SOUTHERN MADAGASCAR WATER ASSESSMENT

Technical Report

Revision – 17 July 2024 (Final Version)

ACKNOWLEDGEMENTS

The research brief was prepared by Emma Cheurfa and Paul Evans with the support of the Hydroconseil project team. We thank the following reviewers: Ranjiv Khush and Jeff Albert from Aquaya.

Prepared for the United States Agency for International Development by Rural Evidence and Learning for Water (REAL-Water) project under Cooperative Agreement Number 7200AA21CA00014.

Aquaya contacts:

Ranjiv Khush, Project Director
ranjiv@aquaya.org

Jeff Albert, Deputy Project Director
jeff@aquaya.org

Dayna Hansberger, Senior Program and Operations Manager
dayna@aquaya.org

ABOUT USAID/REAL-WATER

USAID Rural Evidence and Learning for Water (REAL-Water) is a five-year partnership that develops and evaluates strategies for expanding access to safe, equitable, and sustainable rural water services. REAL-Water supports policy makers, development partners, and service providers to make strategic decisions and implement best practices for water management through implementation research. It also ensures coordination with USAID programs contributing to the water, sanitation, and hygiene (WASH) and water resources management (WRM) knowledge base, in alignment with the USAID Water for the World Implementation Research Agenda. For further information about this and other aspects of the project, as well as to access our knowledge products, please visit globalwaters.org/realwater.

TABLE OF CONTENTS

FIGURES AND TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ADB	African Development Bank
AES	Alimentation en Eau dans le Sud
AOI	Area of Interest
ATEAH	Agents Techniques de l'Eau, Assainissement et Hygiène
BRGM	Bureau de Recherches Géologiques et Minières
CAPMANEX	Renewal and maintenance costs
DEC	USAID's Development Experience Clearinghouse
DDL	USAID's Development Data Library
DREAH	Direction Regionale de l'Eau, Assainissement et Hygiène
EUR	Euro
FGD	Focus Group Discussions
GoM	Government of Madagascar
INSTAT	Institut National de la Statistique
JIRAMA	National water and electricity company
KII	Key Informant Interview
L	Litres
m^3/h	Cubic meter per hour
MGA	Malagasy Ariary (Malagasy currency)
MUS	Multiple Uses Services
NGO	Non Governmental Organization
OPEX	Operational expenditure
STEAH	Services Techniques de l'Eau, Assainissement et Hygiène
WHH	Welt Hunger Hilfe

EXECUTIVE SUMMARY

Overview

The Southern Madagascar Water Assessment Buy-In aims to develop actionable recommendations for USAID's water security programming across the Grand Sud of Madagascar. This Technical report is the third project output, presenting findings and preliminary programming recommendations. The final report about Management Opportunities, with revisions pending discussions with USAID, is scheduled for delivery on 30 June 2024.

Key Findings

Among other water-related programs across the Grand Sud, the World Bank is investing the order of US$16 million through 2026[1] in village-level water supply infrastructure rehabilitation across the area of interest (AOI) in the Grand Sud, focused on upgrading and rehabilitating existing manual pump-equipped boreholes, as well as conversion to solar power. The transition aims to enhance water supply reliability and efficiency across the region, but the rapid pace of implementation poses risks and challenges. The government's institutional capacity to regulate this transition is questionable, as is the capacity of service providers (which sometimes include the communities themselves) to professionally manage rehabilitated systems.

We highlight the following:

- *Widespread water infrastructure upgrades*: By 2026, at least 776 World Bank-financed boreholes will be upgraded from manual to solar-powered systems. This will increase the complexity of the water supply systems (increasing maintenance and repair requirements) and is anticipated to be accompanied by a shift from existing informal and community water management to formal private operator management.
- *Chronic lack of local institutional capacity:* Commune-level and Regional Directorate of Water, Sanitation, and Hygiene (DREAH) institutions are under-resourced and lack the capacity to support, oversee, and regulate service providers effectively. This is compounded by the ambiguity of roles and responsibilities of these institutions, which are signatories to the *affermage* contracts with the private operators. Such a lack of capacity increases the likelihood that recently rehabilitated systems will underperform and/or fail.
- *Financial Sustainability:* Our own financial analysis suggests that the water tariffs recommended by MEAH (100 MGA / 20L) will make significant cost recovery impossible in rural settings. We estimate that solar-powered systems will face financial shortfalls of roughly $2,500 per year each, on average.
- *Poor private operator service delivery:* Existing service providers struggle financially to operate across the Grand Sud due to low revenues and high costs of working in remote areas. These financial pressures result in significant repair delays and meaningful engagement with water users.
- *A lack of community engagement:* Communities that have benefited from upgraded infrastructure express frustration with the lack of communication regarding water pricing policies and other essential information related to the introduction of new management systems. This has resulted in operators shutting off recently rehabilitated water supply systems due to a lack of payment by water users.

[1] This estimate, part of the current US$100M World Bank water investment in the Grand Sud, is based on our discussions with World Bank personnel in Antananarivo.

Preliminary Recommendations

Our analysis points to a USAID programming focus on the management and sustainability of the water supply systems being rehabilitated by the World Bank across the AOI, including interventions to strengthen institutional capacity, set up contracted service providers to succeed, and elevate key actor coordination.

We include the caveat that these programming ideas are preliminary, and finalizing them will necessitate ongoing close coordination with World Bank personnel. But we have conceived of them following steady interaction with Bank officials throughout the Buy-in actvities.

Domain	Illustrative Programming Ideas for Discussion with USAID
Strengthen Institutional Capacity Bolster the capacity of government institutions to support, oversee and regulate service providers.	1. Work with national authorities (MEAH) and regional authorities (DREAHs) to put in place legal, regulatory, and policy measures that will allow proper support and oversight of both the development and execution of *affermage* contracts private operators. 2. National level: consider secondment of senior technical WASH personnel to MEAH to support the development of a Water Supply Master Plan. 3. Support the DREAH and communes (via the Technical Services for Water, Sanitation, and Hygiene – STEAH) to engage in the anticipated transition from community-managed to private operator-managed systems across the AOI.
Set up providers for success Bolster the capacity of government institutions to support, oversee and regulate service providers.	4. Work with contracting authorities above to fashion *affermage* contracts that are fit-for-purpose and enforceable. 5. Offer support to potential *affermage* holders to understand the financial viability of their contracts and implement measures to manage risk. 6. Establish a results-based financial support mechanism for private operators to satisfy contractual obligations for service delivery.
Coordinate Key Actors	7. Support national authorities to re-activate national and regional WASH coordination platforms. 8. Execute an internal review of USAID programming to identify opportunities for internal NEXUS collaboration.

Conclusion

We have identified a critical gap that USAID programming can help to fill. The ongoing transition from manual pump systems to solar-powered systems implemented by the World Bank across the AOI offers improved water access to rural communities. However, these activities focus on relatively rapid infrastructure implementation, with long-term water system management and institutional capacity building appearing to receive less emphasis. Institutions must be able to meaningfully coordinate, oversee, and support the rehabilitated systems, in the interests of their long-term professional management.

INTRODUCTION

STUDY OVERVIEW AND OBJECTIVES

This Buy-in assessment's objective is to develop clear and actionable recommendations for USAID's water resource programming. This Technical Report presents analysis of the collected data and preliminary recommendations. The Management Opportunities Report (scheduled for delivery on 30 June 2024) will refine the recommendations after consultation with USAID. Upon completion, all supporting data will be uploaded to the Development Data Library (DDL) and Development Experience Clearinghouse (DEC) as appropriate.

STUDY PROGRESS TO DATE

The analysis presented in this report is based on data and findings generated through the following activities completed to date:

1. A desk review completed in December 2023.
2. A two-week technical team visit across the Area of Interest (AOI) in February 2024, including visits to existing water supply infrastructure and meetings with key stakeholders and water users. Site files are included in Annex 1.
3. 72 Focus Group Discussions (FGD) across the AOI completed in February 2024. These include both open discussions and closed-question interview exercises. The FGD methodology and results are presented in Annex 2.
4. 61 Key Informant Interviews (KII).
5. Review of secondary data, notably a 2022 study across Amboasary-Sud, Ambovombe-Androy, Tsihombe, Bekily, and Beloha (MedAir, 2022).
6. Facilitation of a "Grand Sud water security donors discussion" workshop on 25 April 2024. The workshop agenda and participant list are presented in Annex 4.

REPORT STRUCTURE

We have endeavored to keep the main text of this report focused on specific findings from data collection their implications for USAID programming in the Grand Sud. All of the following supporting data appear in the Supplemental Information (SI) materials:

- Annex 1 – Technical team visit site files
- Annex 2 – Focus group discussion methodology and results
- Annex 3 – Closed question survey questionnaires and results
- Annex 4 – Donor and MEAH workshop agenda and participant list
- Annex 5 – Water supply technical supplement
- Annex 6 – Water supply system financial analysis
- Annex 7 – Detailed gap analysis

Analysis and Discussion

Household Water demand

The closed-question survey data indicate that the average number of people served per water point is relatively low – on the order of 500 – due to the small population centers across the AOI. The variance in served population ranges from 260 in Amboasary to 600 in Ambovombe and Betroka (based on an average household size of 4.2 individuals, as estimated by the National Institute of Statistics (INSTAT).

According to focus group discussions, household demand for water from local water supply systems for domestic purposes (both drinking and cleaning) is variable, from 40 to 60L per household per day on the high end to less than 20L per household per day where water access is problematic. These relatively modest consumption quantities may limit the revenue potential, as discussed later in this report

Water services payment

The closed-question survey results and the technical team visit indicate that water tariffs are variable across the AOI, differing by infrastructure, season, and location. Water prices range from free (typically for community-managed or informally managed boreholes installed with handpumps) to a premium of 2,000 MGA (US$0.45) per 20L (for water carting supplies during the dry season). Although water access from installed boreholes is often free or very inexpensive, the FGD results suggest that local people understand the need to pay for infrastructure repair, even if done in response to breakdowns via community collections. The FGD and technical team visit also determined that communities rely on cash payments for water; no use of mobile payment, banks or microfinance services was identified across the AOI. Figure 1 presents the price paid per 20L across the AOI using data collected from the closed-question survey. The distribution indicates an increased willingness (or capacity) to pay near populated areas, particularly closer to the coast. This is likely due to the relatively well-established cash economy and better market access across the coastal zone. Much of free water access, mainly across the more rural zones, happens at manual pump-operated systems. However, tariff recovery can be subject to local complexities:

1. The urban commune of Antanimora in Ambovombe district has a population of approximately 20,000. The operator for Antanimora's water supply is the Alimentation en Eau dans le Sud (AES) project, which charges 100 MGA (US$0.02) / 20L. In addition, within the last five years, the local Lutheran church installed 15 boreholes across town, providing free water. Our understanding is that the church assumes the operational costs of these systems. Notably, the resale of water by individuals with private connections is widespread due to the limited number of access points.
2. The urban commune Beraketa also has a population of approximately 20,000. AES provides a solar-powered borehole supply, for which it charges 100MGA (US$0.02) / 20L from communal water points with options for residents to purchase private connections (fitted with meters). In addition, UNICEF installed five boreholes with India Mark series handpumps in the town periphery. UNICEF has delegated manual borehole management to the local communities, with reported but unverified monthly (non-volumetric) tariffs of 500 MGA (US$0.10).

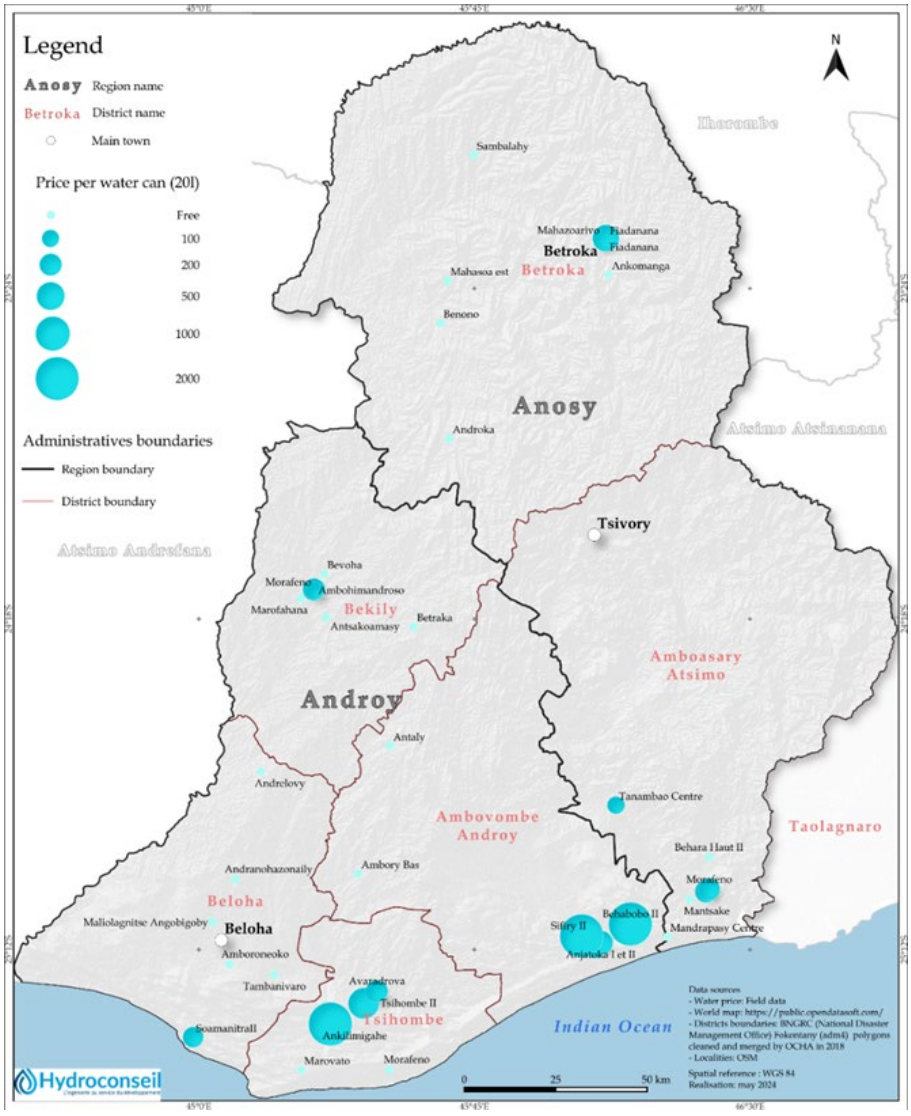

Figure 1 Water pricing across the AOI (based on results from February 2024 closed-survey questionnaires)

WATER EXPLOITATION

WATER ACCESS AND AVAILABILITY

Annex 5 presents a detailed description of the water supply types across the AOI, summarized in Table 1. The most prevalent village-level water supply type across the rural areas of the AOI are boreholes installed with manual pumps. Our closed-question surveys indicate widespread water point reliability problems, with approximately 60% of water points across the surveyed areas reported to experience water availability problems (related to dry season variations and underperforming infrastructure). FGD respondents reported that water users may not always rely on the available water supply infrastructure if alternative free options exist, even when improved infrastructure is available. Preferred sources vary seasonally throughout the year, influenced by household asset liquidity to pay for water as well as infrastructure functionality, which is less reliable during the dry season. FGDs indicated that during the rainy season, the primary alternative sources are rainwater, shallow wells,

and surface water (ponds and rivers). Dry season alternative sources are rivers, shallow wells, and water carting. According to FGD responses and technical visit findings, drinking and cooking is prioritized for drinking and cooking where payment is required. Alternative sources are accessed for other domestic water uses, such as cleaning where such sources exist. An example illustrating this complexity of water point access behavior is in Anjamahevelo (Anosy Region), where the water point manager reported (during the technical team visit) that, contrary to conventional expectations, fewer people purchase water from the water point during the dry season. This is explained by the reduced flow of the nearby Mandrare River during the dry season, which enables the local population to excavate hand-dug wells and access relatively clean and free shallow groundwater used for drinking and domestic use as an alternative to the paid water source.

Table 1 Water supply overview across the AOI based on FGD results and the technical team visit

Context	Water use	Predominant water source or infrastructure type
Rural villages	Drinking	Since the 1970s, over 2000 boreholes have been installed across the AOI in various states of condition. Most boreholes that remain operational are installed with manual pumps (India Mark and Vergnet type), and an increasing minority with solar-powered pumps. Water sales by water carting
	Domestic (cleaning)	Surface water improvised shallow wells where available. Users will use infrastructure where such alternate sources are unavailable, mainly where water is free.
	Crop irrigation	FGD outputs and technical visit observations indicate that crops primarily rely on rainfall. Water access for irrigation was largely ad hoc, with people preferring to access improvised shallow wells with buckets or moto-pumps rather than using water supply infrastructure (particularly where payment is required). The technical team observed a few cases of small-scale market gardening near manual pumps, although this appears to be the exception rather than the norm across the rural areas of the AOI. Communities near rivers benefit from relatively easy water access (using retention structures and canals) for irrigation.
	Livestock	FGD outputs and technical visit observations indicate that water supply infrastrzucture is not used for livestock watering. Farmers prefer to take the animals to access surface water, even where this involves significant travel on foot. This is due to the apparent impracticality of paying for the significant required water quantities.
Towns	Domestic	Relatively large-scale surface water abstraction and treatment powered by solar pumps (Ampotaka pipeline) and diesel generators.

EXISTING BOREHOLES ACROSS THE AOI

At least 2,000 boreholes have been installed across the Grand Sud by various actors, many of which are now defunct. This has resulted in significant variance in the borehole installations' type and quality, which are essential controls on the achievable sustainable yield. Although recent inventories have been undertaken across the area to confirm borehole locations and depths (such as that by Project Mionjo), the condition of the subsurface borehole installations (notably the screen and casing condition as well as the surrounding gravel pack, which are highly likely to be in a degraded condition) remain largely unknown. Boreholes across the AOI are typically relatively shallow (less than 50m depth), with static groundwater levels generally shallower than 20m depth. Reported borehole yields (ranging from under $10m^3/h$ to over $20m^3/h$) are based on questionable pump testing techniques, and thus actual long-term exploitable yields are likely to be lower than these estimated yields. There is a paucity of data on the magnitude of groundwater drawdown during pumping (dynamic water level), an essential indicator required to understand the long-term sustainability of individual borehole supplies, particularly for those equipped with mechanized pumps. Brackish groundwater is also reported to be a problem across localized areas (through both focus group discussions and observations during the technical team visit), particularly across the sedimentary zones in the south of the AOI; this has led to the abandonment of some recently drilled boreholes.

BOREHOLES INSTALLED WITH MANUAL PUMPS - THE CURRENT NORM ACROSS THE VILLAGES IN THE AOI

The rural boreholes visited by the technical team were equipped with either Vergnet foot pumps or India Mark handpumps. Technical visit observations and KII discussions suggest that the India Mark pumps (traditionally supported by UNICEF) outnumber the Vergnet pumps significantly. Some pump users expressed preference for the Vergnet manual pumps, arguing that they are more robust and durable, while other users stated preference for India Mark pumps because of superior ease of repair and spare parts access.

EMERGENCE OF SOLAR-POWERED BOREHOLE PUMPS (MULTIPLE USES SERVICES (MUS) SYSTEMS)

MUS systems emerged in the early 2000s to address water service needs in rural areas (Van Koppen and Smits 2010). The MEAH has encouraged solar-powered borehole MUS models for over five years, with widespread buy-in from international organizations, including UNICEF and USAID BHA.

The World Bank-financed Project Mionjo shortlisted approximately 1,100 existing boreholes across the AOI currently equipped with manual pumps for upgrade to solar-powered pumps. These systems would operate as Multi Usage Services (MUS) systems, and of the 1,100 candidate boreholes, 767 will be selected and upgraded by Project Mionjo, with a target completion date of 2026. This ambitious upgrade is likely to change the water supply infrastructure landscape across the AOI. The solar-powered MUS model across the AOI typically consists of:

1. an upgraded borehole (requiring a detailed diagnostic to ensure suitability for solarization).
2. a mechanized submersible solar-powered pump.
3. an elevated storage reservoir, typically of 10 or $20m^3$ capacity.

Our technical team prioritized visiting existing MUS systems (visiting 10 MUS sites in total) and observed the following:

- Most systems were experiencing technical difficulties related to pump operations, which, at best, limited the achievable yield or, at worst, rendered the system inoperable. For example, we observed recently installed submersible pumps resting on the base of a number of boreholes, indicating a poor understanding of water level variability and creating a significant operational risk (from sediment and debris ingress, as well as damage to the well casing or linings).
- A minority of the MUSs visited were being actively used for irrigation. The observed small-scale market gardening was typically located near village centers with cultivated areas up to 200m^2 managed by women's groups.[2] Given the relatively small scale of this market garden cultivation, it is unlikely that introducing these activities will significantly change the resilience level of any given village community.
- Animal watering troughs were unused and appeared largely derelict. We hypothesize this to be due to farmers' reluctance and/or inability to pay for water for their livestock.
- One MUS site (Bekopile Sud) located within school grounds had been closed by the operator for over two years due to the inability of the school to pay for water. The MUS had replaced a previously installed handpump, resulting in the school no longer having access to their prior water supply. We observed a similar example in another village (Tanandava commune), where standpipe connections had been closed at a school and a health center due to the institutions' inability to pay for the water.

WATER CARTING – A VALUED AND UNREGULATED LOCAL SERVICE

During the technical visit, water provision via unregulated carting delivery using zebus was observed to play an important local role in water distribution, particularly across areas that cannot directly access groundwater due to water quality problems or other issues. Due to its widespread and informal coverage, detailed mapping of the areas served by water carting was not possible. We could not locate any relevant detailed studies that map the extent of the carting services.

Water carting is common around small towns in the AOI, where entrepreneurs purchase water in bulk from private operators for transport and resale to surrounding rural communities. The same model is applied in more rural locations, with entrepreneurs transporting water from rivers and hand-dug wells to village centers. Although our observations provide a snapshot of these informal water carting activities, the associated local dynamics appear to be complex, influenced by local politics, seasonal water demand variations, and the availability of local water supplies. We highlight the following observations from the technical visit:

- Water carting entrepreneurs target gaps in the market, notably areas and populations that experience the greatest difficulties accessing water.
- The carting price points may place it out of the range of the poorest population segments.

[2] The technical visit observations were that the women's groups are organized through the initiative of the local communities and operated on an individual basis with limited integration between the different groups.

- Water carting is most active and widespread during the dry season.
- The water carting industry are accepted across the villages, and we observed no disapproval of the sale or resale of water; indeed, cart vendors tend to be viewed as providing a valuable service.

DESALINATION FACILITIES

We identified three desalination water plants across the AOI: two located in Tulear and one in the commune of Ambondro (Ambovombe). We visited the Ambondro plant, funded by UNICEF and operated by the private operator Ny Ravo, constructed in 2022. We noted the following:

- The system was intended to serve a small-town population of 5,000 with water at a tariff of 250 MGA (US$0.06) for 20L with water sourced from a borehole constructed in 2019. The system's treatment capacity is $3m^3$/day, meaning that it requires one week of operation to meet one day's water demand for the entire community. Water users pay cash and collect water directly from public standpipes.
- According to MadaGreen (the company that installed the facility), the maintenance costs for such infrastructure are approximately US$1.10 / m^3 produced (though we judge this to be at least a 50% underestimate, based on our own experience in the Grand Sud).
- The facility is solar-powered and operates six to seven hours daily, even as it was installed for mixed solar and diesel generator power (with a generator used during night hours). The generator is not currently used due to high diesel costs.
- The facilities' low production rate maybe due to the sole reliance on solar power, treatment plant capacity, or a combination of the two.
- Overall, the facility does not meet water demand for the entire community, suggesting that this water supply modality does not currently offer a financially viable option for the Grand Sud in this context.

WATER SYSTEM MANAGEMENT AND TECHNICAL SERVICE PROVISION

COMMUNE AND COMMUNITY ENGAGEMENT

We heard the following commune and water user concerns during the technical team visit:

- No agreement or specific pricing policy is defined upstream between the community, operators, and public authorities for facilities open to the public, such as schools or health centers.
- There is poor communication among the private operators, the community, and the commune once the systems are operational.
- There is a lack of clarity regarding commune versus private operator roles and responsibilities for the rehabilitated water supply management systems.
- There are significant delays (of the order months) for private operators to address required repairs for recently rehabilitated systems.

WATER SUPPLY SYSTEM MANAGEMENT ARRANGEMENTS

Infrastructure management arrangements vary from formal agreements to ad hoc, reactive management to a complete absence of a management system. Table 2 summarizes the type of management arrangement associated with the different water supply types based on feedback from the FGDs and closed questions. We made the following observations across the rural areas:

1. Responsibility for MUS and solar-powered borehole mini-networks currently lies with either private operators (as further detailed in the following section) or state institutions. Service providers often lack a local physical presence at the village or commune level, and monthly visits are typically undertaken to collect revenue. Providers frequently employ a local agent responsible for several systems located in the same general vicinity.
2. Private operators in rural areas do carry out systematic performance monitoring for their systems.
3. Handpumps often lack formal management systems. Responsibility typically rests with either a village leader or another designated local authority figure. The better-organized community management systems involve revenue collection through monthly household contributions, but more often, "reactive management" is in place, meaning that little or no preventative maintenance is undertaken and funds are collected only after breakdowns occur. This approach results in service downtime on the order of months, as the necessary funds are slowly raised, spare parts are sourced, and the technical support to make the repairs procured.

Where water supplies are managed at the community level, collected funds are typically kept locally within the community. Communities reported this to the technical team as necessary due to the difficult logistics and costs of traveling from villages to towns to access banking services.

Table 2 Management arrangement summary for the various water supply infrastructure types across the AOI

Water supply infrastructure type	Responsible party	Successes	Challenges	Geographical coverage
Large-scale infrastructure and mini networks across small towns (e.g., the Ampotaka pipeline)	JIRAMA, AES, and private operators such as Ny Ravo.	Formalized payment systems and active maintenance.	• Vandalism and water theft by communities near the pipeline, but not benefiting from the water supply. • High non-revenue water. • Heavy reliance on diesel generators (resulting in supply interruptions of the order days when diesel is unavailable).	The coastal zones of Tsihombe and Beloha, Ambovombe, Amboasary Sud, and small towns alongside National Road 13 (Antanimora, Beraketa…).
Mini networks / MUS	Private operators	Some MUS have established formalized payment systems between the communes and the private operators.	• Establishing new formalized payment systems can be problematic for rural populations accustomed to informal payment or free water from boreholes with manual pumps. There is minimal proactive maintenance, and when the • communities request repairs, they take months to complete. • Private operators are under financial pressure and cannot afford professional external technical support or proactive maintenance	Across the rural areas of the AOI
Individual boreholes with manual pumps	Communes, water point committees, or local institutions (e.g., schools).	Significant borehole supply longevity with instances of boreholes operating since the 1970s (albeit inclusive of significant downtime periods as pumps are repaired).	• Lack of proactive maintenance. • Reactive management results in periods of significant downtime (months) while finances are raised and spare parts and technical support are sourced. • Lack of access to external technical support and spare parts.	Across the rural areas of the AOI

PRIVATE OPERATORS

We identified three operators who are now active across the rural zones of the AOI:

1. ***Lovavilu*** (understood to be owned by the husband of the governor and ex-Minister of Water of Anosy), manages an estimated 15 rural MUSs and an unknown number of handpump borehole supplies.
2. ***Ny Ravo*** operates the production and upper section of the Ampotaka pipeline and, more recently (since 2020), approximately 50 rural MUS systems.
3. ***Cap Mad is*** responsible for the lower section of the Ampotaka pipeline and, more recently (since 2020), approximately 15 rural MUS systems.

Based on technical team observations and KIIs, all three providers struggle to provide professional service to rural communities across the AOI because of low water demand by populations (likely linked to low willingness and or ability-to-pay).

We determined that neither Ny Ravo nor Cap Mad rely on external funding, but rather use their wider pipeline management businesses to help finance and subsidize their management operations across the rural areas. The financial pressures on these private operators reduce their ability to outsource repair work (e.g., for solar systems) to technical specialists, resulting in in-house repair efforts to minimize costs, delays, and substandard repairs. A Cap Mad field agent informed our technical team that of six MUS solar-powered systems managed by Cap Mad across Ambovombe District, none are currently functional, either due to non-specified technical issues or management issues relating to nonpayment (such as at Bekopile Sud). Where communities or institutions cannot pay for water, the financial pressures appear to force operators to terminate service.

OPERATION AND MAINTENANCE SERVICE PROVIDERS

Table 3 summarizes key operation and maintenance considerations for the various manual and solar-powered pump-equipped boreholes prevalent across the AOI's rural areas. Closed question feedback and the technical team visit observations indicate that, at present, the water supply systems experience downtime of the order of months before repair works are undertaken (applicable to both handpumps and more advanced solar-powered systems).

The technical team identified significant reliance on improvised manual pump repairs. It appears to be standard practice for improvised repairs to occur at the village level, with spare parts often cannibalized from other pumps. In addition, pump theft was also reported as an issue across numerous villages, indicated by community leaders, due to a scarcity of pump spare parts. Leaders reported this issue becoming increasingly prevalent due to the difficulties experienced in accessing professional pump maintenance and repair services.

Table 3 Pump maintenance and repair requirements (based on technical team observations, private operator KIIs, and professional experience).

	Manual hand and foot pump	**Solar-powered borehole pumps (MUS systems)**
Pump types	India Mark series handpumps and Vergnet foot pumps	Lorentz and Grundfos
Repair complexity	Relatively simple maintenance is possible at the community level (if training and tools are provided).	Highly complex, requiring external technical support
Component types	Pump, headworks, and rising main components	Solar panels, pumps, control boxes, and mini-network infrastructure components (taps, valves, etc.) are included.
Spare parts and replacement parts access	Periodically available across the Grand Sud, but generally necessary to go to Antananarivo to source.	Taps, valves, etc., can be accessed across the Grand Sud or Tulear. Solar panel components and the mechanical pump must be accessed via Antananarivo or internationally.

Table 4 summarizes the range of technical service providers identified across the AOI, ranging from ad hoc technical services provided by communities to international carbon credit-financed organizations. Here we offer additional background on these providers:

SERVICE TECHNIQUE DE L'EAU DE L'ASSAINISSEMENT ET DE L'HYGIENE (STEAH) (WASH TECHNICAL SERVICE)

STEAH is a commune-level technical service unit with responsibilities ranging from infrastructure management, technical coordination, monitoring, and technical support. Our technical team did not observe STEAH to be very active across the AOI and, where present, they appeared to lack capacity and resources (tools, transport). Where our team encountered STEAH personnel (known as Agents Techniques de l'Eau, Assainissement et Hygiène, or ATEAH) (e.g., at Tanandava and Pepiniere Ankirikiriky in Andosy), their knowledge appeared limited to very basic manual pump and valve repairs. In the case of the commune of Pepiniere Ankirikiriky, the STEAH staff were funded directly by the manual pump Water Management Committee that the NGO WHH had recently established. The ATEAH staff positions are precarious, as the appointments are politically controlled; technical team discussions with the adjoint mayor at Beraka indicate that across the Grand Sud, the change of mayor at the end of the mandate typically results in wholesale commune staff changes with key documents (such as the commune development plan) taken by the outgoing officials resulting in a loss of institutional memory.

FIFARAFIA

Established in 2000 with the support of UNICEF, the not-for-profit association FIFARAFIA (based in Antanimora (Ambovombe District)) has provided handpump operation and maintenance for 861 boreholes across the AOI, particularly the India Mark models. FIFARAFIA employs a small team (three

directors and 12 mechanics) providing technical support to the community-managed pumps. The organization has historically relied upon spare part donations (mainly from UNICEF) to operate and payment by the communities for the services rendered. UNICEF support to FIFARAFIA for manual pump maintenance ended in 2018.

Four of the villages visited by our technical team reported that they rely on FIFARAFIA mechanics to repair their manual pumps. Specific challenges cited by FIFARAFIA directors (in February 2024) included:

- A lack of business model and financial management capacity, leading to dependence on external funding. The association's ability to recover its costs seems insufficiently assessed by UNICEF.
- Inadequate revenue recovery for repair services rendered.
- A lack of access to equipment, spare parts, and tools due to logistics challenges and lack of finance. For example, they do not possess the compressor necessary to clean boreholes.
- A lack of financial resources to undertake regular proactive monitoring visits across the boreholes, with communes forced to contact them directly to request services. This is typically done by SMS, with communities often poorly informed of the association and instead reliant on communication with individual mechanics. If the communes do not contact FIFARAFIA, there is no way for them to be aware of a repair of repair needs.
- Repair lead times exceeding two months due to difficulties sourcing spare parts.
- Free repairs undertaken by some other NGOs reducing communities' willingness to pay for FIFARAFIA's service.

Although FIFARAFIA lacks effective management, financing, or development plans, it plays an important role in local-level manual pump repairs. Its long-term local presence, existing relationships with communes, and mechanics who understand the day-to-day realities of community pump maintenance remain valuable.

SANITAP / MADAVANCE

SANITAP (based in Antananarivo, established in 2020) via its local implementing partner MadAvance (based in Fort Dauphin, established in late 2023) seeks to leverage carbon financing to fund the provision of safe drinking water across the Grand Sud for 10 to 15 years.

- The model offers repair and maintenance services for boreholes equipped with manual pumps across communities. Solar-powered pump maintenance is not yet planned, but MadAvance is open to exploring the possibility.
- This service involves establishing a local manual pump spare parts chain and providing technicians. Ten teams of two mechanics are planned.
- The model requires that communes sign contracts with MadAvance that include an exclusivity clause preventing communes from using alternative maintenance and repair services for a fixed period (5 to 15 years).
- MadAvance has recently partnered with MedAir, which will rehabilitate 200 water points across the Grand Sud. By late 2024, MadAvance will take responsibility for the long-term maintenance of these water points.
- MadAvance continues to seek other partners across the Grand Sud to develop its programming further, focusing on boreholes installed with handpumps. It remains unclear how it will

collaborate and coordinate with other service providers across the AOI, particularly given the exclusivity clause in the contracts signed with communes.

SANITAP/MadAvance's proposed model is based on selling carbon credits (under a Gold Standard certification) for theoretical reductions in fuelwood combustion for drinking water treatment via boiling. **We caution that the basis of this carbon credit monetization remains highly questionable, as no evidence of widespread water treatment via boiling with fuelwood was identified through our FGDs and technical visits.** Selling carbon credits for solarization would be far less questionable, with a more plausible causal chain between the intervention and carbon mitigation.

Table 4 Diagnostic of the array of technical service providers across the Grand Sud

Service provider	Organization level	Service provider type	Technical capacity	Local commune/village-level presence	Funding	Estimated number of rural village facilities serviced	Responsiveness
Service Technique Eau, Assainissement Hygiène (STEAH)	Low – highly informal with sporadic coverage	Commune	Low	Commune and/or village-level	Highly variable, with finance sources ranging from communes, village water committees, NGOs, and the DREAH.	Estimated at >20	Very limited due to lack of capacity and means
Communities	Low – highly informal	Community	Low – although with training capable of maintaining and repairing manual pumps	Village level	Low reliance on community funds	Estimated at >300	High but limited by access to funds, spare parts, and technical capacity.
Private operators (e.g., Ny Ravo)	Moderate to high	Commercial private	Moderate – capable of undertaking moderate infrastructure technical repairs but limited capacity related to motorized pumps and solar systems.	No - requires employing local agents that typically cover water supply points.	It is controlled by the revenue generated by water points. Generally, this is very limited, which impacts operators' response time and capacity to undertake regular maintenance visits.	Estimated at approximately 80.	Often slow due to lack of funds, difficulties in accessing spare parts, and requirements to travel to remote locations
Community organizations (e.g. FIFARAFIA)	Low	Non for profit	Moderate – adequate to maintain and repair handpumps	Excellent local presence	Very limited, reliant on subsidies and spare part donations.	861 reported by FIFARAFIA	Historically, they were very active when they were receiving financial support, but currently limited activity due to lack of funds and
SANITAP/ MadAvance	High	Social Enterprise	Moderate – adequate to maintain and repair handpumps	No, but a local mechanics network is planned.	Carbon credits – potentially reliable	200 (planned by late 2024)	Current starting up and anticipated to be active by mid to late 2024
International NGO	High	Non for profit	Moderate – adequate to maintain and repair handpumps	Commune level	International funding	Unknown, estimated at <100	High

TARIFF RECOVERY POTENTIAL

FINANCIAL ANALYSIS: MANUAL PUMP EQUIPPED BOREHOLE VERSUS SOLAR POWER EQUIPPED BOREHOLE

We have undertaken a basic financial analysis to estimate the approximate annual break-even point for the two main water supply systems across the Grand Sud: 1) boreholes installed with a handpump and 2) boreholes installed with a solar pump and connected to a mini network (MUS). The break-even point represents the level of sales the water provider needs to achieve over a given period to reach financial equilibrium, i.e., balance its revenues with its expenses. Below the break-even point, the company is loss-making. Above the break-even point, the company is profitable. Although highly approximative, our analysis is considered sufficiently accurate to help identify potential gaps in the cost recovery models.

The calculations use data collected throughout our study and recent MUS operational costs specifically provided by the private operator Ny Ravo for this exercise. The methodology, calculations, and assumptions are presented in Annex 6 in the Supplemental Information (SI) Materials. (We highlight one important assumption here: we estimate costs based on either a single solar pump or a single handpump supplying 500 users, which means in turn that we assume equivalent O&M costs for communities of 42 households and 100 households in Figure 2.) The break-even point seeks an equilibrium price covering operating costs (OPEX) and renewal and maintenance costs (CAPMANEX). It does not include cost recovery for initial capital expenditure (CAPEX), considering that infrastructure rehabilitation is financed by public authorities and donors, not private operators. The analysis suggests:

- For handpumps, the average breakeven point is approximately 7.8 million MGA or US$1,800 USD per year, equating to a required turnover of approximately US$5 of daily sales revenue.
- The breakeven point for solar-powered pumps is over double that of handpumps, approximately 18.5 million MGA or US$4,260 per year, equating to a required turnover of approximately $12 of daily sales revenue.

Adopting a break-even approach increases the required water price as the number of users declines. As illustrated in Figure 2, the necessary tariff ranges from a minimum of 50 MGA (US$0.01) /20L for a handpump in a village with 1260 users (300 households) to a maximum of 620 MGA (US$0.14) /20L in a village with 175 users (42 households).

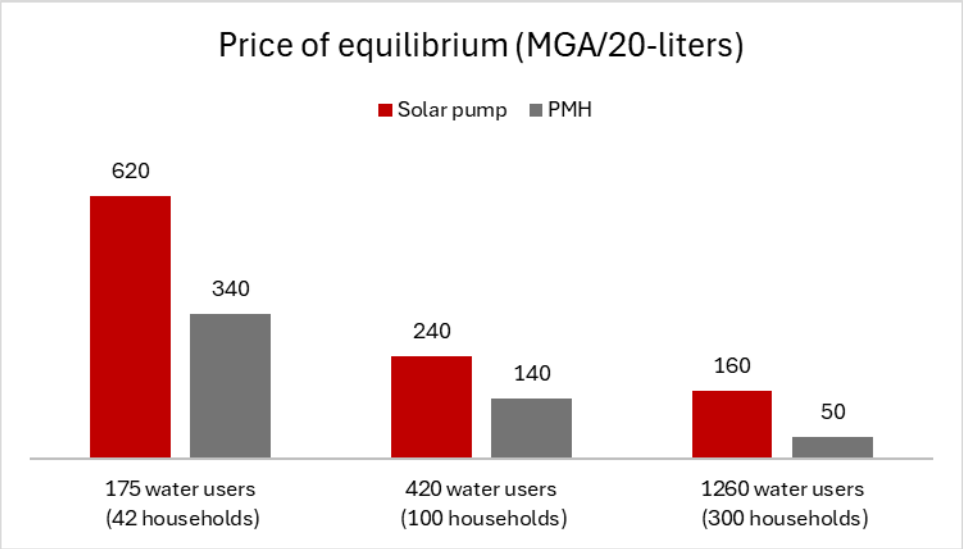

Figure 2 Water price to achieve OPEX equilibrium for different village sizes

WATER USERS' WILLINGNESS AND ABILITY TO PAY

Given that most village populations across the AOI have less than 1,000 individuals, our analysis indicates that the MEAH-recommended water price of 100 MGA (US$0.02 /20L (5,000 MGA/ m^3) is insufficient for private operators to cover their costs via full tariff recovery.

Without local data regarding water users' willingness and ability to pay for water, we have assumed a water affordability threshold of 4% of total household income based on work undertaken by Smets (2008). Although this approach is approximate, it offers an indicative requirement for subsidy. Our analysis (as detailed in Annex 4) indicates:

- Handpump systems appear financially sustainable for villages with more than 100 households for Androy and Anosy. For smaller villages, we estimate that an annual subsidy of on the order of US$900 would be necessary.
- Financial support to cover the cost of operations and maintenance for all community sizes (up to 1,260 users or 300 households) will be necessary for solar pump systems in Androy. This financial support ranges from US$450 per year per system for villages with more than 300 households in Androy, to approximately US$2,500 per year per system for very small villages (42 households) in both regions.
- In Anosy, villages with more than 300 households (1,260 users) could be expected to cover the OPEX of a solar-powered borehole system.
- The majority of operational costs are overheads, transport to sites, and a sufficient margin to allow reinvestment into the infrastructure. Spare parts costs are likely under 30% of the total.

These estimates indicate that potential significant financial support is required to subsidize private operators so that they can deliver professional management and maintenance services to the upgraded systems.

WATER SUPPLY GOVERNANCE

INSTITUTIONAL CONTEXT

In Madagascar, delegated drinking water infrastructure management is generally based on leasing contracts ("contrats d'affermage"). The only existing concession contract is with Jirama in urban areas.

For the *affermage* contract, the Madagascar Water Code stipulates that the commune is the contracting authority and owner of the water supply infrastructure, responsible for asset management and monitoring. However, to be authorized to act as the contracting authority, communes need to meet minimum technical capacity levels. MEAH assesses this technical level. Where communes cannot demonstrate adequate technical capacity, the Water Code stipulates that the role of the project owner reverts to the MEAH. No commune in Madagascar has ever received authorization to be a project owner since the introduction of this Water Law in 1999. As such, the delegated contracting authority across the AOI remains MEAH, represented at the regional level by DREAH.

This institutional arrangement means that DREAH, in partnership with commune authorities, is responsible for approving and overseeing the construction and rehabilitation of water points. MEAH's current national policy promotes public-private partnerships through *manage-only* or *invest-build-manage* leasing *affermage* contracts.

THE REALITY ACROSS RURAL ZONES OF THE AOI

MEAH actively encourages the upgrade of existing boreholes equipped with manual pumps to solar-powered motorized pumps. This upgrade is being actively implemented at scale (676 in total in the AOI) by the World Bank via its Project Mionjo, with ADB is planning up to an additional 100 upgrades in Androy, as further detailed in the following section. Project Mionjo is planning to delegate operational responsibilities for the upgraded/rehabilitated water supplies to private operators (World Bank 2020). ADB has not stated its intentions for management of the 100 upgrades it plans. However, it is currently tendering for a study to evaluate the feasibility of private operator management for the project, so it will likely also rely on private management.

Through KIIs with representatives of Project Mionjo and private operators, we understand that the long-term management of these upgraded systems will be delegated to private operators either under manage-only ***affermage*** contracts (as has been the case to date) or ***manage–invest–construction contracts*** in the future. The private operators are to be selected through an open tender process administered by the MEAH. The private operator contracts are three-party agreements among the operator, the commune, and the MEAH.

We identified the following specific challenges through our KIIs with the DREAH and communes:

- There is a widespread uncertainty about the roles and responsibilities among communes, private operators, and the DREAH. We have not seen the content of the ***affermage*** contracts being used by Project Mionjo, but commune leaders informed the technical team that they do not understand their contractual responsibilities.
- Although, according to the Water Code, DREAH is the designated responsible authority for system management, it lacks the financial and human resources and technical capacity to manage the current private operators and the anticipated significant expansion of upgraded systems across the AOI. Our DREAH KIIs highlighted that the local DREAH Androy office, for example, is limited to two technical staff.

- There is a significant communication disconnect between communes and private operators. This is partly due to a lack of a local private operator presence within communes, as well as by the fact that private operators command small budgets while under pressure from international actors to implement activities rapidly.
- High commune turnover (following a four-year mandate) makes it difficult to ensure continuity of services; mayoral changes result in staffing and political overhauls, including the preparation of replacement Commune Development Plans
- The commune-level STEAH is theoretically meant to bridge the commune–DREAH–private operator divides. In reality, STEAH lacks a meaningful presence across the AOI. STEAH staff (ATEAH), where present, were seen during the technical team visit to be highly motivated but lacking technical capacity and resources (finance, transport, tools, etc.).
- Communes and villages do not enforce MEAH's recommendation of a universal water tariff of 100 MGA/20L.

PARTNERS PROJECT IMPLEMENTATION AND ACTIVITY MAPPING

INTERNATIONAL ACTOR PROGRAMMING

Water security programming across the Grand Sud has attracted significant near-term (2024 to 2030) and long-term (2030 onwards) water supply infrastructure investments. Notably, this includes World Bank Project Mionjo, the African Development Bank, and, in the longer term, the Mandrare River World Bank dam construction project, as detailed in Table 5 and Figure 3.

We organized a donor and MEAH workshop on 25 April in Antananarivo to facilitate discussions on water security in the Grand Sud. These discussions highlighted genuine donor concerns and a strong appetite from all actors to improve water program coordination across the Grand Sud. Key workshop highlights were:

1. High motivation levels by all donors and government participants to improve operational WASH coordination (demonstrated by the high participation level – see the participant list in Annex 4 of the Supplemental Information (SI) materials).
2. Concern that no up-to-date MEAH Water Security Master Plan for the Grand Sud is available; this is essential to inform donor planning and coordination.
3. The need for a functional WASH coordination platform at the Antananarivo level. This platform must include a communication channel among local and regional actors and decision-makers. A WASH coordination platform was previously in place, but the MEAH disbanded it due to a perceived loss of political control.
4. The need for humanitarian and development actors to identify areas of convergence and work together to propose emergency responses that do not hinder development trajectories. Humanitarian response and development programs should be designed as a single package, with resilience as the objective.
5. The link between international actors' humanitarian and development activities needs to be improved (see the following section). The humanitarian WASH Cluster platform operates at regional levels, although it only activates during crisis periods and is reactive by nature.

RECENT HUMANITARIAN AND DEVELOPMENT NEXUS (HDN) COORDINATION EFFORTS

The effort to operationalize and document the HDN in the Grand Sud remains incomplete, as highlighted by the outputs from the 25 April Antananarivo donor workshop. While the challenge has evolved, its implementation in the Grand Sud remains problematic regarding international actor coordination and the challenge of linking humanitarian and development activities. The HDN approach across the Grand Sud has been discussed within the framework of the Restricted Dialogue and Cooperation Group (GDC) since the end of 2020 under the impetus of World Bank mapping with a global budget of 2.2 billion USD targeted for the region. The terms of reference of the technical group were validated in June 2021 by the GDC with a focus on the technical group's "Operationalization of the "Humanitarian - Development - Peace" Nexus in Madagascar's Grand Sud." USAID and the EU facilitated this with approximately 25 member representatives, including donors, UN agencies, bilateral agencies, and INGOs. The objectives are to ensure that all stakeholders (humanitarian and development actors and national and local authorities) have a common and shared understanding of the Humanitarian-Development-Peace Nexus for the Grand Sud and the steps to ensure its operationalization.

Although necessary to provide a high-level overview of development and humanitarian activities, this platform appears too broad to permit the required, focused, detailed discussions regarding water security programming and coordination across the Grand Sud.

USAID: INTERNAL DEVELOPMENT AND BHA PROGRAMMING

USAID BHA implements humanitarian activities across the Grand Sud to respond to famine and drought events. Since 2021, this includes the rapid rehabilitation of up to 40 boreholes by CRS installed with manual and solar pumps across Beloha district (Tranoroa commune), Tsihombe district (Antaritarika commune, Behazomanga commune). The management of the completed boreholes was conferred to the communities with technical support to be provided by FIFARAFIA. As of May 2024, at least 12 of the rehabilitated boreholes are non-functional.

Discussions with the USAID Bureau of Humanitarian Assistance (BHA) and WASH development team yielded the following key points regarding internal USAID programming:

- There is a disconnect between BHA humanitarian interventions and long-term WASH development activities. This includes different procedures, intervention periods, phasing, and programming mechanisms.
- The selection of BHA emergency intervention zones is based on the designation of IPC3+ zones, engagement with the MEAH, the need to maximize the population reached, and implementation partner considerations.
- USAID BHA lacks a formal framework to identify the intervention zones objectively.
- BHA is developing a new "graduation approach" with less emphasis on emergency crisis response.

USAID FUTURE PROGRAMMING ACROSS THE GRAND SUD: PROJECT RANO MANHARITRA

As summarized in Table 5 USAID is investing in the new Rano Manharitra project across the Grand Sud. The project was launched in May 2024 with a Madagascar-wide budget of US$ 35M. The project is planned for implementation across the following target areas:

- North Madagascar (Sofia, Betsiboka)
- South-East Madagascar (Vatovavy, Fitovinany, Atsimo-Astinanana

- South Madagascar (the Grand Sud) (Anosy, Androy)

The project remains in its early planning phases and includes the following components (as identified through a meeting between CARE and Hydroconseil on the 3 July 2024):

1. Institutional capacity building and sectoral coordination at all levels (supported by Water Aid)
    - Support for MEAH at the national level, coordination of interventions, and strategic planning.
    - Development of regional implementation mechanisms.
    - Communal support: support for communal project management, civil society, and accountability.
2. Increased financial resources to support the WASH sector (supported by Miarakap):
    - Support for access to financing.
    - Search for financing for impact investments, i.e. "made to generate a positive return, with a measurable social and environmental impact, while ensuring a financial return".
    - Preparation of business plans
3. Improving the range of WASH products and services:
4. Increased demand and use of WASH products and services
    - Utilization of services and behavioral change

USAID-FINANCED RELATED PROGRAMMING: RANO WASH

The Rural Access to New Opportunities in Water, Sanitation, and Hygiene (RANO WASH) project was a five-year US$30 M USAID project completed across six different regions of Madagascar: Vatovavy Fitovinany, Atsinanana, Alaotra Mangoro, Amoron'i Mania, Haute Matsiatra, and Vakinankaratra. The project was implemented from 2017 to 2022.

Although the Grand Sud context significantly differs from the RANO WASH implementing contexts, the lessons learned can be incorporated into future USAID programming. In particular, the RANO WASH strategic objective of "*Increasing the engagement of the private sector in the delivery of WASH services"* aligns with the identified needs across the Grand Sud. The RANO WASH evaluation report identified the program as one of the leaders in the sector, particularly for its work on private sector engagement in water supply and governance issues. Future programming should capitalize on USAID's and its implementing partners' experiences working with communes in the areas of governance and private sector engagement.

Table 5 Donor project overview across the Grand Sud

Donor	World Bank	World Bank	European Union	African Bank of Development	USAID
Project	Project MIONJO (implemented via UNICEF and local actors).	Mandrare River dam construction project	Green Deal	Mobilize, protect, and develop water resources and strengthen resilience to climate change.	Rano Manharitra
Project Components	Pipeline rehabilitation (Ampotaka Tsihombe) and works (Mandrare - Sampona) Upgrade of 606 existing boreholes into solar-powered MUS systems. In addition, 70 urgently upgraded locations are under the Contingency Emergency Response Component (CERC). Water supply management system evaluation study (planned for late 2024).	Large-scale dam and irrigation systems	Agriculture, Integrated Water Resources Management, and WASH	Dam construction, up to 100 borehole upgrades, a private sector feasibility study, environmental and social impact studies (ESIS)	1. Institutional capacity building 2. Increased financial resources to support the WASH sector 3. Improving the range of WASH products and services 4. Increased demand and use of WASH products and services
Budget	Phase 1 is US$200M, approximately 17M USD for the borehole upgrades.	Phase 1 US$250M, Phase 2 US$150M, Phase 3 US$100M	US$30M	Unknown	US$35M (across all target areas).
Timescale	Phase 1 – in progress and expected to continue through to 2025 (or 2026 if a proposed extension is confirmed)	Currently at the feasibility stage. 15-year project timescale envisaged	2024 - 2029	Unknown but expected to be rapid (within approximately three years)	Five years (2024 to 2029)

Geographical coverage	Borehole rehabilitation across the regions of Anosy, Androy and Atsimo Andrefana.	Androy Anosy par Mandrare	Androy and Anosy	Androy	• North Madagascar (Sofia, Betsiboka) • South-East Madagascar (Vatovavy, Fitovinany, Atsimo-Astinanana • Grand Sud (Anosy, Androy)

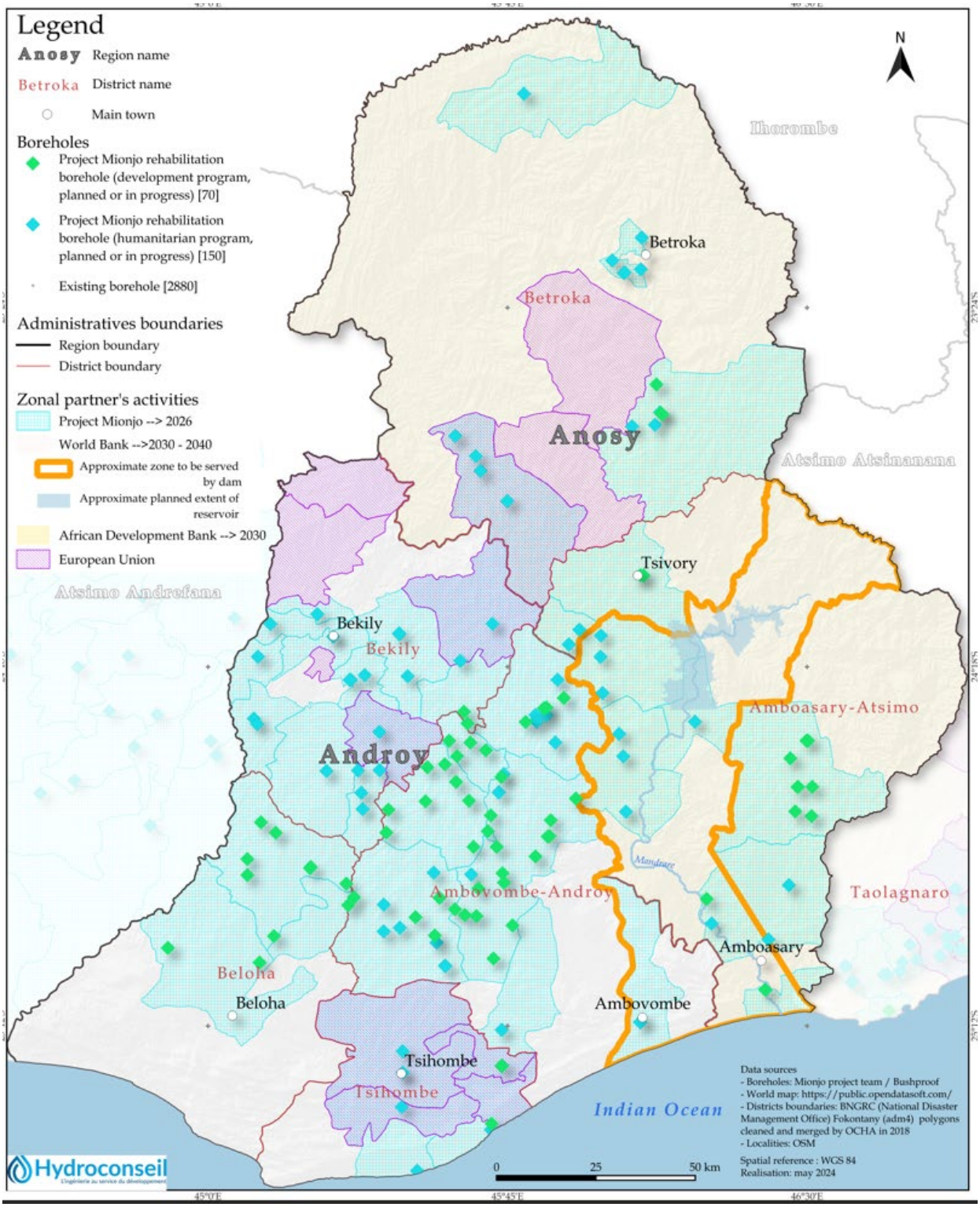

Figure 3 Partner activity mapping

GAP ANALYSIS

The World Bank's activities focus on rapid infrastructure implementation, with long-term water system management and institutional capacity building being a lower priority. The result is an urgent need to strengthen institutional capacities to meaningfully coordinate and regulate the rehabilitated systems. A detailed gap analysis is presented in Annex 7 of the Supplemental Information (SI) materials), and the following gaps are considered pertinent to future USAID programming across the AOI.

LACK OF RESPONSIBLE AUTHORITY; AN EFFECTIVELY UNREGULATED SYSTEM MANAGEMENT LANDSCAPE

The role of the DREAH and the communes is to manage assets and enforce the tripartite *affermage* contracts they sign with private operators for the upgraded systems. Given that these two institutions already lack the capacity to fulfill their institutional obligations, the continued increase in privately managed systems across the AOI places unrealistic demands on them.

We have identified specific operational issues, such as ongoing uncertainty regarding system repairs between commune and private operator roles and responsibilities. This results in under- and non-performing water supply systems that have only recently been rehabilitated. Review and improvement to the *affermage* contracts are necessary to clearly define the roles and responsibilities of the private operator, the commune, and the DREAH.

Affermage contract enforcement is complicated by commune-level politics, particularly the wholesale changes in officials and planning that occur when mayors change. The STEAH is largely absent across the AOI and, where present, was found to lack secure funding while offering extremely low technical capacity. Without additional support from the DREAH and communes, the rapid growth of privately operated systems is highly likely to result in high levels of underperforming and failing rehabilitated water supply infrastructure across the AOI.

INADEQUATE COMMUNITY READINESS FOR WIDE-RANGING WATER SYSTEM UPGRADES

The widespread upgrade of borehole handpumps to solar-powered pump systems will necessitate an equally widespread transition from primarily community-based and informal management to private operator-managed systems. The management system transformation imposes significant requirements on village-level individuals and local institutions (schools, health centers) water users; users previously accustomed to informal system management must adapt to formal payment requirements with limited advance notice.

The technical team determined that communities are often poorly informed before the system upgrades and that even commune leaders across multiple villages were unaware of the name of the private company now operating their upgraded system. The technical visit also established that recently installed solar MUS systems are experiencing problems at the village level related to insufficient payment for water and a lack of community engagement by private operators. This has resulted in at least two recently rehabilitated water supply MUS systems being indefinitely suspended by private operators due to insufficient community payment (including two schools and a health center). The study did not identify any entirely successful transitions from community-managed to private operator-managed systems. Private operators are, therefore, effectively suspending supplies to sections of the communities that previously relied on cheaper manual pump borehole supplies. The ongoing rapid system upgrades can be expected to increase the frequency of such problems.

WATER SYSTEM FINANCIAL SUSTAINABILITY

Our financial analysis has identified significant potential gaps in the sustainability of rehabilitated infrastructure, particularly for boreholes equipped with solar-powered pumps. This is mainly due to the highly dispersed and low water user numbers across the AOI. Private operators have indicated through KIIs that they hope to overcome these challenges by vastly increasing the number of systems they manage in order to benefit from economies of scale. The necessary critical mass is unknown, and it is far from certain that any private operators can achieve it.

Further detailed analysis will be required, but current findings suggest that significant financial assistance is likely to be required to ensure the long-term sustainability of the rehabilitated supply systems, particularly across Androy.

WELL-INTENTIONED BUT INEFFECTIVE EXISTING COORDINATION MECHANISMS

The existing HDP Nexus coordination platform lacks the detailed engagement to meaningfully map and harmonize international partner water supply activities across the Grand Sud. Although the regional WASH Cluster mechanism is activated during crisis periods, a significant gap exists in ongoing and long-term detailed water security coordination. This was observed in at least one location visited by the technical team where humanitarian water supply interventions had been undertaken at the same location by USAID and the FAO. This gap was openly raised through discussions in the April 2024 Antananarivo Donor and MEAH Workshop.

The lack of an updated Grand Sud Water Supply Master Plan was cited during these donor discussions as a significant gap. This plan is essential to inform and assist donors (with the MEAH) in objectively and strategically planning water supply infrastructure investments.

At an institutional level, internal USAID coordination between long-term development activities and BHA interventions is largely absent. This discordance currently prevents short-term humanitarian WASH interventions benefiting from long-term WASH resilience activities that could improve the resilience of communities targeted by the humanitarian activities.

PRELIMINARY RECOMMENDATIONS

In the context of Project Mionjo's ambitious effort to rehabilitate and upgrade nearly 800 rural water supply systems, strengthening the ability of service providers to professionally operate and maintain those facilities should be a central programming priority. In parallel, we emphasize the importance of government institutions being well-positioned to support and regulate these providers, including the contractual arrangements that delegate responsibilities for water services provision.

All such efforts will require close coordination among the MEAH and other ministries (including Agriculture, Health, and Land Management), Project MIONJO, the EU and other bilateral and multilateral institutions, and other actors. Ensuring alignment with planned infrastructure implementation is essential for program coherence, resilience, and sustainability. WASH development programming must also be well coordinated with BHA and nutritional programming to maximize intervention targeting effectiveness and avoid duplication.

Domain	Illustrative Programming Ideas for Further Refinement with USAID
Strengthen Institutional Capacity Bolster the capacity of government institutions to support, oversee and regulate service providers.	1. Work with national authorities (MEAH) and regional authorities (DREAHs) to put in place legal, regulatory, and policy measures that will allow proper support and oversight of both the development and execution of *affermage* contracts private operators. 2. National level: consider secondment of senior technical WASH personnel to MEAH to support the development of a Water Supply Master Plan. 3. Support the DREAH and communes (via the Technical Services for Water, Sanitation, and Hygiene – STEAH) to engage in the anticipated transition from community-managed to private operator-managed systems across the AOI.
Set up providers for success Bolster the capacity of government institutions to support, oversee and regulate service providers.	4. Work with contracting authorities above to fashion *affermage* contracts that are fit-for-purpose and enforceable 5. Offer support potential *affermage* holders to understand the financial viability of their contracts and implement measures to manage risk 6. Establish a results-based financial support mechanism for private operators to satisfy contractual obligations for service delivery.
Coordinate Key Actors	7. Support national authorities to re-activate national and regional WASH coordination platforms. 8. Execute an internal review of USAID programming to identify opportunities for internal NEXUS collaboration.

REFERENCES

Smets, Henri. 2008. "De L'eau Potable à Un Prix Abordable: La Pratique Des États." Académie de l'Eau.

Van Koppen, Barbara, and Stef Smits. 2010. "Multiple-Use Water Services: Climbing the Water Ladder." ***Waterlines*** 29 (1): 5–20.

World Bank. 2020. "Project Appraisal Document on a Proposed Grant in the Amount of SDR 70.9 Million to the Republic of Madagascar for a Support for Resilient Livelihoods in the South of Madagascar - Project (MIONJO)." The World Bank.