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Review

Comparative Analysis of Water Poverty at the Community Level: A Case of Mitundu and Chitsime Extension Planning Areas in Central Malawi.

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Water is essential for the well-being of mankind and for sustainable development. It is used in productive and consumptive activities and contributes to rural and urban livelihoods. Lack of access to drinking water is an indicator of poverty. Therefore, this research focused on assessing water stress and scarcity, linking physical estimates of water availability with socioeconomic variables that reflect poverty, i.e. a Water Poverty Index. The study was conducted in Mitundu and Chitsime Extension Planning Areas. Secondary data was obtained from the Ministry of Water and Irrigation Development, Mitundu and Chitsime Health Communities, and Lilongwe District Assembly. In addition, primary data was collected from focus group discussions conducted in each community. Using Water Poverty Index, water poverty levels were estimated. The study has shown that Mitundu EPA has a lower poverty level compared to Chitsime EPA. However, based on a threshold of 50 for water poverty level, it was shown that both communities need improvements in component areas that were less than 50 in order to lower water poverty. The study recommends that WPI should be updated at reasonable intervals and carried out in other areas to allow decision-makers to identify where attention is needed most and monitor progress at the community level.

Keywords: water, poverty, water poverty, index, environment.

INTRODUCTION

Water is the essence of life and safe drinking water is a basic human right essential to all. Water is essential for the well-being of mankind and for sustainable development. Though water is necessary for human survival, many are denied access to sufficient potable drinking water supply and sufficient water to maintain basic hygiene. Globally, 1.1 billion people rely on unsafe drinking water sources from lakes, rivers and open wells and majority are from sub-Saharan Africa (42%) (World Health Organization/United Nations Children's Fund, 2004). Lack of access to drinking water is itself an indicator of poverty.

Increasingly, water is seen as one of the most critically stressed resources, and much attention is now being paid to global water stress and the water needs of the poorest people (Sullivan et al., 2003). The objective of the United Nations Millennium Development Goals (MGDs), particularly goal number 7, is to "Ensure environmental sustainability" (That is: to reduce persistent poverty and promote sustainable development worldwide especially in developing countries.). Improvement of drinking water supply and sanitation is a core element of poverty reduction. One of the indicators of goal number 7 is to 'halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation'. This MDG target will at least reduce the number of people without potable water and adequate sanitation.

However, the provision of water supply especially in developing countries may not be sufficient because of high population growth, and low priority given to water and sanitation programmes (Jabu, 2005). The goal number 1, to "Eradicate extreme poverty and hunger" is also significant since, as water is a fundamental basis of all life, nobody can be lifted out of extreme poverty without adequate access to water. However, availability of safe water does not automatically lead to poverty alleviation (Sullivan et al., 2003).

The world as a whole is on track to meet the MDG drinking water target. This good news masks two serious challenges: the inequity in coverage between rural and urban areas; and accelerating urban population growth in developing regions. And although the world is still on track for reaching the target, the trend appears to be deteriorating. Rural areas still lag far behind urban areas in terms of drinking water coverage from improved sources. Rural people – many of them women and children – spend hours per day carrying water from far away water sources (WHO/UNICEF, 2006).

Water development is a key to Malawi due to its direct linkages with agriculture and energy. Proper conservation of water contributes towards the generation of electricity and is also an important resource for both household and industrial use. In agriculture, water is important for irrigation which contributes towards reduction of the over dependence on rain-fed agriculture. Thus, increasing access to safe water supplies, contributes to sustainable livelihoods and poverty alleviation through improved agriculture, greater food security, more clean drinking water and better sanitation. Therefore, ensuring availability of water is central to achieving the MDGs objectives (MGDS, 2006).

According to WHO/UNICEF (2006), progress towards drinking water and sanitation solutions needs to be accelerated and sustained to contribute to breaking the circle of poverty, lack of education, poor housing and ill-health. Therefore, to quantify water poverty in a universally accepted way, Sullivan (2002) proposes that water poverty should be quantified through the derivation of a "Water Poverty Index". The index enables progress towards development targets to be monitored, and water projects to be better targeted to meet the needs of the current generation, while securing water availability for the needs of future generations. The study therefore aimed at assessing water poverty in communities of Mitundu and Chitsime Extension Planning Areas. Specifically, the study compared water poverty levels between the two communities using WPI.

Data

Data was collected in two locations namely; Mitundu EPA and Chitsime EPA. The Mitundu EPA is in a rural area while Chitsime EPA is in a peri-urban area so that the differences in water poverty and data requirements between the two environments are taken into account. The study used both primary and secondary data. Key informant interviews and focused group discussions were methods the research used to obtain primary data. Some of the key informants were the Agricultural Extension Development Officers and Village Headmen. The primary data were collected for dry season because it was considered that the dry season results are more representative (Sullivan *et al*., 2003) using probability sampling methods. In addition, considerable amounts of secondary data were obtained from Ministry of Water and Irrigation Development, Chimwala and Mitundu Health Communities, and Lilongwe District Assembly.

Model specification

WPI which has a similar structure to that of the HDI was used in this study because it is judged to achieve the results while retaining the virtues of simplicity and straightforwardness (Sullivan et al, 2002).

The five key components (see Appendix) are combined using the following general expression:

$$\boldsymbol{WPI} = \frac{\sum_{i=1}^{N} w_i X_i}{\sum_{i=1}^{N} w_i} \qquad \textbf{[1]}$$

Where:

$\boldsymbol{WPI} =$ Water poverty index value for a particular location

$X_i =$ Component *i* of the WPI structure for that location

$W_i =$ Weight applied to that component.

Each component is made up of a number of subcomponents, and these are first combined using the same technique in order to obtain the components. For the components listed above, Equation (1) can be

$$\boldsymbol{WPI} = \frac{w_r R + w_a A + w_c C + w_u U + w_e E}{w_r + w_a + w_c + w_u + w_e} \qquad \textbf{[2]}$$

rewritten as:

Where: R is resources, A is access, C is capacity, U is use and E is Environment. Each of the components is first standardized so that it falls in the range of 0 to 100; thus the resulting WPI value is also between 0

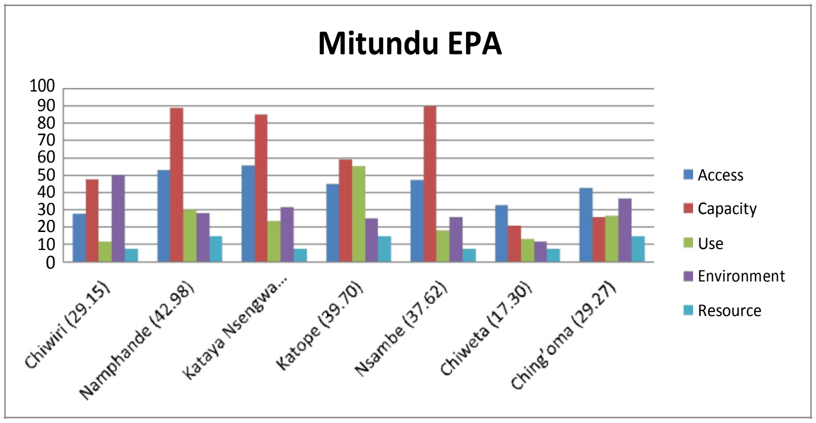

Figure 1. water poverty index components and values for selected sections in Mitundu EPA

Source: Field Survey (2010)

and 100. The highest value, 100, is taken to be the best situation (or the lowest possible level of water poverty), while 0 is the worst.

Collected data was analyzed using Microsoft Excel package to come up with water poverty index values, bar graphs and pentagrams for Mitundu and Chitsime EPAs. The structure of the water poverty index allows different weights to be applied to both the component and the subcomponents (Sullivan et al., 2003). Unequal weights were used for the subcomponents. This means that there is some degree of implicit weighing of subcomponents, since there are different numbers of elements within each main component.

ESTIMATION RESULTS AND DISCUSSION

Water Poverty Index scores by sections in the study areas

Mitundu EPA

Figure 1 below shows how the WPI score may vary between sections in Mitundu Extension Planning Area. The results show that the WPI scores range from 17.30 to 42.98 in the dry season. During the dry season, the capacity to manage water brings the WPI values down. This is because in some sections, water supply points become unreliable in the dry season which in turn affect people's access to water and use (Sullivan et al., 2002). Eventually, lower WPI values are generated during the dry season.

Kataya Nsengwa, Nsambe, and Katope scored the highest on access, capacity, and use respectively. Chiwiri was the highest on environment. The overall WPI scores show that the worst situation to be in the Chiweta section, with a score of 17.30. The best score was in the Namphande section, where the WPI was 42.98. This suggests that although there are improvements to be made everywhere, the most urgent attention should be given to Chiweta, Chiwiri and Ching'oma Sections. Some sections have a higher score on resource (14.75) while others have a lower score (7.59). This is because sections that have a higher score access water for irrigation and other activities from Nanjiri river which increases their score on resource.

Chitsime EPA

Figure 2 below shows that the WPI score range from 19.88 to 38.68 in the dry season in Chitsime EPA. During the dry season, much better access increases the WPI values. However, in addition to some water supply points becoming unreliable in the dry season (Sullivan *et al*., 2002), lower capacity to manage and use water generate lower WPI values during the dry season in Chitsime EPA.

Malili, Nthumbo, and Chamchere B scored the highest on access, capacity, use and environment, respectively. The overall WPI scores show that the worst situation was in Chamchere A section, with a score of 19.88. The best score was in Chamchere B section, where the WPI score was 38.68. This also suggests that although improvement are required throughout the EPA, the most urgent attention should be given to Chitsime, Sasa, Tsabango, Katete, Ukatsi, Malili, Chamchere A, and Dyankhuno sections. Likewise, some sections such as Chamchere B, Ukatsi and Chamchere A have a higher score on resource (14.75) than others because they access water for irrigation and other activities from Nanjiri River.

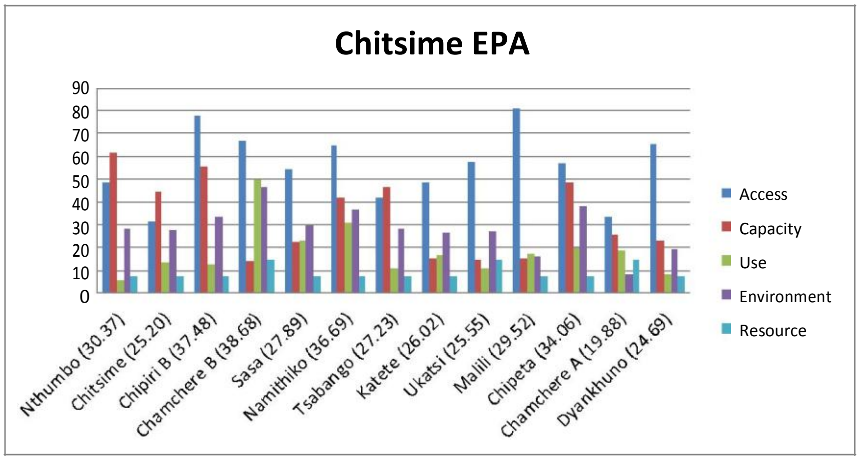

Figure 2. water poverty index components and values for selected sections in Chitsime EPA

Source: Field Survey (2010)

Table 1. Water poverty indices at EPA level

Water Poverty Components						
EPA	Access	Capacity	Use	Environment	Resources	WPI
Mitundu	43.35	59.43	25.47	29.85	14.75	34.57
Chitsime	56.10	33.09	18.38	28.28	14.75	30.12

Source: Field Survey (2010)

Water poverty index scores at community level

Access

This component shows access that people have to water for effective use and survival. Sources of water in both communities include wells, bore holes, streams, and rivers. In addition, some people in Chitsime EPA have access to tap water.
The results in Table 1 below shows that Chitsime EPA has a higher score (56.10) on access while Mitundu EPA (43.35) has a lower score. This is explained by availability of tap water in some sections of Chitsime EPA which increases people's access to safe drinking water sources. In Mitundu EPA, none of the sections has access to tap water. This limits people's access to safe drinking water in the EPA.

Capacity

This component indicates people's capacity to manage water resources, based on education, health, and access to financing. Primary education is the level of education of most people in both communities. Their main sources of income include farming, casual labor, brick making, and small businesses.
The results in Table 1 shows that Mitundu EPA has a higher score (59.43) on capacity compared to Chitsime EPA (33.09). The higher score on capacity in Mitundu EPA reflects a higher status in health, ability to lobby for and manage water sources, and a better social welfare of Mitundu residents than the residents in Chitsime EPA (Sullivan et al., 2006).
Water is the major ingredient in irrigation farming. Therefore, involvement of farmers in irrigation agriculture in Mitundu EPA increases their income base which in turn increases their financial capacity to manage and repair water resources when they breakdown. In Chitsime EPA, most people are involved in small businesses, brick making and casual labor because of their nearness to urban centers. As a result, little emphasis is put on water resource management, except for those doing irrigation farming.

Use

This component indicates the level of water use by different sectors of the economy and economic returns

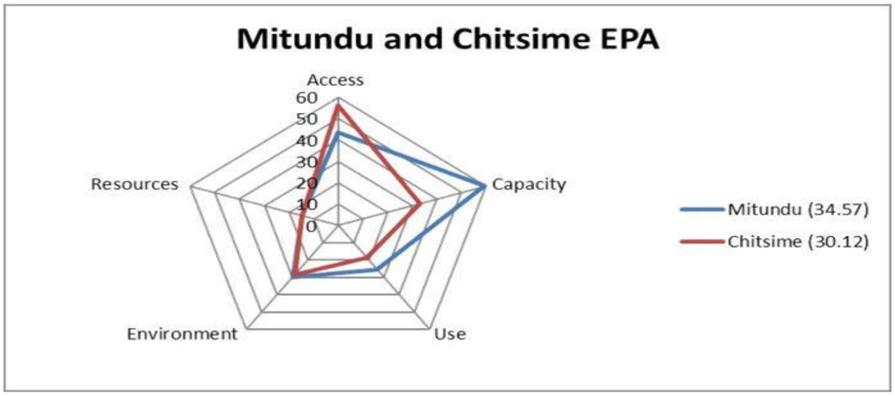

Figure 3. A pentagram comparing Mitundu and Chitsime EPAs

from that use. Uses of water in both communities include domestic use, irrigation farming, construction, and brick making.

The results in Table 1 shows that Mitundu EPA had greater score (25.47) for use compared to Chitsime EPA (18.38). The higher score on use in Mitundu EPA implies that economic return on water use is relatively high compared to Chitsime EPA (Sullivan *et al*., 2006). Therefore, it is important to make improvements to water use efficiency in Chitsime EPA.

Involvement of most farmers in irrigation farming contributes to a high score for use in Mitundu EPA. In Chitsime EPA, few farmers practice irrigation farming; most of them rely on small businesses and brick making for their livelihoods.

Environment

This component indicates environment integrity or environment water needs. Natural resources available in both communities include streams, dambos, shallow wells, rivers, and woodlots. Natural resources are a source of construction materials, irrigation water, firewood, manure making and fish.

The results in Table 1 shows that Mitundu EPA had a higher score (29.85) on environment compared to Chitsime EPA (28.28). The lower score on environment in Chitsime EPA implies that the environment is in poor shape. Soil erosion and crop loss for the past five years have contributed to a lower score on environment in Chitsime EPA.

Resource

This component indicates physical availability of surface and ground water taking into account seasonal and inter-annual variability and water quality. Both communities share Nanjiri River. Data on quantitative and qualitative assessment of surface water using hydrological techniques particularly, river flows, was for Nanjiri River. On the other hand, data on quantitative particularly, pump testing, available was for drilled bore holes in both communities. Being on the same plain (i.e. geographical closeness) there were almost no differences in values obtained from pump testing. Therefore, there were no differences in the score for resources (14.75) in both Mitundu and Chitsime EPAs.

A comparison of WPI values in Mitundu and Chitsime EPA

Because of its simplicity, the WPI appeals to policy-makers. A single number can be used to represent the water situation at a particular location. At the same time, underlying complexities need not be lost (Sullivan et al., 2003). Therefore, to reduce the complexity to policy-makers and other stakeholders, a pentagram was developed (see Figure 3). By showing the values of five components in a visually clear way, it can help to direct attention to those water sector needs that require urgent policy attention.

The pentagram presents Chitsime EPA as the neediest community in terms of capacity, use, and environment. On the other hand, Mitundu EPA is needy in terms of access. Consequently, there was a higher water poverty index score for Mitundu EPA (34.57) compared to Chitsime EPA (30.12). Thus, water poverty level is lower in Mitundu than in Chitsime EPA. According Sullivan et al. (2003) the highest value, 100, is taken as the best situation (or the lowest possible level of water poverty), while 0 as the worst situation. Since water poverty index scores for both communities are below 50, the level of water poverty in both communities is high.

CONCLUSION

The study was carried out to access water poverty levels in Mitundu and Chitsime Extension Planning Areas. Using water poverty index, water poverty levels in both communities were estimated. Water poverty index score for Mitundu EPA (34.57) is higher than that of Chitsime EPA (30.12). Therefore, water poverty level is higher in Chitsime EPA as compared to Mitundu EPA. However, based on the threshold developed by Sullivan *et al*. (2003), the level of water poverty in both communities is high.

In Chitsime EPA, WPI component areas that need immediate intervention are capacity, use, resource, and environment. In Mitundu EPA, areas that need immediate intervention are access, use, resource, and environment. The study has also shown that there were no differences in resource in the two communities because of their geographical closeness.

RECOMMENDATIONS

1. Since water poverty index scores in the communities are below 50, the level of water poverty is high in both communities. Therefore, both communities need improvements in component areas that were less than 50 in order to lower water poverty.

2. The water poverty index should be updated at reasonable intervals, say three to five years, to allow decision-makers to identify where attention is needed most and monitor progress at the community level.

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APPENDIX

Useful definitions of subcomponents of WPI

1. Resources: Physical availability of both surface and groundwater, taking into account variability and quality as well as the total amount of water.

2. Access: Access to water for human use, including distance to a safe source, time needed for collection per household and other significant factors. Access also includes water for irrigating crops or industrial uses.

3. Capacity: Effectiveness of people's ability to manage water. Capacity is interpreted in the sense of income to allow purchase of improved water and education and health, which interact with income and indicate a capacity to lobby for and manage a water supply.

4. Use: Different uses of water, including domestic, agricultural and industrial.

5. Environment: Evaluation of the environmental integrity related to water and of ecosystem goods and services from aquatic habitats in the area.