Sustainability Check: five year annual sustainability audits of the water supply and open defecation free status in the *One Million Initiative,* Mozambique

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Abstract

Economic changes in Western donor economies have resulted in increased attention to means of measuring the sustainability of Overseas Development Assistance. UNICEF, the Government of Mozambique and the Government of the Netherlands co-financed a USD 45 million rural water supply and sanitation intervention termed the One Million Initiative between 2007 and 2013. This paper presents results from the annual audits in 2008, 2009, 2010, 2011 and 2012 using a Sustainability Check (SC) tool. The SC was specifically developed for the programme to ensure on-going sustainability of investments far beyond the programme life span. It grades the status of rural water supplies and Open Defecation Free (ODF) communities based on a multivariate composite model comprising institutional, social, technical, and financial dimensions.

The SC was applied by external audit companies to annually assess a randomised statistical sample of the programme's interventions through four data collection tools: (1) semi-structured focus group with the district authorities, (2) facility audit of water points (3) audit of ODF villages and (4) semi-structured household surveys in ODF villages. Results were aggregated on a district and programme level and the findings and recommendations informed through a management memo and audit statement to national, provincial and district level decision makers for corrective action. This paper will present the results from five years of Sustainability Checks (2008-2012). It will highlight lessons learnt and the need to explore innovative PDA/android based reporting tools for efficiency, data quality assurance and compatibility.

Introduction

The UN Water Global Assessment of Water Supply and Sanitation (GLASS) report indicates that Overseas Development Aid (ODA) increased in absolute terms by 3% from 2008 to 2011 to USD 7.8 billion (UN Water 2012). Despite this increase, only 7% of the overall investment was allocated to maintaining and sustaining existing infrastructure. This limited financial investment in sustainability correlates with the

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minimal progress made in overall functionality of rural water supply and sanitation infrastructure. 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 1998). Indeed, 20% to 70% of all rural water supply investments are noted to be non-functioning by the Rural Water Supply and Sanitation Network (RWSN 2007).

In regards to sanitation, the sustainability of communities that have been declared Open Defecation Free (ODF) equally remains a challenge. The global water supply and sanitation community have questioned the Community Led Total Sanitation (CLTS) approach that revolutionised the sector over the last decade or so with critics stating that it does not focus enough on the quality of infrastructure to ensure long term sustainability (WSP, 2011). In a meta-analysis of CLTS activites in Bangladesh, WSP (2011) noted that 89.5% of households in 53 Union Parashads owned and used a latrine 6 years after being declared ODF. However, concern remained regarding the quality of construction and hygienic status of the latrines which affected the appropriate use of the latrines in the ODF communities. Additionally, the remaining 10.5% without latrines had reverted to Open Defecation in the community which affected the overall public health gain of a total sanitation approach. Similar studies by Chakma et al (2008) evaluated the sustainability of communities declared ODF under the Government of India Total Sanitation Campaign (TSC). The study noted that only 79% of households in the examined communities continued to use latrines one year after being declared ODF in Central India.

However, to address the low level of sustainability in the rural water supply and sanitation sector, 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 by Hook et al (2006) 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.

Nonetheless, despite the development of these tools, there is limited evidence in the literature on the prolonged application of sustainability monitoring tools over multi-annual year programmes. Pattanayak et al (2009) notes that increasingly donors and aid agencies have broadened their narrow focus on physical infrastructure to sustainable service provision. This is supported by WaterAid (2011), who note in their

Frameworks for Sustainability that there is a need to consider a broader definition of sustainability which notes that to ensure lasting impact on the public health of beneficiaries of water supply and sanitation services, a greater emphasis on the "service" component of service delivery is required.

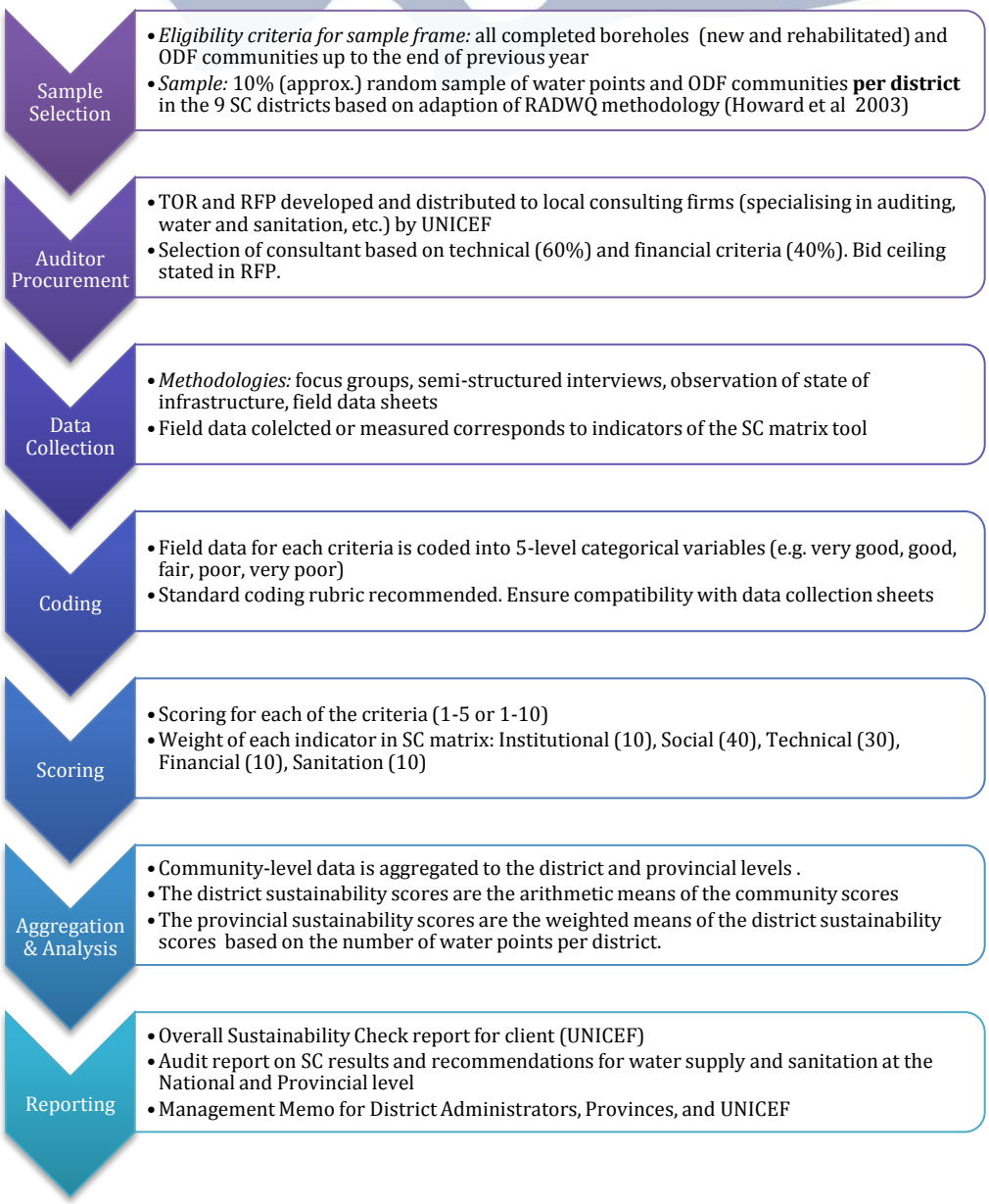
A key component of an effective service is the use of periodic audits to assess and recommend areas for service improvement. The International Standards of Auditing (ISA) notes that audits are a verification of the financial statement of a legal identity resulting in an quality assurance recommendation (ISA 2012). The use of audits of financial statements has resulted in the continued sustainability of many global services. Therefore, its transfer to the water and sanitation sector is explored in this paper through its application in the *One Million Initiative* in Mozambique.

This paper presents findings from the Government of the Netherlands (GoN), Government of Mozambique (GoM) and UNICEF co-financed rural water supply and sanitation programmes termed the *One Million Initiative (OMI)*. The OMI is being implemented between 2007 and 2013 with an objective to ensure that one million people gain access to sustainable water supply and sanitation facilities in 18 districts of three central provinces of Mozambique. To measure the sustainability of the infrastructure built during the programme, UNICEF adapted the conventional financial audit statement approach to undertake infrastructure audits of water supply and sanitation services. Given the complexity of sustainability and the multi-sectoral nature of water supply and sanitation, the audits incorporated multiple indicators comprising social, institutional, technical and financial dimensions.

Materials and Methods

Between 2007-2012, the OMI programme implemented five annual sustainability checks. This is an *intra programme* monitoring tool which is implemented on an annual frequency based on a 10% sample of all water and ODF communities and their sanitation infrastructure constructed from Yr 1 (2007) of the OMI to the Yr X of the annual sustainability check. The sustainability check is undertaken by a technical audit or consulting company who is contracted through a public tender process and follows the staged approach outlined in figure 1 below:

Figure 1: Sustainability Check Staged Approach.



Communities are selected based on a 10% sample of newly constructed water sources and of ODF communities in target districts using a method based on RADWQ (as outlined in Howard et al (2003)). The sample strategy consists of two forms of stratification:

1. Stage 1: primary stratification of programme districts.
2. Stage 2: random communities selection.

The primary stratification involved a 50% sample of the 18 districts of the OMI which include those outlined in Table 1 below:

Table 1: Primary Stratification.

No	Province	District
1	Tete	Zumbo, Marávia and Changara
2	Manica	Manica, Mossurize and Machaze

The second stratification stage used the following sampling formula for the random selection of the communities from programme intervention lists across the selected districts:

SI=Tc/N

Where:

- SI is the sampling interval.
- Tc is the total number of rehabilitated or new water sources and ODF communities.
- N is the total number of applied districts.

Concerning the water sources, the total number of sources (Tc) is the cumulative number of sources built from Yr 1 to Yr X.

Table 2: Water Point Sample Size.

Year	Total Number of Water Sources	Number of Districts	Sample Interval	Sample Size
2008	141	9	16	52
2009	205	9	23	52
2010	241	9	27	55
2011	535	9	59	52
2012	769	9	85	75

Table 3: Open Defecation Free Community Sample Size.

Year	Total Number of ODF communities	Number of Districts	Sample Interval	Sample Size
2008	N/A	N/A	N/A	N/A
2009	N/A	N/A	N/A	N/A
2010	54	9	6	14
2011	97	9	11	25
2012	296	9	33	27

The random number between 1 and the SI was produced using the EXCEL random function and then used to randomly select the distribution of water points and ODF communities from the inventorised list.

In order to get an equal distribution of communities from the different intervention years, a weighted mean was applied to the random sample method. This resulted in the distribution of samples from different intervention years for the water points and ODF communities.

The data collection was undertaken in the last quarter of each year (October-November) in the nine districts using four field collection tools:

Tool 1: Focus group discussion and semi-structured interview with the district administrator and government and non-government key people related to water and sanitation. The primary objective of the focus group discussions related to the **institutional** indicators. These include data collection on:

1. Existence of government updated water supplies and ODF data bases
2. % functionality of the water sources at the district level
3. Number of handpump mechanics at district level and their distribution
4. Number of available spare parts shops and their location
5. Number of ODF communities in the district
6. % sanitation coverage district level

Tool 2: Physical inspection of the water supplies and meetings with the community water committees – this includes data collection in the statistically selected communities on the social, technical and financial areas outlined in Table 4 below.

Table 4: Sustainability categories of water supply facility audits with selected Indicators.

Category	Sustainability indicator
Social	Water Committee operational with gender equity and clear understanding of roles
	O&M group established and operational with gender equity
Technical	Water Committee with sufficient technical knowledge to undertake preventative maintenance
	District level local mechanics available with capacity, equipment for repair of major breakdowns
	Repairs undertaken within 24 hours of major breakdown
	Spare parts availability at community level
Financial	Existence of updated accounts registered, complete and clear

	Existence of efficient funds collection and fund managenment system
	Frequency of contributions collection
	Balance income/expenses

Tool 3: Physical inspection of the communities declared ODF – the criteria considered for determination of ODF status of communities were the following:

1. 100 % of inspected households have latrine
2. 100 % of latrines have slab
3. 100 % of households have a hand washing system
4. 100 % of hand washing systems has soap or ash
5. 0 % of visible faeces in the environment
6. 0 % of reported defecation in the open air

These criteria are used in the national assessment of ODF communities by the Government of Mozambique to determine the ODF status.

Tool 4: Household survey in 10% (max 35) of selected latrines in ODF households for quality of sanitation system (safe sanitation). The inspection criteria included:

1. Latrine with durable and easily cleanable slab
2. The existence of well-fitting lid
3. Privacy provided
4. Existence of a hand washing system
5. Clean back yard

These criteria are aligned with the GoM *safe sanitation* concept, introduced in 2011, which envisages to ensure a more inclusive sanitation concept (not just ODF status but also handwashing, privacy as well as durability of the infrastructure) as well as to harmonise with global monitoring efforts (Joint Monitoring Programme).

The data collected for each sub group had a determined weightage which was either recorded as a percentage or as a binary response. The full list of the indicators and weightages is outlined in ANNEX 1. The results were then banded into a balanced 5-category scale using a weighted mean calculation in an EXCEL database. For example, for a district that has 3 communities and obtains results of 10 % of insufficient, 40 % of satisfactory and 50 % of good, the mark was calculated in the following formula:

2x10 % + 6x40 % + 8x50 % = 0.2+2.4+4 = 6.6

The percentage of each sub-indicator is calculated from this reported value to the maximum sub-indicator mark. So, in the example, the maximum mark being 10, the

percentage will be 66 %. For binary data, the percentage of yes obtained at district level corresponds to the maximum percentage mark established for the sub-indicator.

The composite of these indicators were categorised into the following 5 percentage categories.

Table 5: Overall Programme Sustainability Ranking.

	5	4	3	2	1
Percentage	**Very Good >90%**	**Good 76-90%**	**Fair 51-75%**	**Poor 51-75%**	**Very Poor <50%**

This score, which forms the overall sustainability score for the programme, has a weight of each sustainability dimension in SC matrix: Institutional (10), Social (40), Technical (30), Financial (10) and Sanitation (10). In addition, a separate analysis for water points and ODF communities is made. The scoring above has been based on extensive literature review and expert judgement (see table below – adapted from Godfrey *et al. (2009)*).

Dimension	Weight	Reference
Institutional	10	Hook et al (2006)
Social	40	Mukherjee et al (2003)
Technical	30	Iyer et al (2006); SKAT (2007)
Financial	10	Hook et al (2006)
Sanitation*	10	

* In addition, a separate analysis for water points and ODF communities was made since 2010.

The results of the sustainability check were then officially reported by the audit company through audit statements and management memos. These were sent to National, Provincial and District level Government officials with clear audit recommendations on what areas need to be addressed to improve sustainability in the respective intervention areas. In the consecutive year of the programme the SC would again provide a spot check for improvement in these areas.

Results

The Sustainability Check is an innovative tool which has evolved during the programme cycle of the One Million Initiative. In order to maintain comparability, the programme has attempted to standardise the indicators used in the Sustainability Check over the course of the programme. In addition, some adaptations had to be made when the programme strategy changed or after the introduction of new elements by the GoM (such as the safe sanitation concept in 2011).

Outlined in Table 6 is the result of the evolution of the sustainability check from 2008 to 2012.

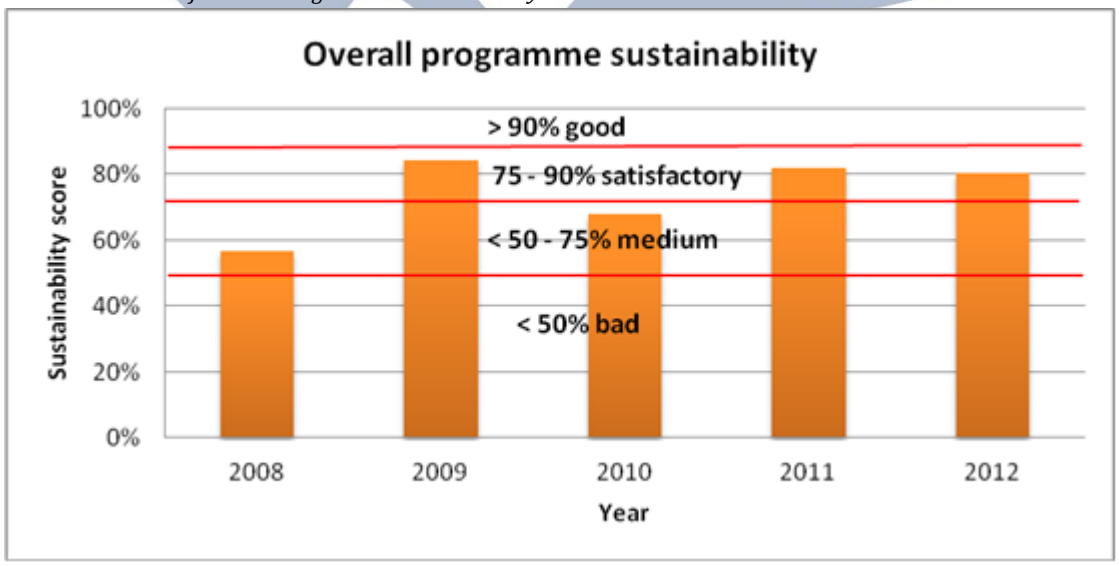
Table 6: Evolution of the sustainability check from 2008 to 2012.

Category	SC Design Components	2008	2009	2010	2011	2012
Intervention	Sanitation intervention	PHAST/CATS	CLTS	CATS	CATS	CATS
	WP intervention	Borehole construction/ rehabilitation	Borehole construction	Borehole construction	Borehole construction	Borehole construction
Sample: Procedure	List order	By locality	By locality	By locality	Weighted by yr	Weighted by yr
Sample: Water Points (WP)	Water point sample	Rehabilitated only	New & rehabilitated	New & rehabilitated	New & rehabilitated	New & rehabilitated
Indicators	Water Point Indicators	Rehabilitation only	Rehabilitation and New	Rehabilitation and New	Rehabilitation and New	Rehabilitation and New
	Sanitation definitions, indicators, & criteria	Latrine (A) only	ODF + latrine (A)	ODF + latrines (B)	ODF + latrines (C)	ODF + latrines (C)
Reporting	Report languages[4]	P	P	E, P	E, P	E,P
	Overall SC Report	Y	Y	Y	Y	Y
	Audit Statements	N	Y	Y	Y	Y
	Management memo	N	Y	Y	Y	Y

Results from the five year audits indicate a gradual increase in the level of overall sustainability of the One Million Initiative from 57% in 2008 to 80% in 2012.

[4] Languages: P=Portuguese, E=English

Table 6b: Results of overall Programme Sustainability 2008-2012.

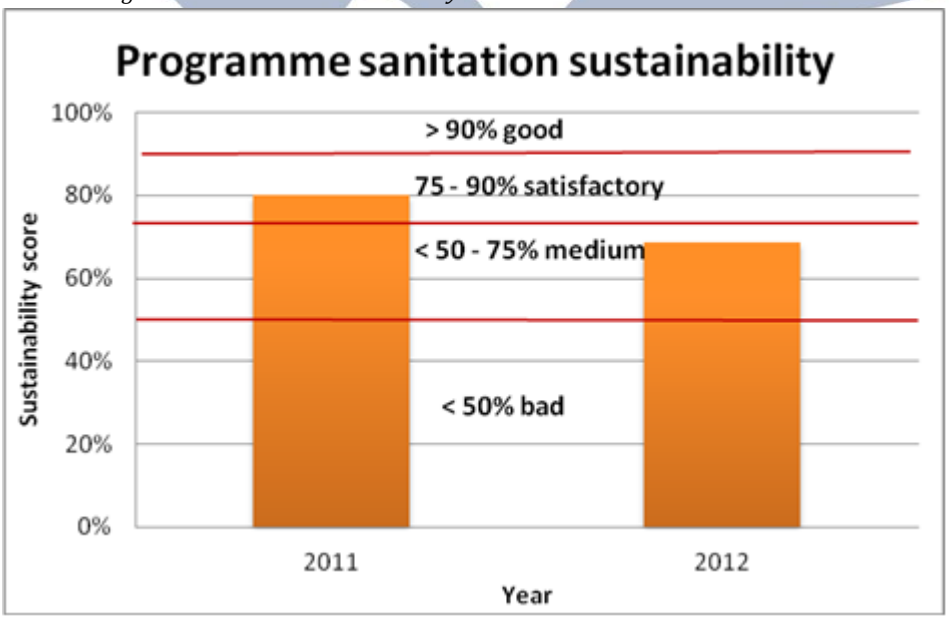


Further analysis of the indicators notes that an overall upward trend can be seen, with a positive outlier in 2009, a modest set back in 2010, and the reaching of a plateau between 2011 and 2012 (Table 6b). There are some factors that are hard to improve above a certain level and constrain further improvement of results above the 80 percent level.

Analysing contributing indicators for the water supply systems, more in-depth, significant improvements have been made on the institutional component, with databases operational and maintained for better troubleshooting by district authorities in case of serious breakdowns. Also, the Water Committees in charge of operation and maintenance of the water points have become well established, and they have in most cases a mechanic identified for repairs. Availability of spare parts remains critical in some districts.

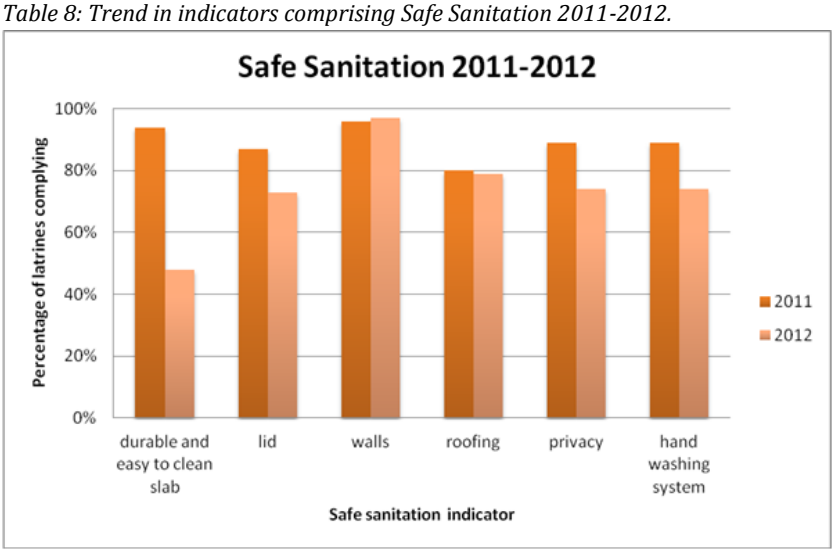
Disaggregated results for sanitation indicate that the sustainability of the ODF communities is of concern. In 2011, the One Million Initiative was resulting in a global average of 80% sustainability of ODF communities. This is in line with other studies (WSP, 2011, Chakma, 2008). However, in 2012, the level of sustainability reduced to 69% with a specific reduction in the quality of latrine construction from 72% to 56%. This reinforced concern about the overall sustainability of the CLTS approach (see Table 7 below).

Table 7: Programme Sanitation Sustainability 2011-2012.



Further analysis of the sub-indicators (Table 8 below) note a significant reduction in the number of latrines that have a lid, which is considered a key feature to reduce the potential cross contamination from flies. The lack of this simple but highly effective means of reducing diarrheal disease transmission was noted in the sustainability check of 2012 and has been placed as a key recommendation for action in 2013 to improve the sustainability of the ODF villages. Additionally, the reduction in the quality of the latrines was noted in the presence of slabs (flooring) made of durable materials and conducive to cleaning from 94% to 48% between 2011 and 2012 respectively. The annual monitoring of this indicator through the *Sustainability Checks* provides important feedback to the district governments and it provides critical data towards the Joint Monitoring Programme (JMP)s definition of *Improved Sanitation* (global target of the Millennium Development Goals).

Table 8: Trend in indicators comprising Safe Sanitation 2011-2012.



Discussion

There are several features that distinguish the *Sustainability Check* from other water and sanitation programmatic monitoring tools. Firstly, the *Sustainability Check* provides a series of annual "snapshots" (not continuous) on the functionality and use of water and sanitation infrastructure and the ODF status of communities. Due to the statistical design and standardised indicators, the *Sustainability Check* has developed into a tool that has been applied now in other rural water supply and sanitation programmes in Sub-Saharan Africa.

Secondly, the *Sustainability Check* is both an "interprogramme" and "post-programme" monitoring tool since it began the first year of the 6-year OMI implementation (2008-2013), and will continue through 2015 to measure post-programme sustainability of the programme outputs.

Thirdly, the *Sustainability Check* has proven to be an effective bottleneck analysis instrument for achieving sustainability. The feedback-loop it enables, with recommendations shared with programme key stakeholders through the annual audit statements, has been instrumental in the success of the OMI reaching its ambitious programme objectives. For example, within the institutional component, existence of a regularly updated database of water points in each district has improved from just over 70% in 2008 to 95% in 2012. Also, the capacity of the water user committees to carry out routine maintenance of their water points increased dramatically from 43% in 2008 to 96% in 2012.

A potential weakness of the *Sustainability Check* is that it is designed on a 10% random sample of constructed water points and ODF communities per district. This allows observations and conclusions to be drawn at a programme level. However, the *Sustainability Check* does not yield district level statistically valid results, nor does it allow follow up for every water point or ODF community for specific problems to be monitored, diagnosed and resolved at the level of the community or individual water point.

With (national) sanitation approaches undergoing large transformations (as during the OMI programme), the tool should be flexible in adapting to this. The criteria for ODF communities have been adjusted regularly during the programme implementation and with the current debate around ODF sustainability it has to be capable of capturing new issues as they emerge.

The contract to carry out the *Sustainability Check* has been tendered annually to a roster of eligible companies. The survey has to be completed in limited time, but with maximum confidence in survey team quality. To reduce cost and increase efficiency of the survey process during the course of the programme, it was concluded that a uniform, "off-the-shelf" tool would be required which integrates the modules of the survey tools and also facilitates data collection, processing and reporting. From the side of the reporting, it was acknowledged that somewhat more standardised reporting

formats rather than lengthy qualitative reports could improve its use at decentralised levels. This brought up the issue of moving towards the use of PDA/smartphone based technology for conducting the annual sustainability checks. This technology would enable harmonisation of tools (for application in other projects/programmes) and also facilitate information flows with the possibility of having information online. The *Sustainability Check* has proven to be an appropriate tool to measure the performance of the Non-Government Organisations (NGOs) involved in the implementation of social mobilisation, and community education. There is a correlation between NGOs contract performance indicators and the *Sustainability Checks* results in a particular district. In other words, the *Sustainability Check* reflects the positive or negative NGO performance during the year.

Conclusions

The evolution of the overall sustainability of the WASH infrastructure, as measured by the annual *Sustainability Checks* in the One Million Initiative, shows an increasing trend. This leads to the conclusion that greater attention to sustainability can be achieved if regular verification of sustainability is a priority during programme implementation. It further notes that the use of management memos and audit statements between 2008 and 2009 has a direct impact in ensuring increased attention to sustainability issues, with a correlated change in the overall indicator from 57% to 84% in a single year.

Conclusively, the *Sustainability Check* provides mechanisms for programmatic adjustment by disseminating the results of the *Sustainability Check* to institutions with key roles in the programme implementation by making recommendations to improve water supply and sanitation sustainability based on the findings of the annual *Sustainability Check*. With the experience available of *Sustainability Check* development and implementation it is now up to implementing governments and donors to move towards scaling-up and integration of sustainability monitoring in the sector. The *Sustainability Check* is a robust base for development of sustainability indictors for the National Rural Water Supply and Sanitation Programme (PRONASAR). The Government of Mozambique included it in the annual workplan for PRONASAR in 2013 covering water supply, sanitation and capacity building. The *Sustainability Check* has been noted by GoM as a key tool in analysing the obtainment of a sustainable MDG target of 70% coverage for rural water supply and 50% coverage for sanitation in Mozambique. Simultaneously, development of "off-the-shelf" monitoring packages should be taken to the next level to ensure availability of cost-effective tools and information sharing platforms.

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ANNEX 1: Coefficients used for calculation of the indicators

Category	Indicators	Sub-indicators	Coefficients							Maximum grade sub-indicator	Maximum grade indicator
			excellent	**good**	**satisfactory**	**bad**	**Very bad**	**yes**	**no**		
Institutional	Established, operational and updated database	Manual database for existing water point						1	0	1	10
		Operational database in use at district level						2	0	2	
		Frequency of update	2	1.5	1	0.5	0			2	
		Person in charge of the water point database						3	0	3	
		Communication system of the community	2	1.5	1	0.5	0			2	
Service	No.. of users ≤500	No. of users of the water point	5	4	3	2	1			5	5
	Functionality	Functioning of the water point	1.5		1		0			1.5	6.5
		Frequency of damages	5	4	3	2	1			5	
	Yield	Water point flow	1	1	0.5	0.5	0			1	1

	Indicators	Sub-indicators	**excellent**	**Good**	**satisfactory**	**bad**	**very bad**	**yes**	**no**	Maximum grade sub-indicator	Maximum grade indicator
Social	Capacitated WC with gender equity and clear roles understanding	WC Composition	2	2	1	0.5				2	15
		Management group capacity building	1	1	0.5	0.5	0			1	
		Roles clarity in the management group	2	1.5	1	0.5	0			2	
		% of women in management group	5	4	3	2	1			5	
		No. of WC meetings in the last 12 months	5	4	3	2	1			5	

	Capacitated maintenance group with gender equity	WC routine maintenance capacity	2	2	0	0	0			2	10
		Management group capacity	1	1	0.5	0.5	0			1	
		Roles clarity in management group	2	1.5	1	0.5	0			2	
		% of women in the maintenance group	5	4	3	2	1			5	
Technical	WC knows how to act in case of damage	WC knows who to contact in case of damage						5	0	5	15
		WC knows where to acquire spare parts						5	0	5	
		WC knows the cost of spare parts						5	0	5	
	Availability of local mechanics for repairs	WC has relationship with existing competent mechanic for important repairs						6	0	6	10
		Relationship with mechanic	4	3	0					4	
	Repair conducted in 24hrs	Duration of the repairs	2.5	2	1.5	1	0.5			2.5	2.5
	Availability of spare parts	Availability of spare parts for small repairs	**2**	**1.5**	**1**	**0.5**	0			2	5
		Distance to the point of sale	**3**	**2.5**	**2**	**1.5**	1			3	

	Indicators	Sub-indicators	**excellent**	**Good**	**satisfactory**	**bad**	**Very bad**	**yes**	**no**	Maximum grade sub-indicator	Maximum grade indicator
Financial	Register of accounts updated, complete and clear	Frequency of accounts update	1	1	0.5	0.5	0			1	2
		Clarity of accounts register	1	1	0.5	0.5	0			**1**	
	Existent and efficient funds collection and conservation system	Existence of contributions conductor						1	0	1	3
		One system of funds collection is implemented						1	0	1	
		Funds kept in a safe way						1	0	1	

	Collection of contributions	% of users that contributed in the last 12 months	2	1.5	1	0.5	0			2	3
		Regularity of contributions	1	0	0	0	0			1	
	Balance Income /expenses	Income is superior or equal to expenses						2	0	2	2

Coefficients used for calculation of sanitation indicators

Category	Indicators	Sub-indicators	Coefficient		Maximum grade sub-indicator	Maximum grade indicator
			Yes	No		
Institutional	Database established, operational and updated	There is a ODF database	5	0	5	10
		The ODF database is operational and in use at district level	2	0	2	
		There is a person in charge of ODF database	3	0	3	
Defecation in the open air	Practice of defecation in the open air	Existence of faeces	5	0	5	10
		Witness of defecation in the open air	5	0	5	
Latrine	Households with latrine	Latrine in households	3	0	3	3
	Latrine in use	Reported	2.5	0	2.5	5
		Observed	2.5	0	2.5	
	Hygiene of latrine	Observation	2	0	2	2
	Improved slab	Improved concrete slab	15	0	15	15
		Plastic slab	15	0		
		Improved slab of wood	15	0		
		Other easy to clean	10	0	10	
		Without slab (traditional)	0	0	0	
		Ground/concrete slab (improved traditional)	5	0	5	
		Other difficult to clean	0	0		
	Lid	Lid	10	0	10	10
	Wall	Latrine without wall	2.5	0	2.5	2.5
	Roof	Latrine has roof	2.5	0	2.5	2.5

	Privacy	Latrine provides privacy with door	5	0	5	5
		Latrine provides privacy with curve	5	0		

Category	Indicators	Sub-indicators	Yes	No	Maximum grade sub-indicator	Maximum grade indicator
Hygiene	Hand washing system	There is a hand washing system	5	0	25	30
		There is soap or ash	10	0		
		There is water to wash hands	10	0		
	Back yard cleaning	Back yard is clean	5	0	5	

Annex 1: Examples of service provider indicators