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CATHOLIC RELIEF SERVICES

Partnership & Capacity Strengthening

LEARNING BRIEF

What to Consider When Establishing a Strong Private and Public Partnership in Water Access and Management

"RANO HP IS THE LARGEST WASH PROJECT EVER FINANCED BY USAID IN MADAGASCAR. IT IS OUR FLAGSHIP PROJECT IN THE SECTOR FOR WHICH WE ARE PROUD. ITS INNOVATIVE APPROACHES TO SUSTAINABLY INCREASING ACCESS TO SAFE WATER SUPPLY AND SANITATION HAVE BEEN RECOGNIZED IN MADAGASCAR AS WELL AS INTERNATIONALLY."

—FROM THE SPEECH BY RUDOLPH THOMAS, USAID MISSION DIRECTOR, RANO HP CLOSING CEREMONY

INTRODUCTION

Catholic Relief Services led the implementation of Madagascar's Rural Access to New Opportunities for Health and Prosperity (RANO HamPivoatra or RANO HP) and Rural Access to New Opportunities for Health and Water Management (RANOn'ala) projects between October 2009 and September 2013 (see box below). Funded by the U.S. Agency International Development, both projects improved access to reliable and safe water and sanitation services in targeted areas, in part through the establishment of public-private partnerships (PPPs). Using private funds, CRS has continued to monitor these partnerships. While not without challenges, about 90 percent of the systems are still functioning at the time of writing — two years after the end of project funding.

MADAGASCAR'S RANO PROJECTS		
Full name	Rural Access to New Opportunities for Health and Prosperity *(RANO HamPivoatra)*	Rural Access to New Opportunities for Health and Water Management *(RANOn'ala)*
Goal	Rural communities in Madagascar have broad access to reliable and economically sustainable water and sanitation services for health, security, and prosperity.	Vulnerable and poor communities in targeted districts have access to assured, economically viable, and safe water and sanitation services for improved health and water resource management.
Dates	October 2009 to June 2013	October 2010 to September 2013
Consortium members	• CARE • Caritas Nationale Madagascar • Voahary Salama (Malagasy NGO network) • BushProof and Sandandrano (private WASH enterprises)	• Conservation International • RTI International • Caritas Fénérive-Est (implementing for Caritas Nationale Madagascar)

CRS is confident that the achievements made and lessons learned from Madagascar's RANO PPPs can inform PPP design and implementation in other countries and sectors. To this end, CRS Madagascar and the Agency's Water, Environment, and Sanitation (WES) and Partnership and Capacity Strengthening (PCS) units joined forces in July 2015 to research and develop two documents, both relying heavily on Madagascar/RANO WASH examples, but designed to be applicable in other countries and/or sectors:

- A “Guidance” handbook providing a stepwise approach to designing and implementing WASH PPPs.
- This paper, *What to Consider When Establishing a Strong Private and Public Partnership in Water Access and Management*

The primary target audience of this learning paper is CRS internal staff, including technical and business development staff designing new programs which include PPPs, and those seeking to incorporate PPPs into existing projects. The authors also intend to help position CRS as a leader in PPPs, targeting donors and current and potential partners.

Strategies that were effective in Madagascar may need to be adapted in order to be used in different contexts. Challenges faced by the RANO projects did not always have obvious solutions. In the interest of continually improving CRS’ project implementation, the researchers worked to distill RANO’s achievements and limitations. These considerations are intended as just that — points to reflect on while developing or implementing PPPs.

Community members from Anovorano Est share their experiences with the RANO PPP. Photo by Chris Seremet/CRS.

BACKGROUND

RANO HP AND RANON’ALA

The RANO projects employed PPP business models to increase the sustainability of water supply infrastructure in rural Madagascar and to protect project investments. RANO HP and RANOn’ala supported the establishment of lease contracts between communes and private-sector water supply system managers, and introduced an invest-operate model in which private enterprises invested in modernizing or rehabilitating existing water supply systems in exchange for longer-term supply management contracts (20 years, rather than 10 years typical in the lease contracts).

SELECT ACHIEVEMENTS FROM MADAGASCAR'S RANO PROJECTS[1]	
RANO HAMPIVOATRA	*RANON'ALA*
• 352,785 people (cumulative) have been reached • 63,325 people have been provided with sustainable access to water from an improved source • 1,001 water connections were constructed and/or rehabilitated by the private sector • 97,685 people are using latrines constructed by households/communities without subsidies • 241 villages have been certified as Open Defecation Free • 26 communes have been established Community Water & Sanitation Business Plans (CWSBPs)	• 81,620 people were provided with sustainable access to water from an improved source • 10 functioning gravity-fed water supply systems were constructed or rehabilitated • 239 functioning boreholes with hand-pumps were constructed or rehabilitated • 10 communes established CWSBPs • 17,858 households are using latrines constructed by households/communities without subsidies • 105 villages have been noted as Open Defecation Free • Two sani-markets have been created and 30 masons/carpenters were trained • 38% of households now participate in water resources protection

WHAT IS A PUBLIC-PRIVATE PARTNERSHIP?

Public-private partnerships, or PPPs, are collaborations between public institutions, such as government bodies, and private-sector enterprises in pursuit of a common or complementary goal. The collaboration aspect of a PPP differentiates it from a vendor relationship in which a business provides the state with goods or services. Similarly, a PPP is not wholesale privatization; details vary with context, but governments frequently set and enforce standards, for example, of quality, price, and coverage.

USAID broadly defines a public-private partnership as "a USAID-supported development project or initiative that engages the private sector (including corporations, foundations, and other non-governmental actors) as a core resource partner."[i]

In terms of sustainable water service delivery, the World Bank describes PPPs —specifically the public delegation of "operations and maintenance, or maintenance only, to the private sector through formal contracts and performance agreements"— as an alternative to community water management models.[ii]

Only two actors are referenced in the phrase "public-private partnership," yet the populations served by the partnership are also critical actors. In a development context, implementing nongovernmental organizations — arguably international NGOs (INGOs) in particular — and donors are also important to the success of PPPs. This paper discusses each of these stakeholders.

1 Details about the projects' achievements, logical frameworks, and implementation mechanisms are available in the final technical reports submitted by CRS to USAID: Project Completion Report: RANO HP Water for Progress, Madagascar (http://pdf.usaid.gov/pdf_docs/PA00JN71.pdf) and Project Completion Report: RANOn'ala Madagascar (http://pdf.usaid.gov/pdf_docs/PA00JPWX.pdf).

"THERE USED TO BE A PUMP BEFORE RANO HP AND PEOPLE WERE HAPPY BECAUSE THERE WAS A PERIOD THAT IT WORKED WELL. AS TIME WENT BY THE PUMP WAS BROKEN AND THERE WAS NO SAFE DRINKING WATER ANY MORE. WHEN THE PROJECT CAME, OF COURSE YOU HAVE TO PAY, BUT THE GOOD THING IS THAT IT'S WELL MAINTAINED AND YOU CAN BE SURE TO GET WATER EVERY DAY."

—JOCELYNNE, FEMALE FOCUS GROUP PARTICIPANT, ANAVARANO EST

CHARACTERISTICS OF PUBLIC-PRIVATE PARTNERSHIPS

Private enterprises frequently thrive even in depressed economies, and respond to market forces more nimbly than large government bureaucracies. When a government lacks capacity or other resources to provide full access to an essential public good or service, for-profit organizations can potentially complement government efforts.

Through extensive interviews, field visits, and desk research conducted in July and August 2015, it became apparent that a successful PPP should:

- Serve customers/beneficiaries reliably, fairly, and affordably with a good quality product or service.
- Comply with international standards and public requirements, complementing existing public systems rather than undermining the government's role as a steward of resources or creating redundancies.
- Be profitable enough to incentivize private enterprise, enabling re-investment, expansion, and medium- and long-term sustainability.

A private water supply manager discusses expansion plans with a CRS staff member. Photo by Rebecca J. Bennett for CRS.

FACTORS FOR SUCCESS

In developing PPPs, CRS is guided by the principles of subsidiarity and working for the common good, and is committed to the tenet of shared value (see box). A PPP requires collaboration among private enterprise, government bodies, and targeted communities to address a common challenge. The outputs and outcomes of a PPP should benefit all parties fairly.

ILLUSTRATIVE PPP SHARED VALUE		
Public Sector	**Private Sector**	**Population**
Improved system ensuring minimum quality standards, monitoring, taxes for funding the Ministry	New or expanded market/customers, increased profit	Improved quality and quantity, equitable access, reliability, and/or sustainability of essential goods or services

"[PPP] IS A GOOD APPROACH BECAUSE IT ALLOWS EVEN RELATIVELY SMALL ENTERPRISES TO WORK WITH PUBLIC INSTITUTIONS LIKE COMMUNES."

— JACINTO SANTOS, OWNER AND MANAGER OF VARANGA WATER SUPPLY MANAGEMENT, IMORNA, MADAGASCAR

In the Madagascar WASH context, political will, size and geographic location of the target population, latent demand for the service or product, and technical and financial support from donors were important factors for the success of the RANO projects.[iii] Logically, political will and profitability (one key consequence of size, location, and demand factors) are prerequisites to any PPP. The role played by donors may vary and is discussed on page 7.

DISCUSSION

CRS believes that the PPP model employed in the RANO projects could be replicated and sustained in other countries and sectors. Key factors for implementers to consider in project design and execution fall into three major categories, which are used to organize the *Discussion* section of this paper:

- Enabling environment
- Roles, functions, and organizational and technical capacity of major actors
- Profitability-affordability threshold

ENABLING ENVIRONMENT

The success of any PPP is dependent on how well the partnership responds to its operating context. Partnership design should reflect both *de jure* policies and structures, and *de facto* processes. In some cases, an implementer might have the time, funding, or mandate to advocate for a more supportive "to be" environment (e.g., policy change to make a process more efficient), but more often, a project will need to adapt to function more effectively within the current "as is" environment.

PUBLIC SECTOR/GOVERNMENT

CONSIDERATION: Implementers should consider the multiple levels and sectors of government that are likely to affect a PPP. Different government agencies and levels may have — by law or by precedent — authority for matters ranging from establishing or enforcing minimum quality standards to issuing construction permits to organizing community outreach campaigns. A country's public sector may also own some (or all) of the infrastructure leveraged in a PPP.

Malagasy communes own their water sources, making mayors and communities relevant partners in RANO's water system development, but a project seeking to expand the reach of an existing system might need to work with JIRAMA, the nationally managed public water utility.

In Madagascar, commune mayors (local executives) were essential to selecting and engaging private water supply managers, and are the day-to-day counterparts to private enterprise; however, by law, the national Ministry of Water is the only authority that can validate commune-level contracts related to water. The Ministry of Water also sets national water quality standards, to be enforced by regional water directors (*DirEau*) and amended only through legislation (central administrative government).

PRIVATE ENTERPRISE/BUSINESS

CONSIDERATION: When considering the enabling environment for a PPP, implementers should determine if businesses exist that currently perform — or could adapt to perform — the sought-after function.

In the case of the RANO projects, that function was water supply management. To identify potential partners, the RANO projects issued a national call for expressions of interest for water supply management in targeted regions. Qualified respondents formed a subsequent short list of businesses that the projects later invited to submit quotes.

CONSIDERATION: Prospective businesses (to be selected through a fair, open, and competitive selection process) should work in or near the targeted geographic areas, currently serve a function similar to the service, and/or be familiar with the industry/sector. Projects can help develop some organizational systems or technical knowledge (see page 9), but reasonably well-established private-sector partners are prerequisite to success.

CONSIDERATION: These private-sector partners also require varying degrees of access to financial capital, be it through donor mechanisms (e.g., USAID's Development Credit Authority, or DCA), the private banking sector, or outside investors (e.g., "Impact Investing"). WASH is not yet considered a profitable venture in Madagascar. Given the country's troubled economy, the availability of non-donor funds has been limited.

POPULATION: COMMUNITY AND CIVIL SOCIETY

CONSIDERATION: Much has been written on creating demand for and changing household behavior with regards to products or services that can improve well-being (e.g., hand-washing, early childhood education, or use of mosquito nets). Formative research should include baseline information about a target population's knowledge, attitudes, practices, and resources with regards to the planned intervention. When analyzing the enabling environment (see p. 5), implementers should consider if other community health initiatives might be operating in the target areas with complementary messages or media. Implementers can explore leveraging the efforts of other groups, and should try to avoid unnecessarily duplicating efforts.

During the RANO projects, client sensitization included information about PPPs and behavior change campaigns around the importance of properly handling clean water and maintaining hygienic yards and households.

CONSIDERATION: Because profitability is a key concern (see page 17), implementers should also assess affordability and the population's willingness to pay for the service/product.

Generally, even very poor households can and will pay for WASH services,[iv] particularly if they see value and trust in the provision of those services.[iii] The establishment of savings and internal lending communities (SILC) or partnerships with microfinance institutions (MFIs) can help households access funds, particularly for initial investments or repairs. Timeliness of payments may vary[vi] but billing tactics such as allowing installment payments or pre-payment during high cash flow periods (e.g., harvest time)[iii] can increase the likelihood full remuneration.

DONORS AND IMPLEMENTERS

CONSIDERATION: Because community-level economic development is often multi-sectoral by nature, most PPPs will affect and be affected by sectors other than the one in which they focus. For example, the water and sanitation sector often overlaps with health and nutrition, environmental management, or education. In order to maximize social benefits and reduce social costs, ongoing coordination among donors and implementers is essential.

ROLES, FUNCTIONS, AND CAPACITIES

CONSIDERATION: The roles and functions of different PPP actors are often evolving and informed by the levels of capacity that each actor has to contribute to the PPP. As noted, stakeholders must recognize that the legislative or policy environment in a country/sector might differ from the actual operating conditions, and successful partnerships will consider both in their design and implementation approaches.

Overview of Typical Roles/Functions of Different Public-Private Partnership Actors

Public sector	At the national level, public-sector partners frequently set and enforce legal and regulatory frameworks. Provincial level government is more likely to be involved in policy enforcement while local government bodies provide technical support and are best-placed to interact with private partners and/or communities on a day-to-day basis.
Private enterprise	Private enterprises provide a service or product for a fee, in collaboration with public institutions. The fee serves to maintain the service and for profits to support increasing the level of service. This complements government efforts to provide a public good.ation services for health, security, and prosperity.
Community and civil society	Civil society and the citizens it represents are invaluable to awareness raising and promotion of PPP governance (including monitoring for accountability) at local levels. They might work in concert with the government representatives from any number of relevant ministries and/or INGO partners, and may play a role in selecting the private enterprise.
Donors and INGOs	Donors are well placed to contribute initial investment and coordinate with other donors, various funding sources, and government representatives. Donors may also contribute to technical support for implementation directly or through implementing partners. INGOs and other implementing partners typically act on behalf donors facilitating formation of PPPs and relationships among stakeholders. These partners offer technical support, expertise, and innovations in operating PPPs, and can lead implementation of adequate and adaptable capacity strengthening initiatives for various stakeholders.

PUBLIC SECTOR/GOVERNMENT

CONSIDERATION: The potential role of government in a PPP varies significantly by country, sector, and level of government (i.e., national ministries versus regional agency offices or local communes). At a minimum, a country's national government should:

- Provide legal and policy frameworks (e.g., quality standards, contractual authority, tax regulations, and procurement authority)
- Enforce (or delegate enforcement authorities for) compliance with those laws, policies, and standards
- Help coordinate among different donors and implementers to avoid redundancies and omissions
- Work within the PPP to ensure that there is a model that addresses the needs of the most vulnerable (e.g., less-expensive and/or subsidized social connections that serve four or five households instead of only one).

In the absence of national policy frameworks, bodies such as the WHO or UN agencies offer international standards and guidance that implementers can adapt to a particular context. To the greatest extent possible, relevant government bodies should be engaged in this process so that PPPs do not undermine or replicate public-sector functions or inadvertently encourage "burden shedding" by public-sector institutions.

As mentioned in the *Enabling Environment* section, more than one ministry or other government body might have jurisdiction over different aspects of a PPP; implementers should explore how to address overlapping and potentially conflicting mandates and authorities in initial assessments and stakeholder mapping exercises.

A strong, functional government with experience engaging the private sector may require minimal technical assistance to launch a successful PPP. In low- and middle-income countries, it is more likely that a partnership will have to identify and address public-sector gaps in funding and capacity. While governed by national-level mandates and funding, sub-national actors working closer to communities are more likely to be deeply involved with PPP contracts than their national counterparts.

THE CHALLENGE OF CENTRALIZATION

The RANO projects provided commune-level committees (comprised of community and public-sector representatives) with technical support to issue an open, competitive call for bids and to select water supply managers through a fair and transparent process. Each commune then entered into a six-month trial period with the selected vendors. Agreements complied with nationally issued price ceilings and water quality standards, and reflected each commune's nationally sanctioned ownership of its water sources. Despite this decentralized process, only the national Ministry of Water can validate long-term water-related contracts with private enterprise. This requirement frequently delayed contract finalization (in at least one case, by more than a year), exasperating commune-level stakeholders. During much of RANO's implementation period, U.S. economic sanctions against Madagascar also severely limited the project's support to government bodies, making coordination and consensus-building difficult.

"THE PROCESS OF TALKING AND RESOLVING WHAT WAS INCLUDED IN THE CONTRACT REALLY TOOK TIME. ... BUT THE BENEFICIARIES—I MEAN, PEOPLE NEED WATER EVERY DAY! SO WHAT DO THEY DO?"

—RADO ANDRIANTATIANA RASOANAIVO, DIRECTOR OF ENTERPRISE VELO, MADAGASCAR

Interviewees in both public and private sectors at all levels expressed frustration with Madagascar's centralized contractual authority. Since commune leadership, private partners, and water customers had already invested a great deal of time and effort in the PPP, they continued to operate under informal agreements in which all parties honored the terms of the pending contract. The informal agreements sometimes varied from the pending formal agreements during these interim periods. For example, the commune of Mananara agreed with the private water supply manager (EGK3S) to continue service delivery but postpone payment of fees to the commune until the contract is validated.

STRUGGLES OF UNDER-RESOURCED PUBLIC PARTNERS

According to Madagascar policy, regional Ministry of Water offices (led by the *DirEau*) are the most-local offices. The *DirEau* is responsible for supporting access to water and sanitation, providing technical assistance and ensuring water quality at the commune level. Some *DirEau* offices have qualified staff (e.g., engineers) with sufficient capacity to perform these functions, but the offices typically are grossly underfunded, lacking the resources even to buy fuel for a site visit in their jurisdiction. This reflects both funding priorities within the ministry and Madagascar's weak economy overall.

CRS has used private agency funds to monitor water supplies in RANO sites, providing on-the-spot technical assistance, helping repair equipment, and troubleshooting problems. While helpful and generally well received, this is a poor substitute for regular quality assurance. Furthermore, the Agency does not have any legal or contractual enforcement authority (contracts are between the government and the private enterprise; RANO consortium members were only facilitators.) Implementers must be realistic about existing quality assurance resources (financial and technical) and explicit in designing and funding quality assurance functions.

PRIVATE ENTERPRISE/BUSINESS

CONSIDERATIONS: In a PPP, a private enterprise's role is to fill a predetermined gap in the delivery of a public good or service. Locally owned and operated private enterprises are typically part of the communities they serve and, when viable, are more likely to continue operating beyond the end of donor financial support.

The RANO projects offered standalone water supply management facilities (referred to these as *monoblocs* and providing multiple services such as laundry, toilets, and showers). This was a new service in Madagascar, but several water system construction businesses saw an opportunity to expand their portfolio. Their experiences building water systems were relevant (e.g., to system maintenance and repairs that are the responsibility of water supply managers) and they knew firsthand the realities of working in Madagascar.

A well-tended *monobloc* operated by one of the RANO private enterprise partners. (This site is not affiliated with the RANO projects.) Photo by Rebecca J. Bennett

Sandandrano is a private Malagasy company specializing in the construction and management of rural water supply and sanitation infrastructure. Their business model is based on providing modern water supply and public sanitation services in medium to high population density areas that remain underserved, and largely monopolized.

Founded in 2004 by several emergency aid and development professionals, **BushProof Madagascar** is registered in the U.K. and Madagascar (where it implements the bulk of its activities). BushProof designs WASH products, provides training and consultancies, and works to create innovative, low-cost opportunities for rural communities to have access to water and sanitation.

DIFFERENT PRIVATE ENTERPRISES FOR DIFFERENT FUNCTIONS

The RANO projects engaged private enterprises to conduct feasibility assessments of engineering and profitability issues and to build or rehabilitate water infrastructure in targeted communes. By design, these activities occurred concurrently with the solicitation for and selection of private water supply management firms for the PPP. This division of labor increased the potential pool of private enterprises engaged in the overall process (because one business did not need to be skilled in all three areas) and helped the project meet its schedule.

RANO HP required a 12-month warranty from the private enterprises that built/rehabilitated water infrastructures, but the terms of those warranties were not well defined or understood. Clarity among the construction companies, water supply managers, and communes is vital.

Each private enterprise representative interviewed in 2015 noted that the feasibility assessments of their areas were at least somewhat inaccurate (a point supported by *Public-Private Partnerships and Water: Theoretical and Practical Considerations*[v]) because the assessors lacked sufficient information about variables and/or an incentive to accurately determine system operating costs and profitability. It is important to note that this model had no precedent in Madagascar, so such precision might have eluded any company conducting feasibility assessments.

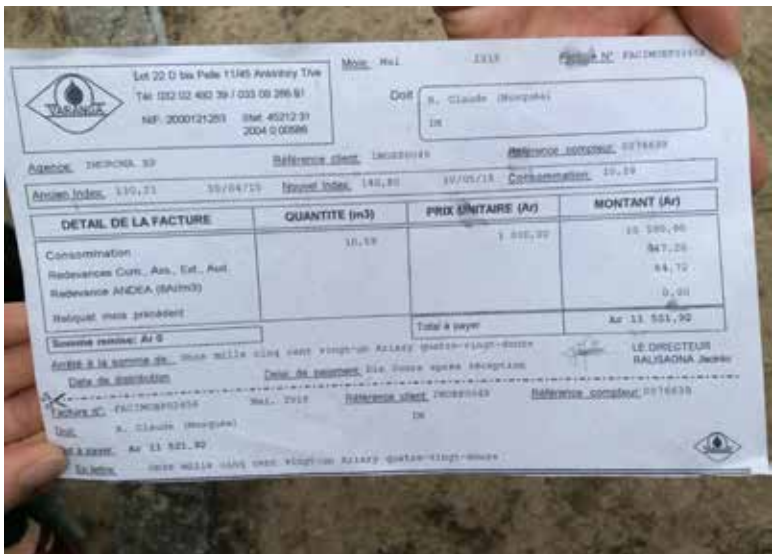
Similarly, water supply managers interviewed for this paper noted a learning curve associated with maintaining a system they did not help to build. The infrastructure partners worked with the eventual water supply managers to orient managers to the system — in one case even developing an apprenticeship of sorts. Partner capacity (existing and sustained) is of prime importance in a PPP, and such apprenticeships wholly align with CRS' commitment to accompaniment (see box).

The owner and manager of a water supply management firm that worked with RANO shares his experiences working in the community during the project and since the project ended. Photo by Alberto Andretta

One of three primary components of CRS' model of local capacity strengthening, **accompaniment** combines consistent coaching and individualized mentoring to individuals and teams after interventions such as workshops, organization design, or on-the-job training.

NEW SKILLS AND FUNCTIONS

Even a well-established business might need to acquire or hone new skills to perform their scope of work in a PPP. For example, most of the companies engaged as water supply managers via RANO projects had to establish new systems for regularly billing clients according to regular meter readings. RANO provided technical and financial support to these companies to purchase and master the use of billing software, develop procedures for regularly reading water meters at each connection, bill clients accordingly (in clear, easy-to-understand formats), and develop systems for tracking even partial payments of those bills.



Tracking the water consumed at each supply point and billing clients accordingly was an important innovation made possible by RANO support to private enterprises. Photo by Alberto Andretta

Other skills and functions required of a business in a PPP might include quality monitoring of the good/service, budgeting or amortization for major investments, and supply chain management for essential inputs to the good/service.

POPULATION: COMMUNITY AND CIVIL SOCIETY

CONSIDERATION: Community members are the ultimate beneficiaries — and the primary client — in a public-private partnership, but PPP stakeholders should appreciate that citizens have a role to play beyond "consumer" in the partnership, and consider if those citizens have the willingness, skills, and or resources to do so. Civil society also can be useful in raising public awareness and engaging citizens to hold public and private actors accountable for good governance and high performance. Civil society organizations (CSOs) have the potential be an invaluable catalyst in PPPs by driving accountability of government, private enterprise, and even citizens, and by engaging communities served by the partnership.

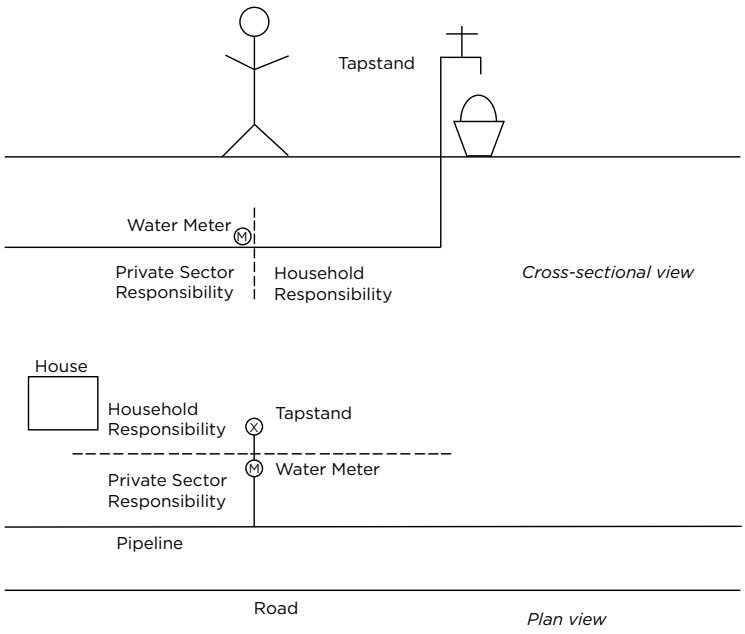
CITIZENS AS MORE THAN CUSTOMERS

RANO water supply management contracts in Madagascar hold the private enterprise responsible for maintaining an improved water source and the water distribution pipes to each individual meter, and community hand pumps. The client or clients are responsible for any pipe or tap stand extending beyond that meter (see figure A).

"THE VALUE OF HAVING WATER, AS A WOMAN, AS A MOTHER, I SEE WATER AS VERY IMPORTANT TO THE HEALTH OF THE FAMILY"

—MONIQUE, FEMALE FOCUS GROUP PARTICIPANT AND FORMER ADVISOR TO THE MAYOR, ANAVARANO EST

Figure A: Construction and maintenance responsibilities of water supply managers and clients



Standard guidance on tap stand construction and site maintenance (e.g., proper drainage and cleanliness) is available, but water supply managers are not obligated to provide this kind of information to clients and have neither an incentive nor the authority to inspect water supplies beyond the meter. Individuals or a few families (for household and social connections, respectively) ended up in charge of this critical "last mile" of service delivery, sometimes leaving clients with a sub-standard product. A system created through a PPP should include a mechanism to prepare citizens for such responsibilities and/or systems to monitor and correct any shortcomings.

CIVIL SOCIETY FOR GOVERNANCE, ACCOUNTABILITY, AND MOBILIZATION

Water management committees are groups of trained community members charged with a range responsibilities related to oversight and monitoring of their community's water supply and infrastructure. They are designed to promote community ownership of the infrastructure and resource, and to hold both communities and water providers (public or private) accountable for their roles in sustaining access to improved water sources. These committees are standard practice within the WASH sector, but are not always effective. However, an engagement and accountability mechanism remains necessary; this is an opportunity for civil society.

After several years of political instability, civil society in Madagascar is in "hibernation," as one interviewee observed, resulting in low levels of capacity, public awareness, and active participation in governance.

"SENSITIZING THE POPULATION IS VERY CRUCIAL TO CREATE [DEMAND]. THIS IS THE RESPONSIBILITY OF THE COMMUNITY AND THE NGO."

—SERGE RANAIVOJAONA, GENERAL MANAGER OF BUSHPROOF, MADAGASCAR

More capable CSOs could increase public awareness by, for example, promoting peer pressure on individuals and families to adopt and model positive deviance (e.g., yard maintenance), encouraging transparency around the use of commune fees paid by private enterprise to local government under the RANO contracts, and even advocating for decentralization of Ministry of Water processes including improved funding for DirEaus to fulfill their mandate to enforce compliance with water quality standards. Stronger CSOs could complement DirEau enforcements efforts by organizing consumers to pressure underperforming water supply managers; however, CSOs would also require information from the DirEau (or the resources and technical know-how) to identify gaps.

This community bulletin board at a monobloc includes contact information for staff of the water supply management firm (bottom left), results from a recent water analysis (top, second from left), and facility hours (top, second from right). Making such information easily accessible is a good first step for transparency. The bulletin board also includes a price list for latrines (top left) sold by the water supply management firm. Photo by Alberto Andretta.

One potential indicator of good governance, as led/facilitated by local civil society, would be the alignment of a PPP with five dimensions of equity[vi,vii]:

- access to public resources
- access to public decision-making
- procedural fairness
- quality standards
- policy outcomes

DONORS AND IMPLEMENTERS

CONSIDERATIONS: In addition to acting as a catalyst for PPPs, donors and INGOs help provide investments of financial capital (see *Profitability* section), are important actors in demand-generation and public awareness raising (see page 15), and can facilitate relationships across sectors. Donors and implementers also bring essential expertise in strengthening the organizational and technical capacity of partners.

"THE NGO PLAYED THE ROLE OF CAPACITY BUILDER…AND LIAISON BETWEEN [PRIVATE ENTERPRISE] AND THE COMMUNE."

—JACINTO SANTOS, OWNER AND MANAGER OF VARANGA WATER SUPPLY MANAGEMENT, IMORNA, MADAGASCAR

PROCUREMENT TRANSPARENCY

Open competition (and the pressure to perform that accompanies it) is fundamental to the success of PPPs. RANO projects worked closely with community committees, which were established specifically for this purpose, to build committee capacity in good procurement processes. From the call for bids to the draft contracts between government and private enterprise, RANO projects enabled a fair and transparent process. Donors and implementers should work within any existing country guidance on procurement, bringing in outside standards that are relevant and introducing tools such as contract templates or best practices for vendor selection.

NEW SKILLS AND CONTINUING EDUCATION FOR PRIVATE ENTERPRISES

Even mature, robust organizations need to develop new skills or systems, particularly when expanding into new areas. They also need to refresh skills as technology changes or staff turnover. Capacity strengthening resources might be available locally, but donors and implementers can be uniquely positioned to provide "industry standard" guidance or state-of-the-art tools.[2]

Adapting accounting and billing systems is fairly straightforward, but mastering operation and use of technology like chlorination machines to disinfect water supplies may require ongoing training or accompaniment.

Implementers should consider local resources or networks for capacity strengthening whenever possible. For example, the RANO project water system builders (Sandrandano and BushProof) provided some training and technical support to individual water supply managers at the commune level. Additionally, Madagascar's Association of Private Sector Water Distributors (started by Sandrandano) is a professional association for water supply managers. Members can share their experiences, or the network can serve as a dissemination network for new techniques or promising practices.

PROFITABILITY & AFFORDABILITY

As mentioned earlier in this paper, a successful PPP will create shared value for all participants. By definition, any for-profit business is motivated by profit: over an acceptable period of time, revenues from the sale of goods or services must exceed the costs associated with creating and/or delivering that product or service.[3] Businesses in a PPP must consider several variables that affect profitability. Some are common to any reasonably competitive market, while others are unique to PPPs and/or the specific sector.[4]

2 Annis and Razafinjato, 2011, call for "specialized training and ongoing support to assure professionalism" of private enterprises by bilaterally funded water projects targeting rural areas and support to the Association of Private Sector Water Distributors.
3 Alternatively, shortfalls with a "loss-leader" product will contribute to gains elsewhere.
4 This section relies heavily on analysis from *Public-Private Partnerships and Water: Theoretical and Practical Considerations*[v] to quantify and verify observations and logical hypotheses.

COSTS THROUGH THE LIFE CYCLE

Long-term expenses associated with infrastructure development, rehabilitation, and maintenance typically are excessive for an individual private enterprise. In the RANO model, these expenses included initial construction or rehabilitation of the central water system, the installation of customer connections (from the closest system branch to an agreed-upon water point), and ongoing maintenance and repairs.

Through the RANO projects, USAID made most of the initial infrastructure investments; in discrete cases, private enterprises contributed to the cost in exchange for a longer-term service contract. Households then paid for the installation of private or social connections (the meter and the connection) at a pre-determined rate. Hybrid models that include private impact investors may represent viable options in designing PPPs for certain business models and services. The cost of water supply projects like those developed under RANO are probably too small to attract such investments, but other sectors or projects may benefit.

> Impact investing is the concept that investments can and should generate positive, measurable social and environmental benefits in addition to a financial return.

If responsible for capital investments in full or in part, most businesses will need to finance at least some of the costs. The availability and terms of such loans will greatly influence potential profitability. In the RANO model, private enterprise partners are responsible for routine maintenance of the system (e.g., cleaning sand filters or replacing broken pipes) and should factor these expenses into their overall business model.

When asked if they could have participated in the WASH PPP without donor funding, interviewees representing the private sector partners were skeptical, noting that loans for WASH projects in Madagascar are virtually unattainable.[5] While some felt that it might be possible for the business to fund an expansion, none appeared to have concrete plans to do so. Similarly, neither public nor private partner interviewees were clear how the systems eventually would be replaced (in several decades).

MARKET AND CUSTOMER ANALYSIS

The communities targeted in a development PPP will likely be underserved for reasons ranging from geography to political or economic marginalization. While such inequalities can present challenges, marginalized individuals should not be viewed as singularly indigent: many (even most) can and will pay for a service that is priced reasonably and valued. As demonstrated in the RANO projects, where households constructed latrines without subsidies and SILC

5 This is echoed in Burr, P., & Fonseca, C. (2013). Applying a life-cycle costs approach to water (8). Retrieved from IRC International Water and Sanitation Center website: http://www.ircwash.org/resources/washcost-working-paper-8-applying-life-cycle-costs-approach-water

"ONE AREA THAT I SEE AS APPROPRIATE FOR PPP IS SUPPLY OF ELECTRICITY…IT HAS BEEN IDENTIFIED BY THE POPULATION AS A PRIORITY"

—JACINTO SANTOS, OWNER AND MANAGER OF VARANGA WATER SUPPLY MANAGEMENT, IMORNA, MADAGASCAR

groups helped expand water access,[viii,ix] establishing SILC groups and relationships with MFIs can further enhance the ability of households to pay, particularly for connection fees.

Once establishing the presence of a functioning market and assessing its level of competition, the subsequent analysis of a PPP is similar to that of a marketplace. Private enterprises should consider the size, geographic location, and potential growth (or decline) of a target population. Businesses also need to consider if they can meet a growing population's needs (e.g., what is the carrying capacity of the water source?).

Corporate social responsibility (CSR) refers to private-sector business practices that consider the business's social impact and/or promote positive social change.

Population density tends to positively correlate with potential profit, raising the possibility that serving sparsely populated areas may not have the potential to be profitable. PPPs should keep this in mind and consider ways to effectively subsidize those markets. Strategies might include seeking donors (traditional or impact investors) or tapping into a business partner's CSR or social enterprise funds. PPPs may also be able to work with municipalities to cluster more and less profitable areas together, cross-subsidizing the latter with revenue from the former to generate enough profit overall to make the venture appealing to the business.

PRICING CONDITIONS

All businesses must recoup their capital investment and recurring operating costs through pricing and sales strategies. In a development PPP, the price may be set by the government and include unique taxes and fees. Competition (if any) should also be considered. Finally, the price of those goods/services must be perceived as fair and acceptable to the consumer. The RANO projects worked to help populations understand that they were paying for a service (e.g., access, disinfection), rather than the water per se.

RANO targeted communes in need of improved water sources, thus private water supply managers did not face competition from other businesses offering a similar project. Water was available for free in many areas, though it was unsafe and frequently far away. This shift from "free to fee" was difficult for many communities until they came to appreciate the value in the *service* provided: clean, convenient water.

ANNEX A: METHODOLOGY

In response to a request from CRS' Madagascar country program, the Agency's PCS and WES units provided technical and financial support to a structured learning exercise. A desk review of standard project documents (e.g., technical reports, assessment tools) and relevant literature (peer-reviewed and gray; see annotated bibliography) was conducted. Through a dialogue with stakeholders from CRS Madagascar and PCS and WES units, a participatory research exercise (see box) was planned for and conducted in July 2015. Researchers deliberately engaged a wide range of stakeholders to identify, collect, and interpret heterogeneous data through a series of individual conversations and group discussions.

HETEROGENEOUS DATA

By design, the data include quantitative, descriptive, qualitative, ethnographic, and interpretive information. The heterogeneous data sets and insights were organized around three major lines of inquiry: enabling environment; roles, functions, and organizational and technical capacity of major actors; and the profitability-affordability threshold. They include:

Notes and recordings from in-depth interviews with PPP actors (including representation from local communes, local and national private companies, ministry and regional level government officials, institutional donors, CRS staff, and beneficiary representatives (duration: one to two hours; small group and individual discussions)).

Documentation from the projects (e.g., technical reports) and CRS-funded research and follow-up with project sites; these provided

- data on profitability of PPP model including expanded use and clientele, and operational efficiencies
- evidence of the capacity strengthening and facilitation roles that each main actor contributed to the PPP

The combination of both qualitative and quantitative elements is intended to leverage the strengths of both views.

The research sought to reveal insights both on what RANO projects did well and what could be improved upon.

ANNEX B: LIST OF INTERVIEWEES AND AFFILIATIONS

Tatiana Tang, Economic Growth Coordinator (SILC and value change activities), CRS Madagascar

Serge Ranaivojaona, General Manager of BushProof (www.bushproof.com), Madagascar

Gerard Razafinjato, Director General of Sandandrano, Madagascar

Angelica Ramaherison, Representative of of PPP, Ministry of Water, Madagascar

Solphi Joli Hamelo, Senior Director WASH, Ministry of Water, Madagascar

HeryLanto Rasaonina, WASH technical consultant, CRS Madagascar

Rado Andriantatiana Rasoanaivo, Director of Enterprise VELO, Madagascar

Nadine Razafindrafotsy, 2nd Deputy Mayor or Anivorano Est, Madagascar

Lucien Augustin, WASH Technician, Anivorano Est, Madagascar

Marie Raminaja, Regional Director of Ministry of Water, Tamatave, Madagascar

Victor Dominique Chan Sao Chan, Mayor of Mananara, Madagascar

Sylvain Randriamiadana, owner and president, Entreprise Générale de Construction

Sylvania-Sylverina-Sylvaincia EGC3S, Mananara, Madagascar

Jacinto Santos, owner and manager of Varanga, Imorna, Madagascar

Benjamin Bogardus, Graduate Fellow (Engineering), Villanova

Morgan Gruenewald, Undergraduate Intern (Profitability Analysis), Villanova

ANNEX C: ANNOTATED BIBLIOGRAPHY

CURRENT DEFINITIONS OF PPPS FROM DEVELOPING OR INDUSTRIALIZED COUNTRIES

IRC International Water and Sanitation Centre. (2012). Public Private Partnerships for Rural Water Services (4). Retrieved from World Bank website: http://water.worldbank.org/sites/water.worldbank.org/files/publication/Public-Private-Partnerships-for-Rural-Water-Supply.pdf

This paper contains a great, concise list of works cited on WASH PPPs; some are included in this bibliography.

Presents the following definitions of PPPs:

- "Delegate operations and maintenance, or maintenance only, to the private sector through formal contracts and performance agreements" (p. 1)
- "Public delegation of rural water service delivery to the private sector" (p. 2)

The authors suggest the following points of action for donors: provide external technical and financial support to government-led initiatives to promote PPPs and discuss with government what support and regulation are needed to ensure that consumers receive acceptable services and are fairly treated. PPPs are more likely to work in countries with civil, rather than common, law. The paper also explores different experiences in delegating management of rural hand pumps to private operators of piped schemes. There is a table on p. 4 detailing organizational options for contracting authorities, from the central government down to water user associations, and includes specific examples of each. A table on p. 5 describes the types of PPP rural water supply contracts (e.g., Lease-affermage contract) and the level of risk associated with each. Water regulation remains a weak point in many of these PPPs, and selection of a contracting authority appropriate to the system is important. Among the recommendations at the end of the paper is to "Make available online information about costs, tariffs, and performance to encourage widespread analysis and understanding of the profitability and sustainability of rural water PPPs under differing conditions" (p. 7). This would greatly facilitate research on the factors, such as population thresholds, influencing PPP profitability.

GUIDELINES OR MINIMUM REQUIREMENTS FOR PPP IMPLEMENTATION IN DEVELOPING COUNTRIES

Akers, David Bradlee, "Lead (Pb) Contamination of Water Drawn from Pitcher Pumps in Eastern Madagascar" (2014). Graduate Theses and Dissertations. http://scholarcommons.usf.edu/etd/4975

UN Development Program. (2010). Rapport de suivi des objectifs du millenaire pour le developpement - Madagascar. http://www.mg.undp.org/content/dam/madagascar/docs/rapportsUNDP_MDG/doc_OMD/OMD_6_mg_2013.pdf

Target 7C quantitatively describes (in French) the progress made in Madagascar during the last few decades to improve sanitation and water supply access. The conclusion provides a summary of how financing for WASH projects was impacted by the socio-political crisis that escalated in 2009. This crisis was a large obstacle to overcome in implementing PPPs with the RANO HP project.

Annis, J., & Razafinjato, G. (2012). "Public-private partnerships in Madagascar: Increasing the sustainability of piped water-supply systems in rural towns." Waterlines, 31(3), 184–196. https://rwsnforum.files.wordpress.com/2011/11/152-annis-madagascar-long-paper.pdf

The authors (the technical coordinator for the RANO HP project and the president of water enterprise Sandandrano) present three PPP case studies in Madagascar and discuss the possible factors that contribute to their success: political will, size and geographic location, latent demand for modern services, and donor support. In addition to financing construction, donors played a key role in "creating an enabling environment in the commune so politicians and the majority of project beneficiaries would accept the PPP model" (p. 193). Steps to create an enabling environment included the requirement of a public call for proposals where enterprises bid for construction/management of the system and creation of multi-year WASH business plans. Increasing demand through informative campaigns targeting beneficiaries, enterprises, and policy makers is among the recommendations made.

Bakalian, A. et al. (2009). Post-Construction Support and Sustainability in Community-Managed Rural Water Supply. https://openknowledge.worldbank.org/handle/10986/11720

Discusses the factors leading to high performance in community-managed water systems in Peru, Bolivia, and Ghana. The authors explore two types of approaches to Post-Construction Support (PCS): supply-driven (outside organizations provide communities with unsolicited support) and demand-driven (spare parts and technical assistance are made available, but communities have the responsibility to seek them out). Key findings included that "successful" communities had been involved in pre-project planning and helped with capital costs. While village water committees in the areas studied searched out funding to repair the system (mostly outside the community) and the systems were still functioning, committee finances were typically in poor shape. While many communities are managing to repair their system, it is doubtful they would be able to replace the infrastructure or make expansions. These findings suggest three reasons why communities are not able to collect adequate funds to manage repairs: insecurity in collecting/saving funds, other village projects are prioritized over repairs, and the funds/materials to make repairs are often forthcoming from outside organizations (p. xvl).

Rural Water Supply Network. (2010). "Myths of the Rural Water Supply Sector." RWSN Perspectives, 4, 7. Retrieved from http://www.rural-water-supply.net/en/resources/details/226

Describes major issues in the provision of rural water services by NGOs. In particular, "Myth 5: We know what we want and what we can get from the private sector" (p. 4), describes the limitations in encouraging private sector investment in construction or maintenance of rural water supply facilities. The authors note several instances where enterprises are providing services directly to rural dwellers. The Pitcher Pump, a shallow pump fabricated and installed by local artisans that has been used sustainably to provide water to Malagasy along the east coast around Tamatave since the mid-1960s (see citation below), might be added to the list. In addition, the synthesis at the end (p. 6) presents interesting suggestions for improving management and financing in rural water systems.

LESSONS LEARNED AND BEST PRACTICES FOR PPP IMPLEMENTATION IN DEVELOPING COUNTRIES

Catholic Relief Services Madagascar. (2013). Capitalisation des acquis du projet RANO HP.

Provides a broad overview of the development, implementation, and accomplishments of the RANO HP project. In particular, Chapter 3: PPP (pp. 35–66) describes the process to create contracts, conduct a call for bids, and monitor the performance of the PPP and water system. It includes several diagrams portraying the regulatory framework, steps for selection of managing enterprises, and the roles/responsibilities of stakeholders. At the end of the chapter (p. 63) is a list of lessons learned: success factors, weak points, challenges and perspectives. It highlights the importance of creating a joint account between the enterprise and the commune for transparency, the importance of a known and competent workforce, and the need to change contracts to make it possible for the enterprise to revise prices over time. All recommendations on this list may be good to consider when setting up PPPs in any sector in the future. In the USAID RANO HP project completion report (cited below), this list is copied and expanded upon on p. 23–26.

Catholic Relief Services Madagascar. (2013). RANO HP Project Completion Report. http://pdf.usaid.gov/pdf_docs/pa00jn71.pdf

Catholic Relief Services Madagascar. (2014). Project Completion Report: RANOn'ala Madagascar http://pdf.usaid.gov/pdf_docs/PA00JPWX.pdf

Wales, J., & Wild, L. (2015). CARE's Experience with Community Score Cards. Retrieved from odi.org website: http://www.odi.org/publications/9282-cares-experience-community-score-cards-works

Tool suggested in the RANO HP document for stakeholders to increase transparency between clients, the commune, and the managing enterprise. Communities provide feedback to supervisors on the quality of service provision using score cards and then service

providers conduct the score card to self-reflect on their performance. This approach is most effective when there is high engagement with different levels of the state apparatus (for example, communes and the Ministry of Water in Madagascar).

Ermilio, J., Cain, D., Pattison, I., & Sohail, M. (2014). "Performance Evaluation of Community Managed Water Supply Infrastructure." In 37th WEDC International Conference.

Monitoring of water system performance in terms of water supply and quality might be accomplished using pressure transducers to measure tank levels and simple instruments such as test strips / reagents. This information could be used to increase transparency between the enterprise and clients, enabling the latter to hold managers responsible for standards outlined in the contract.

DATA, GUIDANCE, AND FORMULAS REGARDING THE PROFIT REQUIRED TO SUSTAIN PPPS IN A DEVELOPING COUNTRY CONTEXT

Burr, P., & Fonseca, C. (2013). Applying a life-cycle costs approach to water (8). Retrieved from IRC International Water and Sanitation Center website: http://www.ircwash.org/resources/washcost-working-paper-8-applying-life-cycle-costs-approach-water

Explores how to calculate the cost to construct and maintain boreholes with hand pumps and small piped schemes in India, Burkina Faso, Ghana, and Mozambique (summarized on p. XVII). In general, recurrent expenditures are a fraction of recurrent costs, leading to non-functionality or breakdowns in the systems. The authors suggest that there is a recurrent expenditure threshold per year necessary to keep a system functioning, and "An important message emerging from WASHCost is that without a clear commitment from governments, NGOs and donors to subsidize part of the recurrent costs over the long term, sustainable water services for the rural poor in developing countries will remain unachievable" (p. XVIII). Includes many interesting observations about how costs change with service levels in the different areas studied.

Ryan, P. (2014). Madagascar WASH Sector Sustainability Check. Retrieved from unicef website: http://www.mineau.gov.mg/wp-content/uploads/filebasee/documentation/eauetassainissement/SC%20Final%20Report%20v1.pdf

Surveys for stakeholders in a wide variety of WASH projects are used to assess the sustainability of the sector. A Ministry of Water database is used to determine sites for sampling. A wide variety of factors that might impact sustainability, such as water system technology and functionality, population and accessibility, and water quantity and quality are assessed using the results. Similar to the data gathered from the FARARANO project, the data used for this report could be helpful in determining the factors influencing PPP profitability.

Triche, T. (2007). Engaging local private operators in water supply and sanitation services: initial lessons from emerging experience in Cambodia, Colombia, Paraguay, the Philippines, and Uganda. Retrieved from Water Supply and Sanitation Sector Board of the Infrastructure Network of the World Bank Group website: http://water.worldbank.org/publications/engaging-local-private-operators-water-supply-and-sanitation-services-initial-lessons-e

Provides a detailed description of the different types of PPP contracts and specific examples in the above countries of "Operate and Maintain" to "Design, Build, Operate, and Maintain" contracts. A graph on p. 11 shows the "Long-term investment by private sector (%)" vs. "Scope of functions assumed by private sector." Of particular note is the example of "Design, Build, and Operate" contracts in Cambodia, where private operators invested 40-50% of the capital to construct the systems (pp. 4–5). Subsidies come either in the form of grants or government loans. A description of the local private operators that submitted the bids and their characteristics is noted on pp. 14–15.

ADDITIONAL DATA/ANALYSIS

- Feasibility studies ('Avant-Project Detaillé' or 'Avant-Project Sommaire') for each system. Comparison with actual water consumption and profitability could help improve future forecasts of demand and growth.
- Actual records of revenue and expenses from water systems, monoblocs, and other service/products offered through PPPs. Initial results show that the population threshold for PPPs to be profitable in rural centers is likely 7-10,000 people while monoblocs cannot be successful in rural areas and can only be profitable in densely populated areas. Further analysis will allow us to provide quantitative estimates of these thresholds.

Gruenewald, M. (2016). Public-Private Partnerships and Water: Theoretical and Practical Considerations. Villanova: Villanova University.

Analysis of Velo's financial records from their system in Anivorano Est. The process used to determine when the system first made a profit, the hypothetical payback period with a certain investment, and the contributions of different types of connections could be easily applied with data from other systems.

At the moment we have a student who is studying the profitability of PPP-managed rural water systems and sanitary blocks. This research includes quantitatively examining the different factors that affect PPP profitability and their extent/weight. In addition, we are examining the hypothetical pay back periods for different systems if the enterprise had invested a certain percentage at the beginning (whether financed by enterprise capital or through a loan). Initial results show that an estimated threshold of population for a PPP-managed water system to be profitable is between 7-10,000 people and that sanitary blocks are not profitable in a rural setting due to the lack of demand, population density, and habits to use the showers/toilets.

[i]USAID. USAID Public-private Partnership Database. (Washington, DC, 2016). https://www.usaid.gov/data/dataset/83ace88b-c6a3-4520-990f-439ffc74e08f

[ii]E. Kleemeier. "Public-Private Partnerships for Rural Water Services." Water Services That Last: Briefing Note No. 4. September 20 2015. http://water.worldbank.org/sites/water.worldbank.org/files/publication/Public-Private-Partnerships-for-Rural-Water-Supply.pdf.

[iii] J. Annis and G. Razafinjato. "Public-Private Partnerships in Madagascar: A Promising Approach to Increase Sustainability of Piped Water Supply Systems in Rural Towns." Presented at Sixth Rural Water Supply Network Forum, Uganda, 2011.

[iv]Catholic Relief Services. Water Services that Last in Central America: Recommendations for Financial Viability, Equitable Distribution, and Water Source Protection. (Baltimore, MD, 2013). http://globalwaterinitiative.org/media/AchievingWaterServicesThatLastInCentralAmerica.pdf

[v]Gruenewald, M. (2016). Public-Private Partnerships and Water: Theoretical and Practical Considerations. Villanova: Villanova University.

[vi]M. Rogers, A. Chassy and T. Bamat. Integrating Peacebuilding into Humanitarian and Development Programming. (Baltimore, MD, 2010).

[vii]World Bank. What is Governance? (Baltimore, MD, 2016). http://go.worldbank.org/07NKGLDBT0

[viii]Catholic Relief Services. Project Completion Report: Rural Access to New Opportunities for Health and Prosperity RANO HP (HamPivoatra) Water for Progress Madagascar. (Baltimore, MD, 2013). http://pdf.usaid.gov/pdf_docs/PA00JN71.pdf

[ix]Catholic Relief Services. Project Completion Report: Rural Access to New Opportunities for Health and Water Management. (Baltimore, MD, 2014). http://pdf.usaid.gov/pdf_docs/PA00JPWX.pdf