Full Length Research Paper

Progress in addressing Millennium Development Goal 7; The Case of Malindza, A Semi-arid Rural area in Swaziland.

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Abstract
A study was conducted to determine the extent at which the Millennium Development Goal 7 was achieved in Swaziland, using Malindza community, a rural community situated in the semi-arid area of Swaziland. A descriptive research using scheduled personal interviews and a questionnaire developed and pre-tested by the authors was used for data collection. The study had a sample frame of 363 households and a sample size of 160 households, developed using a sample size calculator. Descriptive statistics using SPSS was used to analyse the findings of this study.The research collected data on structural integrity of household dwellings, fuel used by households for lighting, cooking and heating, sources of domestic water, methods used for disposal of faecal waste, and methods used for disposal of solid household waste. The results reflected that 78% of the households had walls of dwelling structures made from concrete blocks and mortar. Another 15.6% had their structures made from stick and mud. Such structures were not durable and were likely to fail in the event of floods and strong winds. Most (93%) of the households had their dwelling roofs made from corrugated iron, as opposed to 1.9% who had their roofs made from thatch grass. The introduction of a rural electrification project had been beneficial, as 62% of the households had electricity installed and they were using it for lighting. Ninety seven percent of the households relied on firewood for cooking. About 75% of the households had access to clean water in the form of tap water within the household, adjacent to the household or boreholes. About 83% of the households used improved toilets at Malindza, while at national level about 50% of the households used them. The disposal of household solid waste posed a challenge as over 39% of the households did not have an appropriate method of waste disposal, and they littered.

Keywords: Domestic water, Dwelling structures, Household fuel, Sanitation

Introduction
The Kingdom of Swaziland is a landlocked country in Southern Africa. It borders South Africa and Mozambique (Figure 1). It has an area of 17,364 km^2, with a population of 1.2 million (Central Bank of Swaziland, 2014).

In 2000, the country signed the United Nations Millennium Declaration, and embraced the Millennium Development Goals (MDGs) and the challenges of achieving them by 2015 (Government of Swaziland, 2010). The Millennium declaration addressed eight Millennium Development Goals. MDG 7 addressed the issue of environmental sustainability. The targets within MDG7 were to; 1) integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources, 2) half by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation, and 3) achieve by 2015, a significant improvement in the lives of at least 100 million slum dwellers (United Nation, 2013). The Millennium Declaration has since been succeeded by the 2030 Agenda for Sustainable Development which includes a set of 17 Sustainable Development Goals (MDG) that aim to end poverty, fight inequality and injustice, and tackle climate change by 2030 (United Nations, 2015). Out of the 17 SDGs, three of them that address the targets within MDG7 are SDG 6 (addressing issue of clean water and sanitation), SDG7 (addressing affordable and clean energy), and SDG11 (addressing issue of dwellings and housing).

Plantations, natural forests and woodlands cover about 45% of the total land area in Swaziland (FRA, 2015). The area under natural forest has increased from 312,000 ha in 1990 to 423,000 in 2010 due to natural forest regeneration. On the other hand, the area under plantations decreased from 160,000 ha in 1990 to 140,000 ha in 2010 (Manyatsi, 2014). It is estimated that 80% of the households in the country use firewood for cooking and household heating (Manyatsi and Hlophe, 2010). The amount of wood harvested for firewood has increased over time, and it is proportional to the population increase. In 1990 firewood harvest amounted to 710,000 m^3, and by 2012 it had increased to 1,093,000 m^3, showing an increase of 52% (FAO, 2014). Access to electricity contributes towards poverty alleviation, over and above mitigating deforestation, as the amount of firewood harvested and burned would be reduced. The

government of Swaziland started a Rural Electrification Programme in the mid-1990s in order to provide access to electricity to rural public institutions and rural households, where electricity was not deemed economically viable (Swaziland Electricity Company, 2014). At present, 60% of the households in the country have access to electricity.

Problems of poverty and poor health are closely linked with those of the availability of water, its proximity, its quantity and its quality (UNESCO, 2005). The use of improved drinking water sources in urban areas is almost double the use in the rural areas in Sub-Saharan Africa (WHO and UNICEF, 2015). In Swaziland 94% of the urban population had access to improved drinking water sources as compared to 60% of the population in rural areas (World Bank, 2015.About 75% of urban households have water piped into their dwellings or yard, while 23% of rural households have direct piped water. Rural households also rely on public taps and dug-projected wells for potable drinking water. About 35% of the total population rely on unsafe drinking water sourced mainly from rivers, streams, unprotected wells and springs (Manyatsi and Mwendera, 2007). Half (50%) of the households had improved toilet facilities in 2007. The urban areas, including the peri-urban area access to improved sanitation stood at 55.6%.

It is estimated that about 21% of the country's population lives in urban areas and peri-urban areas. The rate of urbanisation was estimated at between 3%and 5% per annum (World Bank, 2015). In Swaziland, there is a dominance of informal settlements as opposed to slum dwellings. The informal settlements take the form of unplanned households units in the peri-urban areas. They usually lack standard residential structures and infrastructure services (Owoeye and Omole, 2012). Major informal settlements are found in the peri-urban areas of the country's major two cities (Mbabane and Manzini).

The achievements and progress on addressing the issues under MDG 7 have not been evaluated holistically in Swaziland, despite the fact that the mandate of the United Nations Millennium Declaration has expired. The objective of the study was to determine the extent at which the Millennium Development Goal 7 was achieved in Swaziland using Malindza community as a case study. Malindza is a semi-arid rural community.

Methodology

Description of study area
The study was conducted at Malindza, a rural area in the lowveld of Swaziland (Figure 1). The area has four communities (Lawini, Malindza, Njobo and Sikhuphe). It is situated under Swazi Nation Land (SNL). Under SNL ownership of land is vested on the King, and the local chief is responsible for allocating land use rights for the purpose of cultivation and building homesteads to each family. Grazing of livestock is done on communal basis. Malindza had a population of 2,548 inhabitants and 363 households in 2007, when the last national census was conducted (Government of Swaziland, 2007). The annual rainfall varied from the low of 200mmin 1990 to the high of 850 mm in 2005. Average temperatures ranged from the low of 28^0C in 2000 to 31^0C in 2010 (Government of Swaziland, 2014). Households rely on growing crops such as maize, sweet potatoes, beans, pumpkin, and jugo beans for livelihood. However, due to high temperatures and low rainfall, yield of crops, and in particular of maize are poor in most years. Households in the area also rear livestock such as cattle, goat and poultry.
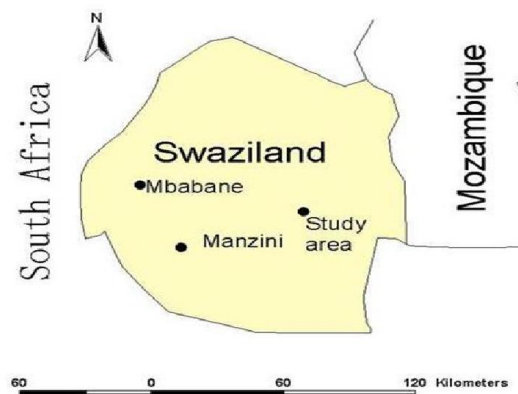
Fig 1: Map of Swaziland showing location of study area

Data collection
A questionnaire was developed and used to collected both qualitative and quantitative data. A list of households was used as a sampling frame and the households were allocated identification numbers. A sample size calculator (Creative Research Systems, 2014) was used to determine the representative households for data collection at 95% confidence level and 5% confidence interval. The representative number of households was found to be 160. The households to be sampled were randomly selected. The number of households that were selected from the different communities (Lawini, Malindza, Njobo and Sikhuphe) were 34, 50 57 and 19, respectively. The questionnaire solicited information on household profile, household dwelling structures, household fuel usage, water

sources and sanitation situation. Prior to administering the questionnaire, it was pretested by administering it to 20 households within an adjacent community for face and content validity. The questionnaire was further modified based on the feedback from the pre-test. It was administered through interviews in each of the selected households, and the respondent was the head of household, or any adult person who was available at the time of conducting the interviews.

Data analysis
The collected data was coded and entered into a Statistical Package for the Social Sciences (SPSS) software for analysis (SPSS, 2008). Descriptive statistics that were used to analyse the data included percentages and frequencies. The results were presented in the forms of tables.

Results and discussion
Profile of households
The age of household heads ranged from 17 to 80 years, with 54 years being the mean for the 160 households studied. The results further reflected that males were the most dominant heads of households as 63% were male headed while 37% were female headed. The majority (53.8%) of household heads were married, while 31.3% were widowed. About 12.5% of the household heads were single and 4% of these households were child headed. According to UNAIDS (2002) many African countries were greatly affected by the HIV/AIDS pandemic and this resulted in household being headed by surviving children. It also caused serious damage to the agriculture sector, especially in areas highly dependent on labour for production. The able and active bodied men and women were infected and affected by HIV/AIDS. In Swaziland for example, about 25% of the population was infected with the HIV/AIDS virus (WFP, 2005). The majority (54%) of household heads were unemployed. The main sources of income in the study area were salaries and repatriation from working members of the households with about 50% of the households relying on it (Mavuso et al., 2015). About 26% of the household's income came from informal work. These can be seasonal or low paying jobs with a very poor job security. About 7% of the respondents relied on subsistence agriculture and could sell excess produce once in a while to buy farming inputs.

Household dwelling structures
The most (79.4%) used wall material for the construction of dwellings structures by households at Malindza was reported by the households studied as blocks and mortar (Table1).

Table 1: Wall construction material used by households at Malindza (N=160)

Community	Wall construction material												Total	
	B&M		CB&M		CIR		S&MS		Stones		Other			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Lawini	3	1.9	27	16.9	0	0	1	0.6	1	0.6	1	0.6	33	**20.6**
Njobo	0	0	52	22.5	1	0.6	5	3.1	0	0	0	0	58	**36.3**
Sikhuphe	0	0	14	8.2	0	0	2	1.3	0	0	0	0	16	**10.0**
Malindza	2	1.2	31	19.2	1	0.6	17	10.6	1	0.6	1	0.6	53	**33.1**
Total	**5**	**3.1**	**124**	**79.4**	**2**	**1.2**	**25**	**15.6**	**2**	**1.3**	**2**	**1.2**	**160**	**100**

B&M -Brick and mortar, **CB&M** - Concrete blocks and mortar, **CIR-** Corrugated iron, **S&M** - Stick and mud.

The other wall construction materials that was utilized for dwellings by households comprised stick and mud, corrugated iron, brick and mortar, stones and other materials, which were used by 15.6%, 1.3%, 3,1% and 1,3% households, respectively. The stick and mud as well as stone wall dwellings were of relatively low structural integrity and not durable. The material was however, locally available and affordable to poverty stricken households as evident by the Central Bank of Swaziland (2014) which stated that 63% of the population in Swaziland live below the poverty line. Walls made of concrete blocks and mortar and well as brick and mortar are of relatively good structural integrity and more durable (Venkatarama *et al,* 2007).

The results in Table 2 indicated that the majority (93.5%) of the households at Malindza used corrugated iron sheets for the roofing material for their dwelling structures. The other roofing materials used were tiles/slates and thatching grass utilised by 5.6% and 1.9% households, respectively. The households that used corrugated iron as roofing material were higher than the national proportion of 80% reported by Manyatsi and Vilane (2011).

Approximately 62% of the households relied on electricity for lighting, while 37% used candles and 2% used solar power for lighting. The proportion of households with access to electricity was above the national average of 60% reported by the Swaziland Electricity Company (2014). The increase in household electricity connection was due to rural electrification projects implemented by the government of Swaziland to help develop rural areas. With more access to electricity, women would no longer be disadvantaged and would not need to walk long distances to collect firewood for fuel.

Table 2: Roofing material for household dwelling structures at Malindza (N = 160)

| Community | Roofing material | | | | | | Total | |
| | Tiles / Slate | | Corrugated iron | | Thatch grass | | | |
	N	%	N	%	N	%	N	%
Lawini	4	2.5	29	18.1	0	0	33	20.6
Njobo	2	1.3	54	1.3	2	1.3	58	36.3
Sikhuphe	1	0.6	15	9.4	0	0	16	10.0
Malindza	2	1.3	50	31.2	1	0.6	53	33.1
Total	9	5.6	148	60	3	1.9	160	100

Household energy or fuel for lighting, cooking and heating
The households at Malindza used energy for lighting that was reported as electricity from the National grid, solar power and candles (Table 3).

Table 3: Household lighting power sources at Malindza (N = 160).

| Community | Lighting power source | | | | | | Total | |
| | National grid electricity | | Solar power | | Candles | | | |
	N	%	N	%	N	%	N	%
Lawini	25	15.6	0	0	8	5.0	33	22.6
Njobo	39	24.4	0	0	19	11.9	58	36.3
Sikhuphe	12	7.5	1	0.6	3	1.9	16	10.0
Malindza	23	14.4	1	0.6	29	18.1	53	33.1
Total	99	61.9	2	1.3	59	36.9	160	100

 According to the Government of Swaziland (2010) rural electrification is key to rural development and coping with the impact of climate change and variability as households are able to preserve more food in refrigerators. Vilane et al. (2015) found that some households with electricity had started small businesses such as running tuck shops to sell household essentials to other households in other rural communities in the country. These basic essentials included candles, matches, bread and sweetened ice blocks. The family tuck shops contributed to the livelihood s of the households.

The results in Table 4 indicated that approximately 98% of the households at Malindza used firewood for cooking and the remaining 2.5% used electricity from the national grid. The high demand for firewood leads to deforestation, which result in reduced carbon dioxide uptake by trees that may eventually contribute to global warming and accelerate climate change.

Table 4: Cooking fuel sources for households at Malindza (N=160)

| Community | Households cooking fuel | | | | Total | |
| | Firewood | | National grid electricity | | | |
	N	%	N	%	N	%
Lawini	32	20.0	1	0.6	33	20.6
Njobo	56	35.0	2	1.3	58	36.3
Sikhuphe	15	9.4	1	0.6	16	10.0
Malindza	53	33.1	0	0	53	33.1
Total	156	97.5	4	2.5	160	100

Households domestic water sources, sanitation and solid waste disposal
Households had potable tap water within or near the homestead (Table5). The potable water was supplied by the Swaziland Water Services Cooperation (SWSC), a government company (Swaziland Water Services Cooperation, 2013). A third (33.1%) of the households at Malindza used communal boreholes as sources of domestic water. The boreholes had been installed by the government of Swaziland and other development partners, including non-governmental organizations and international organizations. It is worth noting that the 75% households that used water from SWSC (41.9%) or boreholes (33.1%) were using water that was safe for drinking. A few (18.1%) of the households used unsafe domestic water that was sourced from unprotected community wells, canal and dams.

Table 5: Household domestic water sources at Malindza.

| Domestic water source | Community | | | | | | | | Total | |
| | Lawini | | Njobo | | Sikhuphe | | Malindza | | | |
	N	%	N	%	N	%	N	%	N	%
Indoor tap	3	1.9	2	1.3	4	2.5	3	1.9	12	7.5
Tap within yard	20	12.5	18	11.3	5	3.1	12	7.5	55	34.4
Private borehole	0	0	0	0	0	0	1	0.2	1	0.6
Communal borehole/tap	6	3.8	19	11.9	2	1.6	26	16.3	53	33.1
Pond	0	0	2	1.3	4	2.5	4	2.5	10	6.3
Communal protected well	0	0	13	8.1	1	0.3	2	1.3	16	10.0
Canal	1	0.3	1	0.3	0	0	1	0.3	3	1.9
Dam	3	1.9	3	1.9	0	0	4	2.5	10	6.3
Total	33	20.6	58	36.3	16	10.0	53	33.1	160	100

The sanitation methods used by households in Malindza were identified as conventional pit latrine, improved pit latrine, no toilet, flush toilet and the bucket system by 69.4%, 10.6%, 15.6%, 3.1% and 1.3% households, respectively (Table 6).Most (82.1%) of the160 households studied used improved sanitation methods. These were reported by the households as flush toilets (3.1%), improved pit latrines (10.6%) and conventional pit latrine (69.4%). This proportion was above the 50% national utilisation reported by the World Bank (2015). Though this was the case, IRIN (2014) reported a nationwide outbreak of diarrhoea in August 2014, which was attributed to poor sanitation and lack of clean water in schools and homes.

Table 6: Toilets utilised by households at Malindza (N = 160).

| Household toilet | Community | | | | | | | | Total | |
| | Lawini | | Njobo | | Sikhuphe | | Malindza | | | |
	N	%	N	%	N	%	N	%	N	%
No toilet	6	3.8	9	5.6	0	0	10	18.9	25	15.6
Flush toilet	1	0.6	2	3.4	2	1.3	0	0	5	3.1
Improved pit latrine	5	3.1	8	5.0	2	1.3	2	1.3	17	10.6
Conventional pit latrine	20	12.5	39	24.4	12	7.5	40	25.0	111	69.4
Bucket system	1	0.6	0	0	0	0	1	0.6	2	1.3
Total	33	20.6	58	36.3	16	10.0	53	33.1	160	100

About 16% of the households in Malindza reportedly had no toilets and they relieved themselves in the bush. The bucket system, which was used by one (1.3%) household, was also emptied in the bush. These two sanitation methods are likely to contaminate surface water sources. Despite the above, it is worth noting that the Ministry of Health together with development partners have embarked in the construction of pit latrines in the rural and peri-urban areas in the country (Government of Swaziland, 2015; World Vision International, 2015; Red Cross Society, 2013).

The household waste disposal methods used in Malindza were reported as pit, open burning and littering by 45.0%, 15.6% and 39.4% households, respectively (Table 7). This was the case though the Waste Regulations of 2000 regulate the management and disposal of solid waste in the country (Government of Swaziland, 2000). The regulations however tend to be enforced in urban areas and not in the rural areas.

Table 7: Solid waste disposal methods used by households at Malindza (N = 160).

| Community | Household waste disposal method | | | | | | Total | |
| | Pit | | Open burning | | Littering | | | |
	N	%	N	%	N	%	N	%
Lawini	18	11.3	4	2.5	11	6.9	33	20.6
Njobo	32	20.0	11	6.9	15	9.4	58	36.3
Sikhuphe	11	6.9	1	0.6	4	2.5	16	10.0
Malindza	11	6.9	9	5.6	33	20.6	53	33.1
Total	72	45.0	25	15.6	63	39.4	160	100

The 45% households using pits reported that when they were full, the waste was burnt, while 15.6% households reported that the waste was burnt in the open. About 39% of the households in Malindza was littering. According to UNDP (2013) littering is one of the environmental problems faced by the country, especially plastics, which are not degradable. However, the Swaziland Environment

Authority (SEA) has been running campaigns to promote environmental protection and to educate the nation against littering (SEA, 2015).

Conclusion

The target for MDG 7 was to ensure environmental sustainability. This entails protecting of environmental resources, sustainable access to safe drinking water and basic sanitation and improved household dwellings. The majority of households (78%) had the walls of dwelling structures made from concrete block and mortar, and thus were of better structural quality and more durable. Eighty percent of the households used corrugated iron as roofing material. About 16% of the households had their walls of their dwellings made from stick and mud, and these dwellings were of poor structural quality. Sixty two percent of the households had access to electricity from the national grid system. The electricity was used mainly for lighting. More or less all the households (97%) used firewood for cooking purposes. This contributed to deforestation. Seventy five percent of the households had access to safe drinking water. The proportion of households that used improved sanitation methods for disposal of faecal matter was higher than the national average at 83%. Littering was prevalent, as 39.4% of the households did not dispose their solid household waste in a controlled and environmentally friendly manner.

Ethics

All the authors read and approved the manuscript and no ethical issues involved.

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