34th WEDC International Conference, Addis Ababa, Ethiopia, 2009

WATER, SANITATION AND HYGIENE:
SUSTAINABLE DEVELOPMENT AND MULTISECTORAL APPROACHES

Sustainability check: A monitoring tool for the sustainability of rural water supplies

S. Godfrey, M. Freitas , A. Muianga, M. Amaro, P. Fernadez, L. Sousa Mosies, Mozambique

REVIEWED PAPER 719

The UNICEF/WHO Joint Monitoring Programme (JMP) notes that 42% of the population of Mozambique has access to safe water (UNICEF/WHO 2008). To accelerate access to water supply in the rural areas, UNICEF is currently implementing a programme termed the One Million Initiative with allocated funds from the Government of the Netherlands. To assess the sustainability of this programme, UNICEF, in collaboration with government and non government partners, developed a programme management tool termed a Sustainability Check. The check involves a selected number of control and treatment communities which were selected based on a random statistical basis. A total of 52 water supplies were assessed and then the sustainability in each community was tested using a multivariate composite model tool. The results indicate low levels of sustainability of 50-75%. Based on the assessment, it is recommended to focus on spare parts provision and increased community capacity to manage financial contributions for operation and maintenance of the water points.

Introduction

The UNICEF/WHO Joint Monitoring Programme (JMP) notes that 42% of the population of Mozambique has access to safe water (UNICEF/WHO 2008). This equates to approximately 9 million people with access to safe water (Census 2001). The desegregation of this percentage indicates high disparities between access to water supplies in urban areas (71%) and access to water supplies in rural areas (26%). The majority of the rural population access the water from groundwater sources using simple handpump technologies. To accelerate access to water supplies in the rural areas, UNICEF is currently implementing a programme termed the *One Million Initiative* with allocated funds from the Government of the Netherlands. The objective of the programme is to ensure that one million people receive access to improved water supplies in the rural areas of the three central provinces of Tete, Manica and Sofala by 2013 in Mozambique.
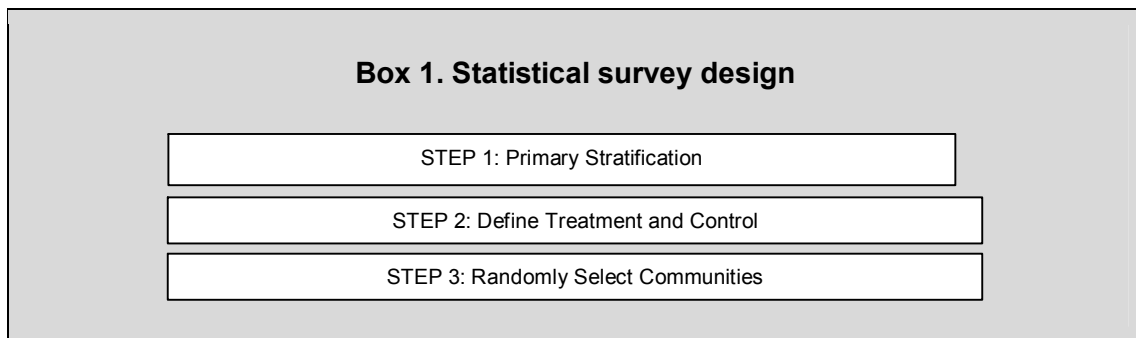
   Historically, it has been documented that the provision of water supplies without due attention to the aspects of operation and maintenance results in low levels of sustainability (DFID 1998l). Therefore, to improve the sustainability of rural water supplies, a number of scientific and participatory tools are currently in use in the water sector. These include interdisciplinary multi criteria models such as those implemented ... 06) to assess the sustainability of rural water supplies in Matabeleland, South Province of Zimbabwe. Hook et al (2006) considered sustainability indicators such as reliability of the system, human capacity development, institutional arrangements, and the impact of the project on rural livelihoods. Results of the survey indicated that to achieve a sustainable water supply there is a need for active community involvement, improved training and strong water point committees. Further studies similarly note the need for an interdisciplinary approach to achieve sustainability of rural water sources. In a survey of rural water supplies in Malawi, Sugden (2001) developed a *Sustainability Snapshot* tool. This interactive tool comprises three tiers which address the technical, financial and institutional capacity of communities to maintain rural water supplies.

Based on the experience from the literature, UNICEF, in collaboration with government and non government partners, developed an annual *Sustainability Check.* The objective of the sustainability check was to assess the sustainability of the rural water infrastructure in Mozambique.

Materials and methods

To estimate the number of rural water sources to be included in the sustainability check, a statistical monitoring tool termed *Rapid Assessment of Drinking Water Quality* (RADWQ) (Howard et al 2003) was applied. The method uses a cluster sampling approach to identify the number, type and location of water supplies to be included in an assessment. Cluster sampling means that the water supplies selected for inclusion in the assessment are geographically close to one another (in "clusters"), but are representative of all water-supply technologies.

The survey design comprised of the steps outlined in Box 1 below.

Box 1. Statistical survey design

STEP 1: Primary Stratification
STEP 2: Define Treatment and Control
STEP 3: Randomly Select Communities

The Primary Stratification of the data was undertaken by selecting 50% of the districts of the 18 project districts in Tete, Manica and Sofala province. This equaled 9 districts as shown in Box 2 below.

Box 2. Project sites (Mozambique)
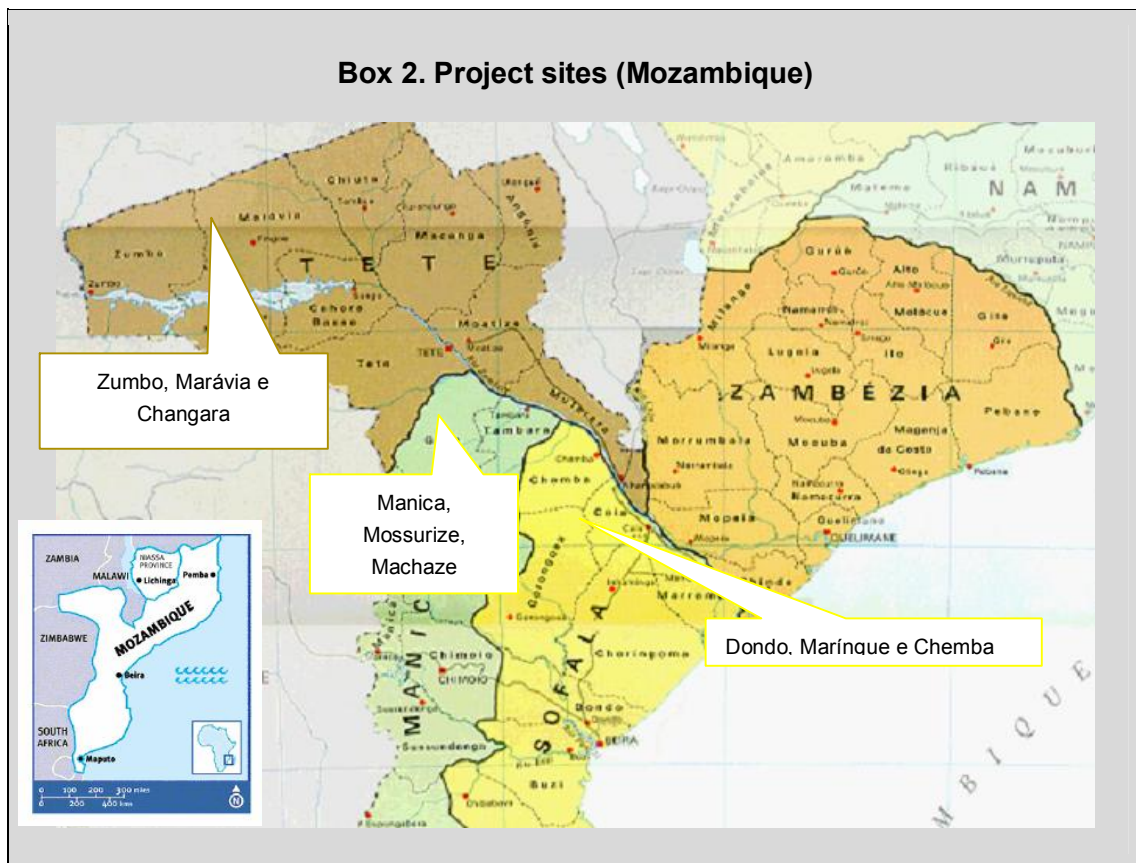
In step 2, 141 communities were selected from the 9 districts. These were the total number of communities where rehabilitations of water points occurred in 2007. These were communities where water points had been rehabilitated in 2007 and 2008. To compare these to "control" communities, a statistically minimum sample size of 3 treatment and 3 control villages were selected from each district.

To randomly select these communities from the list of intervention villages, the following sampling formula was used.

$$SI = \frac{Tc}{N}$$

SI Sampling interval
Tc Cumulated number for total water supplies
N   Total number of districts required

For this survey design:

$$SI = \frac{141}{9}$$

The 141 selected communities were divided by 9 (number of districts) to provide a sample interval of 15.6 (**16**). A random number between 1 and 16 was generated using the EXCEL random function. The number 4 was selected and communities were then chosen from the list of 141 community water supplies.

In total, 32 water supplies were selected from the intervention list of 141. These were then compared to a control group of 20 communities to provide a total of 52 water supplies.

Sustainability was assessed in each of these 52 water supplies using a multivariate composite model tool. This tool considered the institutional, social, technical and financial indicators of sustainability and included the criteria outlined in Table 1 below. These criteria were selected based on extensive literature review. The referred literature is noted in the table below.

Table 1: Sustainability indicators			
	Sustainability indicators	**Criteria**	**Reference**
Institutional	Status of manual database of water points	Includes: database existence, update frequency	Hoko et al (2006)
Social	Community participation in O&M	Includes: Existence of water committees, number of women in committee, availability of local artisans	Mukherjee et al (2003)
Technical	Availability of spare parts	Includes: Vendor points of spare parts, affordability of spare parts	Iyer et al (2006)
	Frequency of maintenance	Includes: Status of pump, availability of spare parts	SKAT 2007
Financial	Financial contribution	Includes: Number of communities contributions, financial management	Koko et al (2006)

The sustainability of each of the water sources was then graded using scores of 1 to 5 (where 1 = insufficient, 2 = sufficient, 3 = satisfactory, 4 = good, 5 = excellent). A maximum total of 100 could be achieved. Weightings for each criterion were calculated using the following table. The weightings were decided based on expert judgement.

Table 2: Sustainability weightings	
	Weighting
Existence of an annual database	10
Community participation in Operation & Maintenance (O&M)	40
Technical aspects: functionality of the handpump	30
Financial Contribution for O&M of the water points	10
Sanitation Infrastructures	10

The weighting for sanitation was included to provide an overall scoring on the sanitation and hygiene of the surroundings to the water point.

Results
Results of the study indicate a low level of sustainability in the 52 water supplies assessed. Figure 1 below indicates that the majority of the water supplies are within the 50 to 75 grade of sustainability. In order to reach the programme objectives the levels of sustainability need to rise to 90.
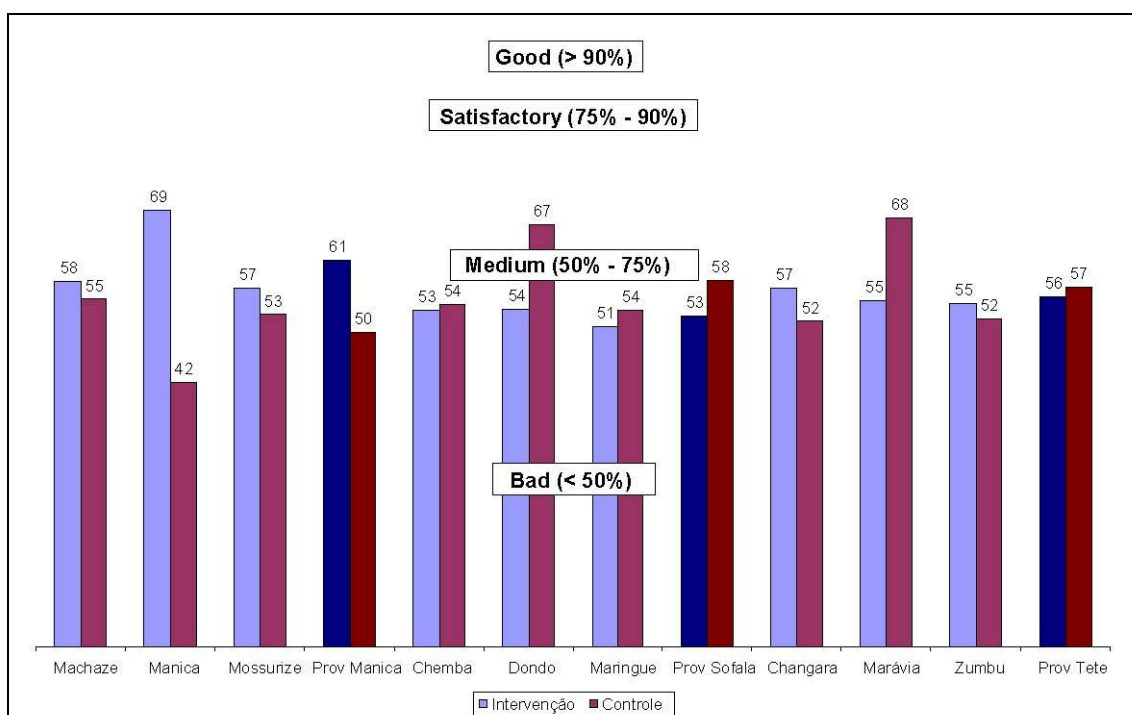

Figure 1.

Source: Ernst & Young (2009)

The main contributing factors leading to the low level of sustainability include:

- Low levels of community contributions – In all 9 districts (in both the control and treatment communities), a low level of community contribution was noted
- Spare parts availability – All districts (except the district of Manica) noted no or almost no evidence of available spare parts. Manica was the exception due its proximity to the provincial capital.

Discussion

The results from the survey are aligned with earlier studies undertaken on sustainability in Mozambique. For example, the SKAT foundation (2007) state that the sustainability of rural water supply systems based on handpumps is dependent on two key factors. The first is the willingness of the community to maintain the handpumps and the second is dependability of a spare parts network. The results from the sustainability check in Mozambique reinforce the observations of SKAT.

Conclusion

The sustainability check proved to be an effective snapshot of the status of sustainability in the three provinces. Based on the results, it is recommended that greater attention is given to spare parts provision and increased community capacity to manage financial contributions for operation and maintenance of the water points. To facilitate this, UNICEF proposes to establish a sustainability competition between the districts. A small fund will be given to provide revolving spare parts in the district. Furthermore, the programme proposes to officialise the community contracting of handpump mechanics so as to ensure timely payment and viability of service. Based on the results of the 2009 sustainability check, a prize will be given to the district with the highest level of sustainability.

Acknowledgements

References

Department for International Development (DFID) (1998) Guidance manual for water and sanitation, DFID, UK.

Ernst and Young (2009) Sustainability Check of the One Million Initiative – Unpublished report.

Hook, Z. Hertle, J (2006) An evaluation of the sustainability of a rural water supply project in Zimbabwe, Physics and Chemistry of the Earth Parts A/B/C, Vol. 31, Issue 15-16, pp 699-706.

Howard, G., Ince, M. and Smith, M. (2003) "Rapid assessment of drinking water quality: a handbook for implementation" (Unpublished draft) WHO/UNICEF/WEDC, WEDC, Loughborough University, UK.

Iyer, P., Davis, J., Yavuz, E. and Evans, B. (2006) Rural Water Supply, Sanitation and Hygiene: A Review of Years of World Bank Lending (1978-2003) Summary report. Water Supply & Sanitation Working Notes. World Bank Group. www.worldbank.org/watsan

Muianga, A. (2007) Demand Responsive Approach: Eligibility Criteria for Selecting Communities for Rural Water Supply Investment in Mozambique, Unpublished Thesis, Master of Engineering, University of Pretoria.

Mukherjee, N, Van Wijk, C. (2003) Sustainability planning and Monitoring in Community Water Supply and Sanitation, World Bank.

Skat Foundation. (2007) Proposal for a study in Mozambique. Standardisation, Supply Chains and Local Production Handpumps. HTN – Network for cost-effective technologies in Water Supply. www.skat.ch/htn

Sugden (2001) Assessing Sustainability – Sustainability Snapshot, 27th WEDC conference, Lusaka, Zambia.

WHO/UNICEF (2008) Progress in drinking water and sanitation: special focus on sanitation, WHO Geneva.

Contact details

Dr Sam Godfrey
Address: 1440 Zimbabwe Avenue, Maputo,
UNICEF Mozambique.
Tel: +258 21 481 127
Fax: +258 21 491 679
Email: sgodfrey@unicef.org
www.unicef.org/mozambique

Manuel Freitas
Address: 1440 Zimbabwe Avenue, Maputo,
UNICEF Mozambique.
Tel: +258 21 481 127
Fax: +258 21 491 679
Email: mfreitas@unicef.org
www.unicef.org/mozambique