomes – and a definition of the ‘endgame’**

A first step in improving funding flows for water access will be to align incentives around more accountable, sustainable and long-term service by providers. The three-part water access outcomes framework proposed above is a starting point that needs to be refined with key partners. In particular, a better definition is required of the ‘end equilibrium’ sought by all parties, which will determine the amount and delivery of funding (including development assistance, grants and private investment) and the legal and regulatory framework.

This report assumes an ‘invest to save’ approach to ensure secure water access at non-drought levels even during drought sequences. But there needs to be further discussion around whether the aim is, in fact, to improve water security beyond current non-drought levels on a sustained basis. The latter aim has implications:

- It could imply altered economic activity in the ASALs – more irrigated agriculture along the Turkwel River, more active livestock markets with local value-added, etc.
- However, it also presents significant risks for the long-term economic carrying capacity of the ecosystem – e.g. livestock (and population) growth.
- Clear answers are needed before proceeding to the design of any funding instruments.

## **Convene key partners to explore options for outcome-focused financing and the Turkana Water Fund**

Gauge engagement and strategic alignment within the ecosystem by bringing together organizations from across county government (outcomes funders), development banks and commercial banks, such as Equity Bank Kenya (investors) and water companies (service providers) in a handful of high-priority areas. With the establishment of the Turkana Water Fund (TWF), this could be the right time to convene key partners for a strategic funding discussion and to present new models of funding. Appendix 3 provides greater detail on the potential structure and operations of such a fund, as well as the outstanding questions to be explored in the next phase of discussions. The early-stage development of the role of a county-controlled water fund is an excellent opportunity to orient devolved funding structures around outcomes. The authors believe that Oxfam can play a role in facilitating this discussion with partners – convening and influencing key market players to work together to a shared definition of outcomes and an outcomes-focused objective for the TWF.

## **Assess the impact of new technology on future system infrastructure**

This includes further discussion with lower-capex pump providers to determine their role in the future market, and also a discussion on whether custom systems are over-engineered. Feedback from discussions suggests that this might be a shared view in some instances and therefore might represent an opportunity to introduce competing products into the market for more affordable systems in the least commercially viable settings.

## **Other considerations**

In the current political ecosystem, a sub-set of households, informal enterprises and some institutions could all be negatively affected by a move away from the status quo. Further analysis is required to understand both what the impact would be and how this could be tackled.

## APPENDIX 1: DONOR-FUNDED PROGRAMMES IN KENYA

### **The Global Solar and Water Initiative (GSWI) (ECHO and USAID)**

The GSWI, funded by the European Commission Humanitarian Aid Office (ECHO) and the United States Agency for International Development (USAID) and implemented by the International Organization for Migration (IOM), Oxfam and the Norwegian Refugee Council (NRC), operates with the objective of increasing the number of water-pumping systems powered by renewable energy across the globe. The project's activities include technical trainings, technical assessments to develop economic business cases for transitioning generator-powered pumping systems to solar-powered pumping systems, and the establishment of a technical working group and a solar 'help line' to support stakeholders to install SWP systems.

Since 2016, the GSWI has made seven country trips, visiting 55 camps and communities, has conducted 11 technical training workshops and has addressed 150 technical queries from 50 organizations (UN, donors, Red Cross and NGOs in 27 countries), across five continents. This has helped to build the technical capacity of decision makers and engineers in government and humanitarian organizations, increasing their understanding of solar pumping and along the way debunking some myths about solar power.

### **SWIFT Consortium (DFID)**

The Sustainable WASH in Fragile Countries (SWIFT) Consortium aims to deliver sustainable access to safe water and sanitation and encourage the adoption of basic hygiene practices in communities in the Democratic Republic of the Congo and Kenya. Led by Oxfam, the consortium includes Tearfund and the Overseas Development Institute (ODI) as Global Members and Water & Sanitation for the Urban Poor (WSUP) as Global Associate, along with many implementing partners in the two focus countries.

SWIFT operates as a payment-by-results (PBR) programme, where consortium members are reimbursed by the funder only when a combination of outputs (mostly related to the installation of sustainable technology) and outcomes (mostly related to sustainable service provision) have been verified by an independent third party. Results must be shown to be sustainable if the consortium delivering the programme is to receive payment in full. Following the deadline for outputs delivery, the consortium has two years to continue to engage with stakeholders and build capacity to ensure sustainability.

<http://swiftconsortium.org/>

### **Kenya RAPID (USAID)**

The Kenya Resilient Arid Lands Partnership for Integrated Development (Kenya RAPID) programme brings together public and private institutions and communities with the goals of increasing access to water and sanitation for people and water for livestock, and rebuilding a healthy rangeland management ecosystem. The programme is designed to increase the average water coverage rate in the five counties it covers (Garissa, Isiolo, Marsabit, Turkana and Wajir) from 37 percent to more than 50 percent, while building a model that can be adapted for use by other counties.

<https://www.usaid.gov/documents/1860/kenya-resilient-arid-lands-partnership-integrated-development>

### **KIWASH (USAID)**

The Kenya Integrated Water, Sanitation and Hygiene (KIWASH) programme aims to accelerate and sustain improvements in water and sanitation access and services in nine target counties. To achieve this, KIWASH is implementing activities that contribute to six distinct objectives, of which four focus on

water provision: scale up market-based WASH service delivery models, increase and sustain access to finance/credit for WASH facilities, improve access to integrated WASH and nutrition services and strengthen governance of WASH services and water resources institutions. The project targets larger urban and peri-urban WSPs with the objective of professionalizing their operations, helping them to attract additional investment capital and improve revenue.

<https://www.kiwash.org/>

## **Kenya Off-Grid Solar Access Project for Underserved Counties (KOSAP) (World Bank)**

KOSAP's project development objective is to increase access to energy services in under-served counties of Kenya. Providing equal opportunities to the whole of the country is key to achieving Vision 2030 and especially the national target of achieving universal access to electricity by 2020. This desire has led the Government of Kenya to seek to close the access gap by providing electricity services to remote, low-density and traditionally under-served areas of the country. KOSAP directly promotes these objectives by supporting the use of solar technology to drive the electrification of households (including host communities around refugee camps), enterprises, community facilities and water pumps.

The project targets 14 of the 47 counties in Kenya, which have been defined as marginalized by the Commission on Revenue Allocation (CRA). The SWP component will support the financing of solar-powered pumping systems to increase sustainable access to water supply by equipping new boreholes and retrofitting existing diesel-powered boreholes associated with community facilities within the target counties. A private sector contractor will be competitively selected for each service territory to supply, install and maintain stand-alone solar systems in community facilities.

<http://www.kplc.co.ke/content/item/1943>

## **FundiFix**

FundiFix is a social enterprise that span out of research done by the Smith School of Enterprise and the Environment (SSEE) at the, University of Oxford into the idea of remotely monitoring rural water points. The research team developed a GSM-enabled Water-point Data Transmitter (WDT) that collates information on real-time abstraction volumes and breakdown incidents, as well as time taken to repair. The first experimental WDT was installed in Kenya in 2011 and deployment to date has grown to 366 'smart' hand-pumps across the country.

SSEE's research into smart hand-pumps provided various insights into the causes of high levels of non-functionality of rural water systems, which it sought to address by establishing a social enterprise, FundiFix Limited, to provide repair and maintenance services for rural water systems. To date, both the WDT and the FundiFix model have undergone various research and operational iterations informed by SSEE research and trials. FundiFix Ltd (which has two franchisees, trading as Miambani Ltd and Kwale Hand-pump Services Ltd) is a Kenya-registered and owned company established in 2014.

<http://fundifix.co.ke/>

## APPENDIX 2: SCENARIO MODELLING FOR SWPS

### General

Analysis timeframe	20 years	<i>System sizing and simulation using Lorent Compass planning software<sup>32</sup></i>
Discount rate (real interest rate)	8.6%	<i>Source: World Bank: World Development Indicators – 5-year average (2012–2016)</i>
Exchange rate: US\$1 =	KES 100	<i>Source: Rate at 25 April 2018 on xe.com</i>
Cost of diesel	\$1.20/litre	<i>Note: Price in Lodwar, May 2018. Source: Oxfam Kenya WASH Team</i>
Average no persons per family	Five	
Litres per m <sup>3</sup>	1,000	

### Operational

#### Water demand

Scenarios:	Flow (m <sup>3</sup> /day)	
Low	10	<i>Note: Smallest borehole capacity in Kenya = 10m<sup>3</sup></i>
Medium–low	50	
Medium	100	
Medium–high	300	
High	500	<i>Note: Largest borehole in Lodwar, Turkana = 70m<sup>3</sup>/hour and Kilkilley, Wajir = 700m<sup>3</sup>/day</i>

	Rural	Peri-urban	
Per capita daily water consumption	20 litres	60 litres	<i>Source: World Bank: 20–30 litres/Oxfam Kenya WASH Team</i>
Water storage requirements – days	1.5 days	1.5 days	<i>Source: World Bank: 1.5–3 days recommended</i>
Users (families) per water kiosk	250	100	<i>Source: Oxfam Kenya Team for rural setting; urban setting is estimation for public water points</i>
Water tanks required per kiosk	0.33	0.33	

#### Head

Scenarios:	Head (metres)	
Low	10	<i>Note: Smallest borehole head in Kenya = 10m</i>
Medium–low	50	
Medium	75	
Medium–high	100	
High	250	<i>Note: Heads higher than 300m are rare in Kenya</i>

## Costs

### Set-up costs

	Unit cost
Pump costs	See model
Water kiosk (including three taps)	\$1,000
Pipeline per kiosk	\$6.5/m
Storage tank	\$1,200/10m <sup>3</sup>
Smart meter	\$2,100

Source: Lorentz SWP system cost estimations (includes pump, controller, PV modules)

Source: Oxfam Kenya WASH Team  
Source: Lorentz: SmartTAP – 25mm MDPE \$1.50/m plus \$5/m installation; Oxfam Kenya WASH Team: 150–200m length per kiosk  
Source: Lorentz; SmartTAP. Assume \$1,200 per 10m<sup>3</sup>  
Source: Susteq: equipment (\$1,000) + installation (\$1,000) + \$100 software (one-off payment per kiosk)

	Cost as % of pump
Balance of system and cables	20%
Installation and transport	25%

Source: World Bank Group (2018). Solar Pumping: The Basics.<sup>33</sup>  
Source: World Bank Group (2018). Solar Pumping: The Basics.

### Operations and maintenance cost

	Unit cost
Pump service to full cost ratio	15%
Tap service	\$100
Pipe and tank service	\$200
Pump replacement to full cost ratio	33%

Source: Lorentz; SmartTAP. Assume 15 percent of Pump cost, although Oxfam Kenya WASH Team recommends service costs only incurred after breakdown i.e. seven years on average.  
Note: Assume \$50 + \$50 spare part. Source: Oxfam Kenya WASH Team  
Source: Oxfam Kenya WASH Team

Note: One-third total system cost i.e. each of the Three key components of the system (pump, controller, PV modules) has a lifetime of around seven years.  
Source: Lorentz

## Revenue

### Tariff rate

Scenarios:	Tariff (KES/20-litre jerrycan of water)
Low	0.7
Medium–low	2.0
Medium	3.0
Medium–high	4.0
High	5.0

Source: LOWASCO tariff as of site visit, May 2018: 'We have the lowest tariff in the country at KES 33/m<sup>3</sup>' i.e. KES 33/1,000 litres

Source: Susteq guidance on tariff range as \$0.03–0.05 per 20-litre jerrycan, May 2018; Sustainable Management of Rural Water Service Provision – The Case of Bubisa and BoKa WSP: 'The current tariff (KES 4 per jerrycan) exceeds the "recommended" tariff under the Extraordinary Tariff Adjustment (KES 2 per jerrycan).'

## APPENDIX 3: TURKANA WATER FUND (TWF)

**This appendix has been drafted as a discussion document to share with the Turkana County Government.**

The Turkana County Ministry of Water Services, Environment and Mineral Resources outlined, in the Turkana Water Bill 2018, plans to implement a Water Fund in Turkana that would be available for the financing of water services delivery, development of infrastructure and financing of county activities – for example, sub-county forums and Water User Associations (WUAs). The structure of this fund is still being determined by the County Government (CG). Following the research team's meeting with the Chief Officer and Minister in May 2018 and meetings with various water sector experts and partners in Kenya, this appendix aims to synthesize the findings of this report to support and present ideas for the set-up, administration and outcomes of the Turkana Water Fund (TWF).

The work undertaken for this study suggests that, despite the significant efforts of government, donors and market providers, the current ecosystem for water access is still characterized by a lack of accountability, lack of incentives to achieve outcomes and, as a result, a lack of sustainable, reliable water access. The authors' view is that the TWF can be designed to overcome these shortcomings through an outcome-focused funding approach.

### **What is an Outcomes Fund?**

An Outcomes Fund is a ready pool of capital to fund several outcomes-based programmes, which are focused on a set of shared results. Payments from the fund occur only if specific criteria agreed in advance are met. A successful Outcomes Fund would have the following characteristics:<sup>34</sup>

- *Open-ended and open access:* Funding multiple projects led by multiple water service providers (WSPs) (i.e. water utility companies as well as WUAs) on an ongoing basis over multiple years.
- *Competitive:* Enabling multiple WSPs to bid into the fund with some level of competition to maximize the efficient allocation of resources. This could be achieved via regular and recurring deadlines or funding windows as part of the fund's governance. WSPs would submit proposals to have community-based water projects funded by the TWF by certain deadlines, and TWF administrators would assess these proposals and determine which projects to fund (more detail on the business case development process is given below).
- *Open data:* Collating a centralized repository of key lessons as projects progress, helping to inform future infrastructure projects and scaling up of SWPs that are commercially viable.
- *Adaptive:* Flexible management of resources during implementation is likely to increase the chances of success – for example, allowing flexibility in how the WSP tests and measures different revenue collection methods and the ability to change course as a result.

### **What is the benefit of an Outcomes Fund?**

Outcomes Funds can add significant value in markets that have historically struggled or lacked the resources to achieve outcomes. Some of the benefits are outlined below in the context of the TWF, including:

- *Focus on outcomes:* Projects that are approved by the TWF would be funded by an investor that is repaid only once predetermined outcomes are achieved. This would enable Turkana CG to determine the desired outcomes (or to align metrics to the stated outcomes in the Turkana Water Bill). In the case that outcomes are not achieved, the CG would not be required to repay the investment made by an investor.
- *Technical assistance/development grant funding for capacity building:* One benefit of existing Outcomes Fund models is the ability to introduce a technical arm to the fund that supports capacity building of the provider market to design sustainable business models. The exact

model would need to be determined in collaboration with market partners to understand whether NGO involvement might be required for this capacity building. This technical assistance would usually be funded by the outcomes funder itself i.e. Turkana CG; however, it is possible that NGO involvement could help to subsidize this, and this would require further discussion between parties.

- *Investor involvement:* The involvement of investors in the Outcomes Fund model would transfer the capital risks away from WSPs and enable them to operate effectively without the ongoing cashflow and profitability concerns that exist today. Investors accept the risk of no return on the agreement that, if outcomes are achieved, their investment capital will be repaid with a modest return.
- *Demand-led:* WSPs would develop proposals and apply to an Outcomes Fund – as opposed to the project being determined by donors. This would provide incentives to the WSP to ensure the long-term viability of the proposal and a commitment to work alongside an investor to achieve target outcomes.

### **How would the TWF be structured?**

The specific governance structure of the TWF would need to be determined during a feasibility study phase, as this would require a better understanding of Kenya's legal framework (e.g. the Public Private Partnership Act 2013). Our hypothesis is that this Outcome Fund could be administered within the CG organization by the sub-county water officers or equivalent, with the assurance that the right skills sets are built for the administration of the fund (examples are given below). During a feasibility study, the cost and benefit of different governance structures would need to be evaluated to understand the overall implications for the CG.

### **The roles and responsibilities of the TWF may include the following:**

- *Strategic management:* Developing and approving business cases and supporting capacity building of WSPs to submit robust business cases for funding, as well as ensuring that proposed outcome metrics are aligned to the objective of the TWF.
- *Operational management:* Managing the fund's day-to-day logistics and contracting.
- *Data management and coordination:* Identifying relevant data and setting up data management capabilities to monitor outcomes in individual projects.
- *External engagement:* Leading engagement with investors, WSPs and other stakeholders (e.g. prospective donors and WASREB).
- *Internal engagement:* Including clear reporting and accountability expectations.

### **How does the TWF operate?**

In an Outcomes Fund, a contractual framework would exist between three parties – the outcomes funder (CG or donor), service provider (WSP) and investor (social, outcomes-focused investors):

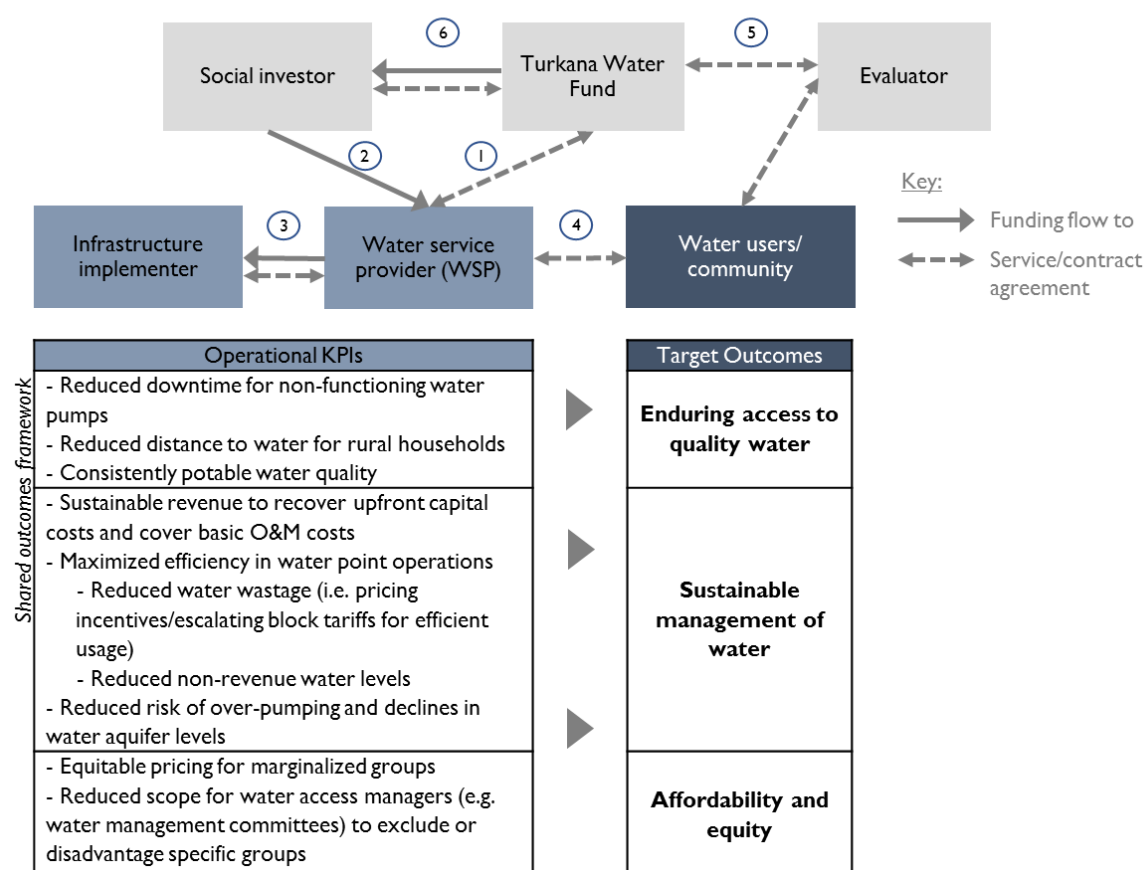
- The outcomes funder is the party that pays for the results, if successfully achieved. In this case, the primary outcomes funder would be the TWF, administered by the CG. This funding could also be boosted by contributions from donors.
- The WSP is the frontline agency delivering water access. This could be a county-owned WSP or a privately owned (but formally constituted) organization. The service provider may also contract with private infrastructure implementers for effective service delivery.
- The investor would be a socially oriented funder that looks for the return of its investment in the event of success but also prioritizes social impact.

The figure below outlines the typical funding flow in an Outcomes Fund model, as well as typical contractual agreements. This model is illustrative and might vary during a feasibility study: for example, the role of infrastructure implementer below might not be necessary in reality. As a first step

in setting up the TWF, the CG (and if applicable, donors) would pool funding resources under the desired fund administrator – whether within the CG or a separate organization.

**Figure 1: Funding flows and contractual arrangements in a potential Turkana Outcomes Fund model – an illustrative example**

- After pooling funding into the TWF and agreement of a shared outcomes framework (example illustrated below):
1. WSP develops business case for funding from the TWF
  - 2a. Once business case is approved by the TWF, WSP raises capital from investors to fund the upfront costs of the project
  - 2b. TWF commits to pay investors when pre-defined outcomes are achieved
  3. WSP uses investment capital to install and set up water infrastructure
  4. WSP operates water system, collects fees from users and manages O&M according to agreed outcomes framework
  5. Evaluator verifies outcomes that are achieved
  6. TWF disburses outcomes payments to investor.



**1.** WSPs would develop ‘business cases’ that outline the investment capital required to install and set up water infrastructure, as well as the long-term financial projections of the system. In this business case, a WSP would have to demonstrate the water infrastructure set-up, target population and tariffs, along with a plan to deliver the desired outcome metrics.

In designing the administration of funding for the TWF, it is important to consider how the funders might flexibly evaluate business cases received e.g. differentiating between SPA1 versus SPA3 providers; low-capex versus high-capex projects; low cost per litre of water versus high; low population density versus high, etc. Our hypothesis is that the cost per litre of water estimated within the financial projections (i.e. as a proxy for affordability) could be used to determine which projects might benefit from a grant/blended finance approach to overcome the initial challenges anticipated in commercial viability. This would need to be further evaluated during a feasibility study.

**2a.** A social investor would be engaged in the project to provide the upfront capital for the water infrastructure. There are different approaches to raising capital that could be explored in a feasibility study – either allowing WSPs to raise capital for individual projects or (ideally) the CG might choose to

raise sufficient investment capital from prospective social investors while establishing the Outcomes Fund to support multiple projects. This can be a sole investor, but often there may be benefits in having a small consortium of investors that can provide rigour and challenge to the various projects funded by the Outcomes Fund. Having the CG raise capital at a fund level would prevent WSPs from doing this themselves and might accelerate the delivery of projects.

**2b.** Investment capital would be tied to outcomes funding commitments made by the TWF. The pricing of those outcomes would be determined upfront and agreed before the project begins.

**3.** If a WSP's business case is approved, it would access the investment available in the Outcomes Fund to pay for the installation and set-up as well as any technology focused on efficiently and equitably distributing water in the community, such as pre-paid water ATMs.

**4.** The WSP would operate the water system and collect data regularly to demonstrate whether it is achieving the pre-agreed outcomes. The investor may initially become involved in ensuring that the WSP is well equipped to achieve these outcomes, and may intervene when the WSP is under-performing, supporting it to find solutions to challenges. For example, if a WSP is failing to repair water pumps in a timely manner, the investor may provide support in identifying the causes for delay and, if necessary, funding to overcome the challenge.

**5.** An independent evaluator would assess the performance of the WSP against the target outcomes and determine the level of outcome payments due to the investor.

**6.** The investor is repaid according to the outcomes achieved.

#### **What role does each partner play?**

For the day-to-day running and management of the projects sitting under the TWF the roles and responsibilities might consist of the following:

- *Delivering support:* Referring and identifying the target populations and delivering tailored, constantly improving services to the WSP.
- *Contract management:* Managing ongoing contract arrangements with the providers.
- *Data and analysis:* Managing the data collection process and monitoring progress against the pre-agreed outcomes.
- *Communication and reporting:* Creation of feedback loops to ensure that each partner is informed about the programme's performance in a timely manner.

Beyond the fund itself, other partners are outlined in Table 1 below. It is important to note that the role of NGOs and donors is unlikely to end in the short term. NGOs currently play a critical role in water access in Turkana, both in providing funding for infrastructure projects and in capacity building. This model assumes that a percentage of the investment capital that is raised by the WSP will be used for this capacity-building exercise in order to ensure that finances are well managed, users understand/are educated on the need to pay water bills and outcome metrics are well understood by all parties.

**Table 1: Possible partners under an Outcomes Fund model**

Partner	Example
Outcomes funder	County Government, humanitarian donors/NGOs, Water Sector Trust Fund (WTSF)
Social investor	Banks (e.g. Equity Bank Kenya, KfW), corporate CSR programmes
WSP	LOWASCO (SPA1 provider), formalized Water User Associations (SPA3)
Technical assistance	NGOs (e.g. Oxfam Kenya, Catholic Diocese of Lodwar's Insurance Programme), social entrepreneurs

**What are the risks and assumptions that need to be addressed?**

As suggested in this report, the current tariff in Turkana is one of the lowest in Kenya. Scenario modelling suggests that cumulative net income over 20 years is only net positive in some scenarios, when non-revenue water (NRW) and unpaid water fees are well managed. This has huge implications for the term of an investment, given that the break-even point may be as long as ten years or more. Providers in Turkana would need to address the issues of low tariffs and NRW to achieve outcomes, and as such one consideration of the fund might be to mandate the installation of e-billing/pre-paid ATM technology to overcome this challenge.

**How do we move the conversation on to implementation?**

Table 2 outlines some of the outstanding questions to be addressed in a feasibility study.

**Table 2: Questions to be addressed by a feasibility study**

Workstream	Key questions
Target population	What is the current coverage of water provision in Turkana? Should the TWF focus on new water infrastructure projects that reach the last mile, or should it also consider projects that replace existing but non-functioning pumps? How many non-functioning pumps might benefit from investment capital?
Market engagement	Which investors might be interested in this sector? Would NGOs and existing funders such as the WSTF take on this investment role? Would WSPs be able to deliver these outcomes? What concerns might they have in outcomes-based financing?
Metrics/outcomes	What are the desired outcomes in the water sector? How can these be reliably measured and monitored? What is the baseline of each outcome?
Data	What data is available in the current system? What datasets are needed to measure the outcomes defined and to set the baseline?
Tariffs, subsidies and NRW	Is there scope to influence the county's regulated tariff? What other mechanisms exist in the market to manage NRW other than pre-paid ATMs? Should these mechanisms be a set condition for projects funded by the TWF? How can pro-poor tariff structures be designed effectively to balance affordability with commercial viability of water provision?

Fund structure and governance	What legal framework would be most appropriate and cost-effective in Turkana? Who can play the role of Fund Manager most effectively?
Business case	<ul style="list-style-type: none"> <li>What are the key inputs that need to be outlined in a template? Are there existing frameworks that could be used?</li> <li>Do WSPs have the capacity to develop business cases?</li> <li>Can NGOs play a role in supporting WSPs as they build their financial models/projections?</li> </ul>

## NOTES

1 B. McSorley, M. Muema and J.J. Singano (2011). Solar Pumps: A solution to improving security in drought prone areas. Oxfam. [https://reliefweb.int/sites/reliefweb.int/files/resources/F\\_R\\_456.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/F_R_456.pdf)

2 See proposal: Funding mechanisms to scale up solar water pumping in Kenya's arid and semi-arid lands v3.

3 Kenya's arid and semi-arid lands (ASALs) make up close to 80 percent of the country's total land area; 70 percent of this area is arid and 19 percent semi-arid. The ASALs are mainly concentrated in Northern Kenya, spanning 23 of the country's 47 counties. Republic of Kenya (2012). Ending Drought Emergencies in Kenya: Country Programme Paper. <https://resilience.igad.int/index.php/knowledge/technologies/documents/49-cpp-kenya/file>

4 In Turkana county, 64 percent of the population are dependent on pastoralism, and the figure is estimated to be close to 75 percent for the former North Eastern province, including Wajir county. REGLAP Secretariat (2012). Key statistics on the drylands of Kenya, Uganda and Ethiopia. [http://www.fao.org/fileadmin/user\\_upload/drought/docs/Key%20Statistics%20on%20drylands%20of%20Kenya,%20Uganda%20and%20Ethiopia\\_October\\_%202012.pdf](http://www.fao.org/fileadmin/user_upload/drought/docs/Key%20Statistics%20on%20drylands%20of%20Kenya,%20Uganda%20and%20Ethiopia_October_%202012.pdf)

5 By 'ecosystem', this paper means the set of actors (public and private), structures and processes that, between them, determine water access outcomes in the ASALs. It encompasses both the water market and non-market activities. 'Water access' is used rather than 'water provision' to emphasize the importance of the demand side.

6 In other words, the use of 'market' is not restricted to for-profit provision.

7 It is recognized that different locations have different potentials to deliver these outcomes (e.g. because of physical location, local population dynamics, pump head, local willingness to pay, etc), implying that outcomes will not be equal in all areas.

8 Any outcomes-based funding approach needs to be oriented around results that can be attributed to the intervention (as opposed to external or extraneous causes).

9 Some households are reported to be conflating Oxfam and the local utility firm Lodwar Water and Sanitation Company (LOWASCO), underlining the lack of a clear delineation of responsibility between the two organizations for ongoing service provision.

10 Note that each of these models relies on subsidies to enable their ongoing operation, particularly during drought periods, and so commercial viability remains a challenge to be overcome.

11 The Turkana County Water and Sewerage Services Bill, 2018. [https://turkana.go.ke/wp-content/uploads/2018/03/Turkana-County-Water-and-Sewerage-Services-Bill-Final-\\_23022018.pdf](https://turkana.go.ke/wp-content/uploads/2018/03/Turkana-County-Water-and-Sewerage-Services-Bill-Final-_23022018.pdf)

12 Bloomberg, Earth Policy Institute. <http://www.earth-policy.org>

13 In other words, assuming a reasonable length of loan term and interest equivalent to what could be obtained from a commercial bank in Kenya for other projects. Of course, given higher upfront capital expenditure (capex) costs for a SWP, if loans were available only on very short terms and with high interest rates, then an SWP might not be bankable. This risk is partly why credit de-risking – including, for example, the provision of guarantees by Oxfam, as piloted in the Philippines – has an important role to play.

14 Both system manufacturers and distributors: there is a range of business models in the market.

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15 In other words, a pump curve that optimizes across total dynamic head (TDH) and flow rates, assuming 50m<sup>3</sup>/day or more of water is needed in the majority of locations. Some irrigation providers believe that they will, in time, be able to compete directly in the WASH market.

16 Other technical improvements – such as increasing efficiencies in battery technology offering an alternative to traditional water storage tanks – will likely offer lower-cost solutions to the challenge of 24-hour water supply.

17 Evidently, the opportunities for domestic water supply by private sector actors are constrained to locations with existing diesel gensets (or at least functioning boreholes), given the very high cost of new drilling. That said, low-cost SWPs may also open up new economic opportunities, such as increasing the amount of irrigable land along the Turkwel River. This in turn could have ramifications for the patterns of economic activity in the ASALs. Moreover, commercial suppliers of low-cost irrigation SWPs do not consider or market themselves as water service providers but as distributors of productive assets. This offers a work-around of the regulatory framework for water and electricity service provision. For example, in Turkana, operation of a water distribution service to more than 20 customers requires licensing under the legal/regulatory framework.

18 NRW is water that is produced by a utility but for which it receives no revenue, as a result e.g. of leakages, inadequate metering or theft.

19 B. McSorley, M. Muema and J.J. Singano (2011). Solar Pumps: A solution to improving security in drought prone areas, op, cit.

20 Including accessing Lorentz Compass planning software, as well as discussions with the World Bank task team about its financial model that underpinned the KOSAP project.

21 This model is for illustrative purposes only and should not be used as a basis for investment decisions.

22 Note that the sizing and costing of SWPs have been simplified for the purpose of this early-concept note and thus are illustrative of the relative capex and opex costs of the system, and not an accurate depiction.

23 In this analysis, NRW is defined as revenue lost from illegal piping as well as revenue lost through unpaid fees.

24 See WASREB tariff guidelines: <https://wasreb.go.ke/tariff-guidelines/>

25 SWIFT Kenya Strategic Operational Learning Report – Round 2 (2018).

26 \$1 is equivalent to KES 100.

27 Netherlands Development Agency (2012). Commercial viability analysis of water systems in Lake Victoria North and South Water Services Boards.

28 <https://www.water-forever.com/about-us/about-maji-milele/>

29 One topic to explore further is understanding the scope for private sector-led rehabilitation of abandoned boreholes, given that borehole drilling is by some margin the biggest use of capex in establishing a new water point.

30 Lifeline rates are targeted subsidies based on the consumption level of households, i.e. subsidized rates for a first block of consumption that is sufficient to cover basic needs (for water, for example, 25 litres per person per day). This involves using consumption volume as a targeting mechanism and provides an easy quantitative target as to what and how much to subsidize. Lifeline rates are a way of improving the design of increasing block tariffs, since only the first block, covering basic needs, is subsidized. Anything beyond this would be charged at a commercial rate, i.e. based on the marginal cost of service provision. This mechanism appears to be more accurate than increasing block tariffs, since in this case only the lower block is subsidized. S. Trémolet and D. Binder (2009), Regulationbodyofknowledge.org. (2018). Retrieved 22 August, 2018, from <http://regulationbodyofknowledge.org/faq/social-pricing-and-rural-issues/what-are-the-strength-and-limitations-of-lifeline-rates/>

31 WASREB drinking water quality guidelines: <https://wasreb.go.ke/drinking-water-quality-guidelines/>

32 System sizing and simulation using Lorentz Compass planning software. Lorentz is a private company based in Germany which manufactures, designs and sells SWP systems in over 130 countries. [www.lorentz.de](http://www.lorentz.de).

33 International Bank for Reconstruction and Development/World Bank Group (2018). Solar Pumping: The Basics. <http://documents.worldbank.org/curated/en/880931517231654485/pdf/123018-WP-P159391-PUBLIC.pdf>

34 Social Finance (2018). Outcomes Funds. [https://www.socialfinance.org.uk/sites/default/files/publications/sf\\_outcomes\\_fund\\_note\\_feb\\_2018.pdf](https://www.socialfinance.org.uk/sites/default/files/publications/sf_outcomes_fund_note_feb_2018.pdf)

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Tintagel House  
92 Albert Embankment  
London SE1 7TY  
[info@socialfinance.org.uk](mailto:info@socialfinance.org.uk)

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