Impact Evaluation of the MCC's Rural Water Supply Project in Mozambique: Enhancing local partner capacity through collaboration

Dr. Ralph P. Hall, School of Public and International Affairs (SPIA), Virginia Tech

Dr. Eric A. Vance, Laboratory for Interdisciplinary Statistical Analysis (LISA), Virginia Tech

March 27, 2014

Rural Water Supply Activity (RWSA)

- Installation of 600 handpumps in rural communities across the provinces of Nampula (358) and Cabo Delgado (242)

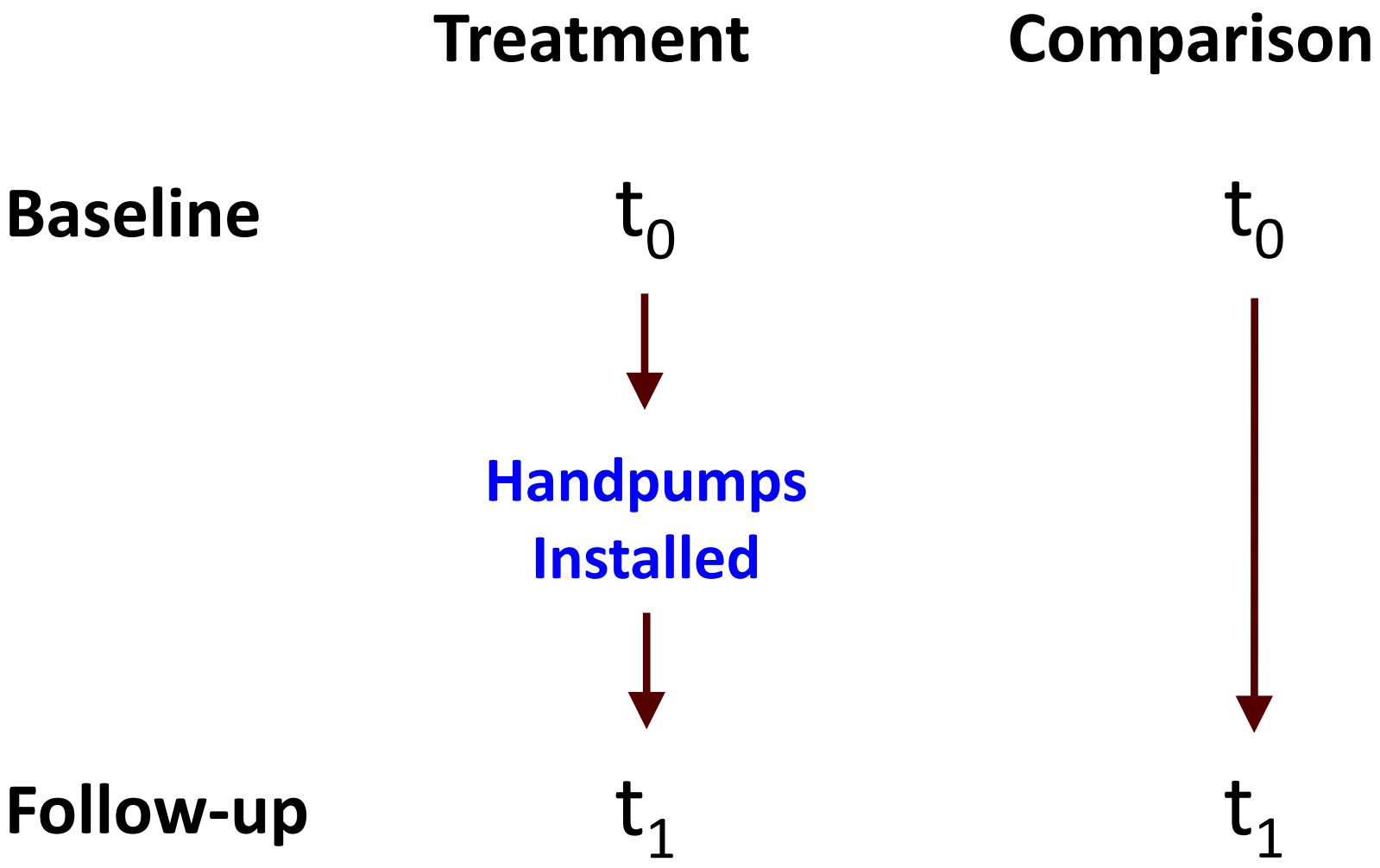
- Installation of 10 small scale solar systems in Cabo Delgado

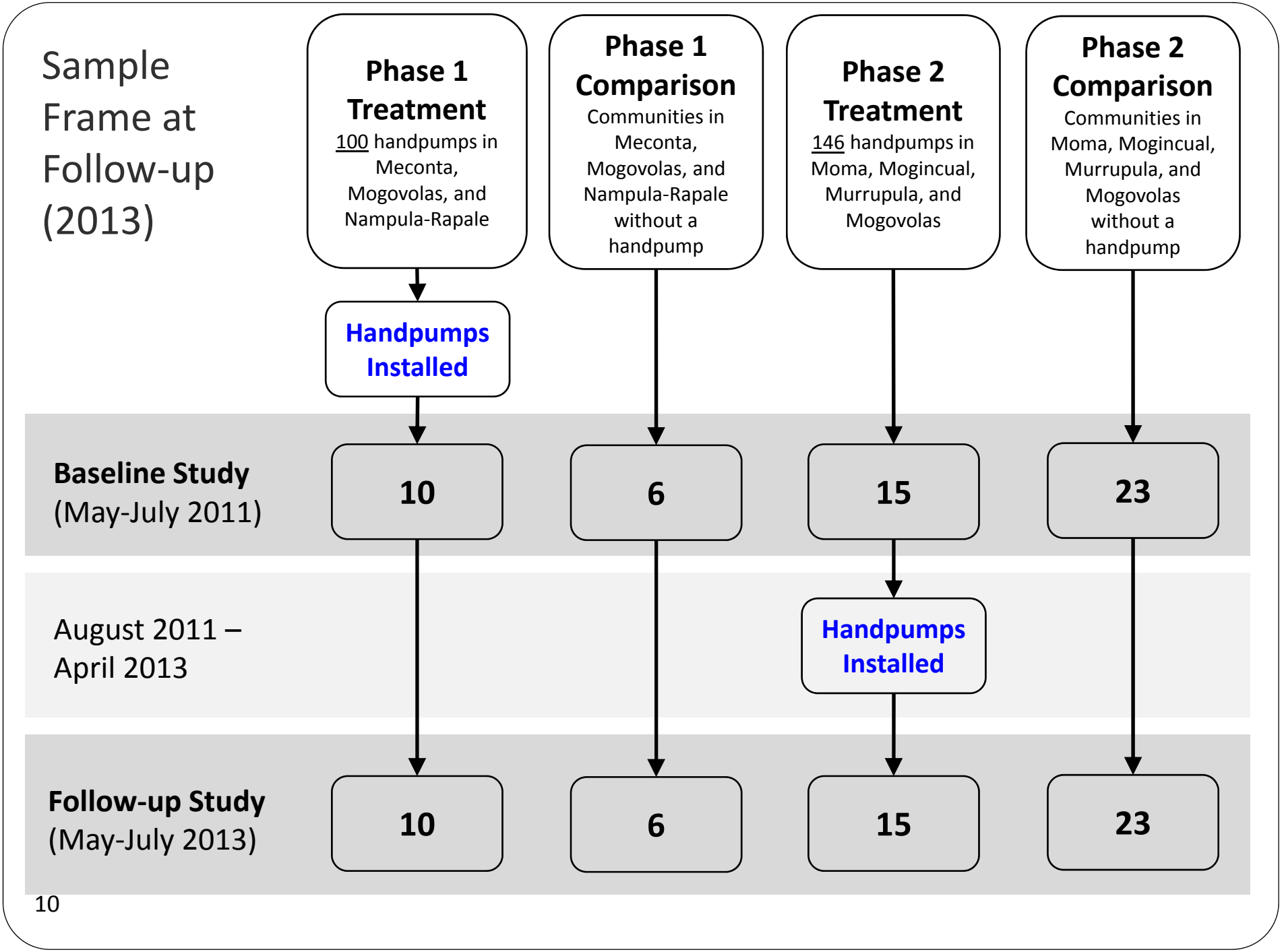
The objectives of the RWSA, as stated in the Compact, are to **increase beneficiary productivity and income** through:

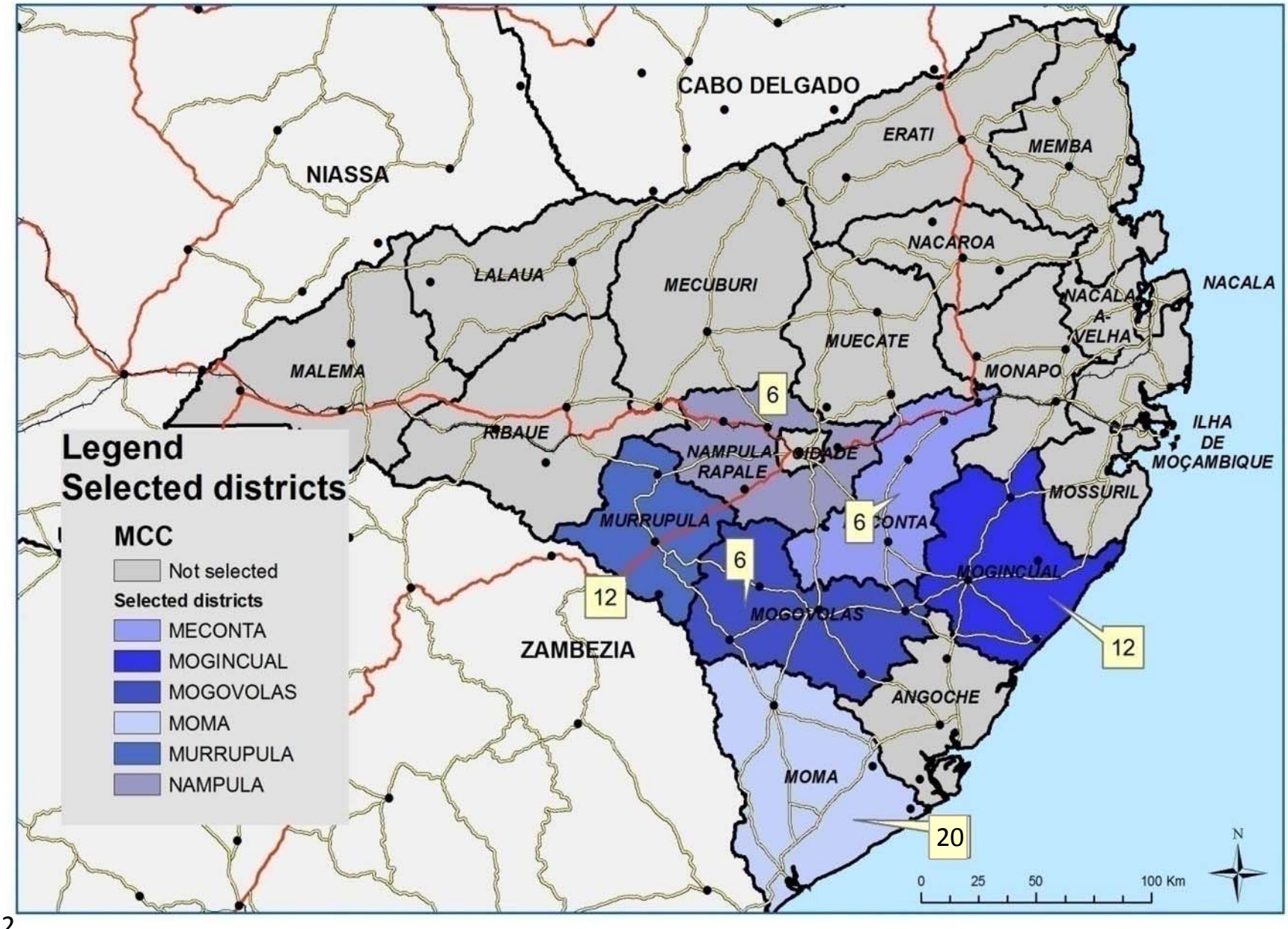
- Time savings
- Reducing water-related illnesses (diarrhea, dysentery, etc.)


Demand Response Approach
Communities submitted an application +
Contributed 2,500 MZN ($86 USD)

Research Design




Sample Frame at Follow-up (2013)
Phase 1 Treatment
100 handpumps in Meconta, Mogovolas, and Nampula-Rapale
Phase 1 Comparison
Communities in Meconta, Mogovolas, and Nampula-Rapale without a handpump
Phase 2 Treatment
146 handpumps in Moma, Mogincual, Murrupula, and Mogovolas
Phase 2 Comparison
Communities in Moma, Mogincual, Murrupula, and Mogovolas without a handpump
Handpumps Installed
Baseline Study (May-July 2011)
10
6
15
23
August 2011 – April 2013
Handpumps Installed
Follow-up Study (May-July 2013)
10
6
15
23


CABO DELGADO
NIASSA
ERATI
MEMBA
NACAROA
LALAUA
MECUBURI
NACALA
NACALA-A-VELHA
MUECATE
MALEMA
MONAPO
6
RIBAUE
ILHA DE MOÇAMBIQUE
NAMPULA
RAPALE
IDADE
MOSSURIL
MURRUPULA
6
CONTA
6
MOGINCUAL
12
MOGOVOLAS
12
ZAMBEZIA
ANGOCHE
MOMA
20
Legend
Selected districts
MCC
Not selected
Selected districts
MECONTA
MOGINCUAL
MOGOVOLAS
MOMA
MURRUPULA
NAMPULA
0
25
50
100 Km
N

Final Sample Frame

	Community Classification	Number of Communities in Group	Number of Communities by District
Phase 1	Treatment	10	4 Meconta 3 Mogovolas 3 Rapale
	Comparison	6	2 Meconta 1 Mogovolas 3 Rapale
Phase 2	Treatment	15	8 Mogincual 3 Murrupula 2 Mogovolas 2 Moma
	Comparison	23	4 Mogincual 8 Murrupula 1 Mogovolas 10 Moma

Data Collection

Data Collection Activities (RWSA)

Activity	2011 Baseline Study	2013 Follow-up Study
Household Surveys	**1,579** (54 communities: 27 treatment; 27 comparison)	**1,826** (62 communities: 32 treatment; 30 comparison)
Water Committee/ Leader Interviews	**54**	**31**
Water Sampling	**11 communities** (39 community water sources and 259 household containers)	**11 communities** (32 community water sources and 873 household containers; water source variability tested in 4 communities)
Handpump Observations	NA	**17** (17 communities)

73% of the households interviewed during the baseline study were surveyed again in the follow-up study

Fieldwork Preparation

- Household surveyors and water quality testing team members were trained for 2 weeks
- A pilot study was undertaken to test instruments and fieldwork protocols

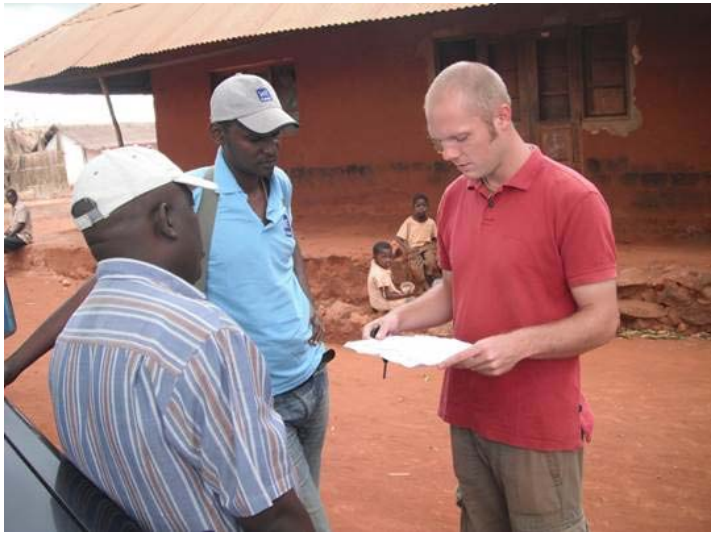
Fieldwork Preparation

- Following pilot – surveyors were retrained and instruments/ protocols were revised
- Three household surveying teams consisted of:
  - 1 team leader
  - 3 household surveyors
  - 1 driver

Fieldwork Preparation

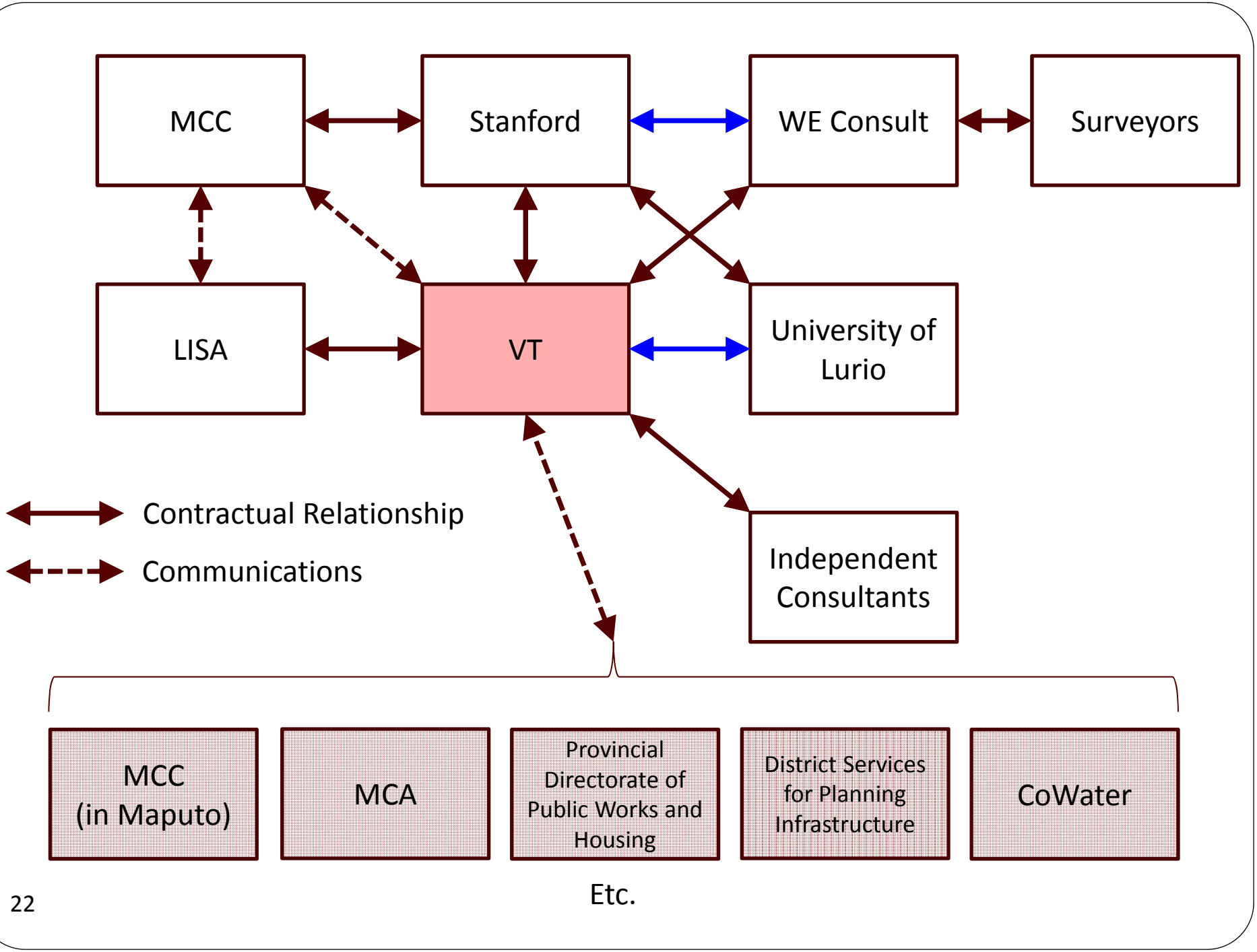
- Stanford-VT-WE Consult team supported the water sampling team (*consisting primarily of Universidade Lúrio students*) in the field and laboratory work

Household Survey Teams (in field)



Household Survey

- Household surveys undertaken using PDAs
- Data were cleaned during fieldwork
  - Enumerators were provided with feedback on their data entry errors and outliers were checked
  - Feedback dramatically reduced the number of recurring errors
- Summary data were sent to the MCA/MCC every two weeks during fieldwork


MCC
Stanford
WE Consult
Surveyors
LISA
VT
University of Lurio
Contractual Relationship
Communications
Independent Consultants
MCC (in Maputo)
MCA
Provincial Directorate of Public Works and Housing
District Services for Planning Infrastructure
CoWater
Etc.

Water Sources Used by Households

78% of the households surveyed in the **treatment communities** reported using a handpump

Phase 2 Treatment – Percent of Households Using Source and Percent of Total Water Collected from Source

	% of HHs Using Source	
	Baseline	Follow-Up
Handpump	**9%**	**78%**
Unprotected Well	**85%**	**21%**
River/Lake	16%	9%

Water Consumption

All Sources and Improved Sources

The installation of the MCA handpumps are associated with an insignificant **2.5 LPCD** increase in **median water consumption** (from all sources) (p<0.1)

Phase 2 Median Total Liters per Capita per Day (LPCD) (All Sources)

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median LPCD	Mean of Median LPCD	LPCD
Treatment	15	17.2	19.5	2.3.
Comparison	23	18.5	18.3	-0.2
			Difference in Differences	2.5.

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

The installation of the MCA handpumps are associated with an **15.1 LPCD** increase in **median water consumption** (from **improved sources**) (p<0.001)

Phase 2 Median Total Liters per Capita per Day (LPCD) from *Improved Sources*

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median LPCD	Mean of Median LPCD	LPCD
Treatment	15	0.0	15.1	15.1***
Comparison	23	1.8	0.2	-1.6
			Difference in Differences	16.7***

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

In treatment communities, 3 out of every 4 buckets of water collected are from an improved source

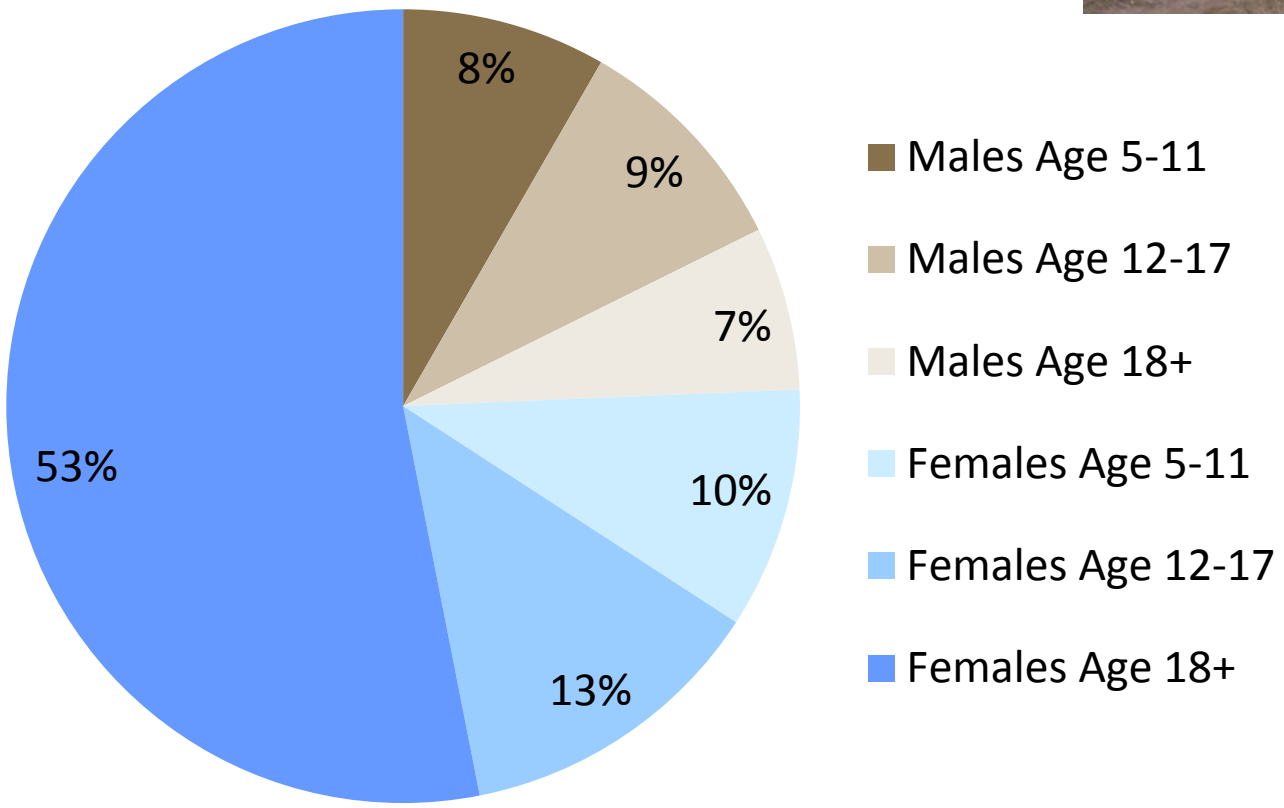
Phase 2 Median Total Liters per Households per Day (LPD)

		Baseline	Follow-Up	Difference
Phase/ Community	Number of Communities	Mean of Median LPD	Mean of Median LPD	LPD
Treatment (all sources)	15	65.4	76.5	11.1*
Treatment (improved)	15	0.0	58.0	58.0***
Comparison (all sources)	23	75.6	68.5	-7.1
Comparison (improved)	23	7.5	1.3	-6.2

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Time Spent Collecting Water

Females account for three quarters (76%) of the total time spent collecting water



Following the installation of the MCA handpumps there was an **88-minute decline** in the time households spent collecting water from all sources, but this decline was **statistically insignificant**

But…

The installation of the MCA handpumps can be associated with a 62-minute reduction in the median roundtrip time to the **'primary' source** (p<0.05)

Phase 2 Median Roundtrip Time to *Primary Source*

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median Time (Minutes)	Mean of Median Time (Minutes)	Minutes
Treatment	15	161	76	-85**
Comparison	23	137	114	-23
			Difference in Differences	-62*

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

The wait time at the primary source in treatment communities **declined by 41 minutes** relative to comparison communities ($p<0.05$)

No statistically significant change was found in the one-way walk times to the primary source

The installation of the MCA handpump can be associated with a 30% reduction in the total median time females (aged 12 and above) spend collecting water each day

There was no overall reduction in the time males spent collecting water

By comparing the **time** and **water volume** data by demographic groups, the installation of the MCA handpump can be associated with …

an *increase* in the quantity of water collected by girls and boys aged 12-17 and women aged 18 and above, …

but a *decline* in the time these groups spend collecting water

The installation of the MCA handpumps can be associated with a 55-minute reduction in the median **time to collect 20 liters of water** (p<0.001)

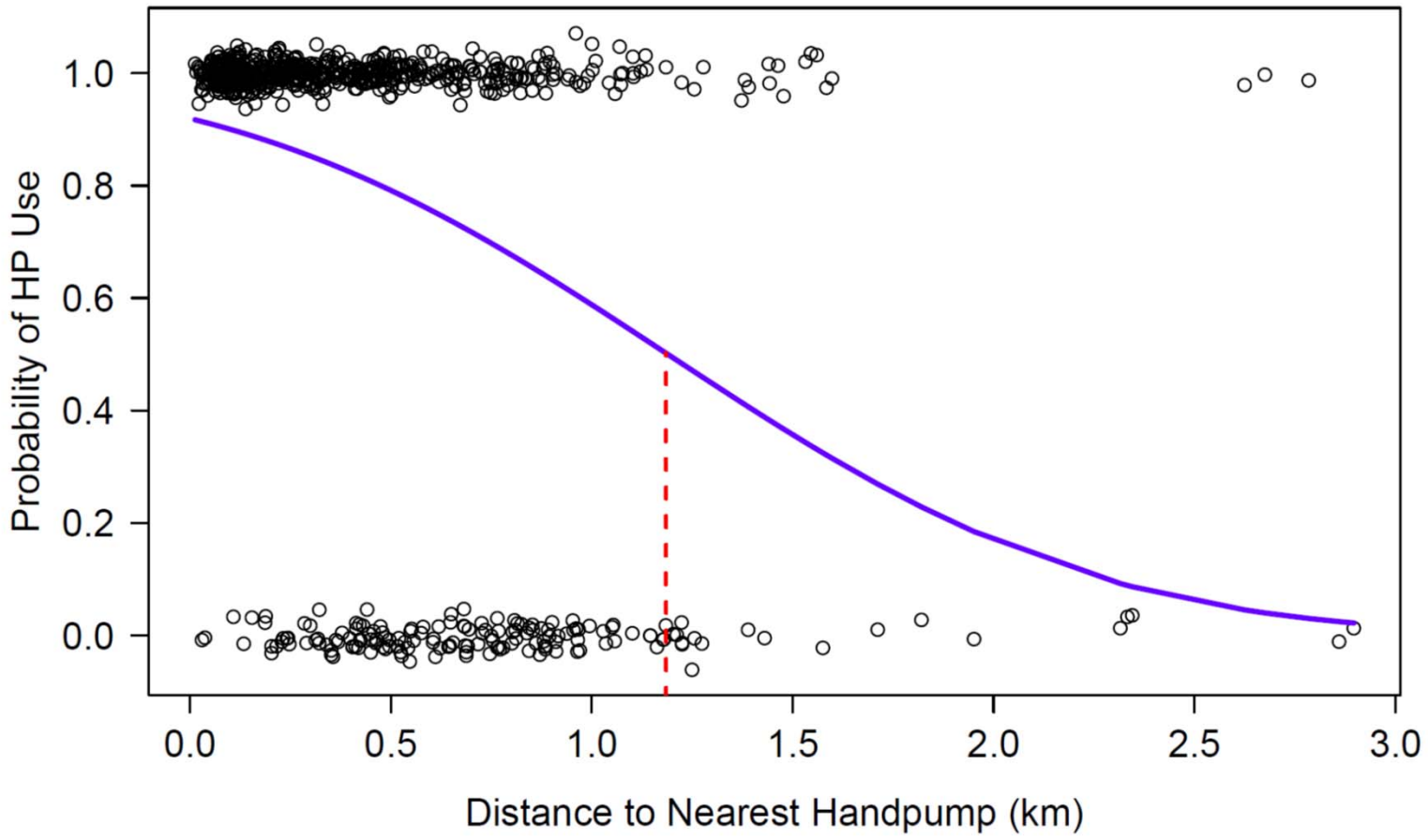
Phase 2 Median Time to Collect 20 Liters of Water

	Number of Communities	Baseline	Follow-Up	Difference
		Mean of Median Time (Minutes)	Mean of Median Time (Minutes)	Minutes
Treatment	15	104	62	-42*
Comparison	23	86	99	13
			Difference in Differences	-55***

Significance codes: *** p<0.001 ** 0.001>p<0.01 * 0.01>p<0.05 . 0.05>p<0.10

Probability of Using the Installed Handpumps

As distance to the nearest handpump increases, the probability that a household will use the handpump decreases. The distance at which the probability of using a handpump drops below 0.5 is 1.2 km.



Reasons for Not Using a Handpump

- 22% of households in the treatment communities do not use the handpump

Reason for Not Using Handpump	Percent of Households (n=170)
Distance	64.7%
Too expensive	28.8%
Don’t like taste	14.1%
Closed or broken	7.1%
Too crowded	6.5%
Not permitted to use	5.9%
Conflicts	1.2%

Collaboration-Related Conclusions

- The collaboration with LISA supported the development of “LISA 2020” – now funded by Google
- The “on-the-ground statistician” advanced the skills of local surveyors and improved the quality of the data collected
- Water testing enhanced the skills of students at University of Lurio and WE Consult staff
- Sharing of data with the MCC/MCA promoted trust among stakeholders
- Now collaborating with the MCC: MCC-M&E College; webinar
- VT-Stanford team invited to submit an MCC Blanket Purchase Agreement for impact evaluation services ($8 to $15 million)

Impact Evaluation Team

- Co-Principal Investigators:
  - Dr. Jennifer Davis (Stanford University)
  - Dr. Ralph Hall (Virginia Tech)

- Core Team Members:
  - Dr. Eric Vance (Virginia Tech)
  - Dr. Emily Van Houweling (Virginia Tech)
  - Marcos Carzolio (Virginia Tech)
  - Mark Seiss (Virginia Tech)
  - Kory Russel (Stanford University)
  - Wouter Rhebergen (WE Consult)

Questions?