POLICY AND INSTITUTIONAL CHALLENGES IN PROMOTING RAINWATER HARVESTING FOR DOMESTIC USE IN MALAWI'S CITIES AND TOWNS

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Abstract

Given the current domestic water shortages in Malawi's cities, towns and market centres, this paper examined the use of roof-top rainwater harvesting for domestic use. Analyses of water sources for Blantyre and Lilongwe cities, 12 market centres and towns and 4 rural districts have shown that there is low usage of rain water harvesting (RWH) for domestic use in Malawi's cities, rural towns and market centres (0.2%). The paper further analyses the policy and institutional factors contributing to the low use of roof-top RWH at a time when Malawi's cities and towns have a shortage of domestic water.

The analyses indicate that while the Malawi National Water Policy has encouraged Integrated Water Resources Management (IWRM) through which rainwater harvesting could be promoted, the Water Works Act (1995) has not allowed for extraction of multiple water sources within the Water Board's catchment areas in cities, towns and market centres. While the Water Department has the mandate to promote IWRM from multiple sources (including roof-top rainwater harvesting) and for multiple uses it is constrained because the implementing agencies (Water Boards) in cities, towns and market centres, have no financial incentive for promoting, operating and maintaining rainwater harvesting works in cities and towns since it is non-revenue generating. There is need to re-define roles of key stakeholders in the provision of RWH technologies in cities, towns and market centres of Malawi.

Keywords: *Malawi, rainwater harvesting, water utilities, IWRM, water policy,*

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Abbreviations

BT	Blantyre City
CARD	Centre for Agricultural Research & Development, Bunda College
GoM	Government of Malawi
HD	High Density
HDT	High Density Traditional
IWRM	Integrated Water Resources Management
LD	Low density
LL	Lilongwe City
MD	Medium Density
MoIWD	Ministry of Irrigation and Water Development
NSO	National Statistical Office
RWH	Rain Water Harvesting

1.0 Introduction

Cities, towns and market centres of Malawi are facing rapid population growth (NSO, 2009) exerting pressure on water supplies for domestic use. Blantyre and Lilongwe Cities are supplied by city Water Boards while rural towns and market centres are supplied by three Regional Water Boards with a large geographical footprint.The market centres and small rural towns get water from boreholes, protected and unprotected wells. Currently, most of these centres are served by communal water points or traditional water sources that are inadequate and unsuitable for the growing population. A reliable water supply is critical for these areas. Sanitation is particularly lacking in most rural towns and market centres. In rural areas, most domestic water is supplied from boreholes, gravity-fed stand pipes, shallow wells (protected and unprotected) and springs, where available.

Given the growing population, the demand for safe water points is growing at a time when most existing boreholes and stand pipes are not functioning and are in need of rehabilitation (Wiyo *et al.*, 2011). Given the growing demand for domestic water supply, roof-top rainwater harvesting offers an alternative water supply for emergencies and other household uses. This paper reviews the state of rainwater harvesting for domestic use in cities and market centres and the policy and institutional factors contributing to its non promotion.

2.0 Common Sources of Domestic Water in Cities

Table 1 shows the common sources of domestic water in Blantyre City (BT) while Table 2 is for Lilongwe City (LL) as reported from a water survey of two cities (CARD, 2010). From high density traditional (HDT), high density (HD) through medium density (MD) to low density (LD) areas in cities, there is an increasing reliance on tap water whereas there is a declining trend in use of kiosk water. Kiosk water is mainly used in HDT areas. Similarly, water from boreholes, protected and unprotected wells is mostly confined to HDT, HD and MD areas but there are exceptions in LD areas. Use of bottled water for drinking is very low in all areas.

Table 1: Common sources of domestic water in Blantyre City, Malawi (Source: CARD, 2010)

City	Sources	Socio-economic stratum				All
		HDT	HD	MD	LD	
Blantyre	Sample size n	822	88	186	191	1287
	Tap water	20.3	78.4	74.2	37.9	37.9
	Kiosk water	32.0	2.3	2.2	22.4	22.4
	Water bought from neighbours	16.5	10.2	5.4	13.2	13.2
	Borehole	13.4	2.3	5.4	10.6	10.6
	Protected well	7.8	2.3	8.1	7.3	7.3
	Unprotected well	7.3	2.3	3.2	6.0	6.0
	River/stream	2.4	1.1	0.4	1.9	1.9
	RWH	**0.2**	**0.0**	**0.0**	**0.2**	**0.2**
	Bottled water	0.1	1.1	1.1	0.5	0.5
	Total	100.0	100.0	100.0	100.0	100.0

HDT= high density informal areas, HD= high density formal areas, MD= medium density and LD= low density area

A significant percentage of residents are relying on protected wells (7.3% in BT and 12.3% in LL) and unprotected wells (6.0% in BT and 12.7% in LL). About 1.9% of the residents in Blantyre City rely on river/stream water compared to 1.6% in Lilongwe City. In both cities there is low usage of rain water harvesting water. The number of residents with roof-top rainwater harvesting systems is low and thus use of rainwater harvesting systems in the two cities is only 0.2%.

Table 2: Common sources of domestic water in Lilongwe City, Malawi (Source: CARD, 2010)

City	Sources	Socio-economic stratum				All
		HDT	**HD**	**MD**	**LD**	
Lilongwe	Sample size n	1254	307	97	40	1698
	Tap water	36.2	50.8	43.3	40.2	40.2
	Kiosk water	24.5	14.3	1.1	20.7	20.7
	Water bought from neighbours	3.7	3.3	6.2	3.9	3.9
	Borehole	6.5	10.4	17.5	7.8	7.8
	Protected well	12.8	10.4	17.5	12.3	12.3
	Unprotected well	13.6	9.4	14.4	12.7	12.7
	River/stream	1.9	1.4	0.0	1.6	1.6
	RWH	**0.4**	**0.0**	**0.0**	**0.2**	**0.2**
	Bottled water	0.4	0.0	0.0	0.6	0.6
	Total	100.0	100.0	100.0	100.0	100.0

HDT= high density informal areas, HD= high density formal areas, MD= medium density and LD= low density area

3.0 Common Sources of Domestic Water in Rural Towns and Market Centres

Common sources of domestic water in selected rural towns and market centres in Table 3 as revealed in a survey of rural towns and market centres by Wiyo *et al.(*2011). The small rural towns and market centres mostly get water from boreholes, protected and unprotected wells (Table 3). Use of rainwater harvesting (RWH) is non-existent in rural towns and market centres. Currently, most of these centres are served by communal water points or traditional water sources that are inadequate and unsuitable for growing towns and market centres. Sanitation is particularly lacking in most rural towns and market centres (Wiyo *et al.* 2011).

Table 3: Common sources of domestic water in selected rural towns and market centres (Source: Wiyo *et al.* 2011)

Districts	Rural Towns/ Market centres	Sources of water in dry season								
		Piped into dwelling %	Piped into yard/ plot %	Community stand pipe %	Unprotected well %	Protected well %	Borehole %	River/ stream %	RWH (%)	size n
Lilongwe	Nathenje	0.0	0.0	0.0	0.0	100.0	5.3	0.0	**0.0**	19
	Nsaru	0.0	0.0	0.0	40.0	15.0	55.0	30.0	**0.0**	20
	Mitundu	0.0	0.0	0.0	17.2	24.1	79.3	0.0	**0.0**	29
	Kasiya	0.0	0.0	0.0	6.7	30.0	96.7	3.3	**0.0**	30
Machinga	Ntaja	0.0	5.6	0.0	0.0	0.0	100.0	0.0	**0.0**	18
	Msanama	0.0	0.0	0.0	0.0	0.0	100.0	16.7	**0.0**	18
Mulanje	Chitakale	13.3	16.7	50.0	3.3	0.0	16.7	13.3	**0.0**	30
	Muloza	0.0	40.0	0.0	20.0	13.3	66.7	40.0	**0.0**	30
	Nkando	0.0	0.0	0.0	5.3	5.3	94.7	57.9	**0.0**	19
Zomba	Chingale	13.3	0.0	0.0	0.0	0.0	86.7	0.0	**0.0**	15
	Jali	0.0	0.0	0.0	0.0	0.0	100.0	0.0	**0.0**	23
	Malosa	14.3	7.1	35.7	0.0	0.0	46.4	0.0	**0.0**	28

Note: None of the district headquarters reported rainwater harvesting in 2008 NSO Population Census (NSO, 2009)

4.0 Common Sources of Domestic Water in Selected Four Districts

In rural areas (Table 4), most domestic water is supplied from boreholes, gravity-fed stand pipes, shallow wells (protected and unprotected) and springs, where available. Given the growing population, the demand for safe water points is growing at a time when most existing boreholes and stand pipes are not functioning and are in need of rehabilitation (Wiyo et al., 2011). Further, more than 80 percent of the country's population resides in rural areas.

Table 4: Common sources of domestic water in selected districts of Malawi (Source: CARD, 2011)

Water source	Lilongwe		Machinga		Mulanje		Zomba		Total	
	Wet (%)	Dry (%)	Wet (%)	Dry (%)	Wet (%)	Dry (%)	Wet (%)	Dry (%)	Wet (%)	Dry (%)
Borehole	63.1	63.2	59.5	62.6	69.1	60.8	77.6	79.3	65.2	65.9
unprotected well	16.4	16.1	26.8	25.1	3.7	5.4	5.5	5.2	16.3	15.2
protected well	13.0	12.2	3.4	4.0	0.0	0.0	1.2	0.6	6.3	5.8
river/stream	5.4	6.7	1.1	1.2	9.3	7.7	0.4	0.6	3.6	4.0
Spring	1.6	1.7	0.7	0.2	0.0	0.0	5.9	4.6	1.9	1.6
piped into dwelling	0.4	0.0	0.9	1.0	0.6	2.3	0.0	0.6	0.5	0.7
bottled water	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
piped into yard/plot	0.0	0.0	1.6	0.8	8.6	9.5	0.8	1.2	1.6	1.8
community stand pipe	0.0	0.0	5.6	4.5	8.6	14.4	8.7	7.9	4.3	4.9
RWH[1],	**0.0**	**0.0**	**0.4**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.2**
N	555	598	447	494	162	222	254	329	1418	1643

RWH also include water from dams, ponds and lake in Machinga District

5.0 Review of Policies and Acts in The Water Sector-Gaps And Challenges

5.1 National Water Policy (2005)

Malawi is encountering a number of growing competing demands and challenges, including high population growth resulting in increase for demand for water for domestic, industrial and municipal uses, agriculture/irrigation, tourism, mining, manufacturing, water transport/navigation, energy/hydropower, and ecological sustenance. Since water is a finite resource, its conservation, allocation, and utilization must be guided by a strong policy framework and strategies to achieve the policy objectives. To this end, Government of Malawi (GoM) developed the National Water Policy (NWP) in 2005 to guide the country in the management and development of its water resources. The NWP sets out to regulate the use of water resources with a vision to ensure that every Malawian has equitable access to safe water and sanitation services for attaining sustainable socio-economic development of the country.

The overall water policy goal is to ensure sustainable management and utilization of water resources, in order to provide water of acceptable quality and of sufficient quantities, and ensure availability of efficient and effective water and sanitation services that satisfy the basic requirements of every Malawian and for the enhancement of the country's natural ecosystems. The specific policy goal for urban, peri-urban and market centres is to achieve sustainable, commercially viable provision of water supply and sanitation services that are equitably accessible to and used by individuals and entrepreneurs in urban, peri-urban and market centres for socioeconomic development at an affordable cost.

5.2 National Sanitation Policy (NSP 2008)

The GoM developed the NSP in 2008 order to provide a framework for the development of programmes and initiatives to address sanitation and hygiene challenges facing Malawi. These programmes contribute to the improvement of the health and quality of human life, and create a better environment and new ways for sustainable wealth creation. The mission of the NSP is to ensure that all people in Malawi own and have access to improved sanitation facilities, practice safe hygiene, and practice safe recycling of liquid and solid waste for sustainable environmental management and socio- economic development (NSP, 2008). Some of the major guiding principles for the NSP include; sanitation as a basic right, gender inclusion, recycling and re-use of solid waste, and stakeholder participation. The overall policy goal is to promote improved sanitation and safe hygiene practices for improved health and socio-economic development for the people of Malawi. It aims at improving universal access to improve sanitation and safe hygiene practices.

5.3 The Water Works Acts (1969 and 1995)

Sustainable use of water is the underlying principle of the water development. Water suppliers and users in Malawi need to adopt the concept of demand management in order to ensure cost effectiveness of water use. There is a pressing need for increased and improved water delivery services in the country due to high demand created through the increased number of users in the rural, urban and peri-urban areas, and for agriculture, irrigation, navigation, fisheries, hydro-power generation, forestry and eco-tourism, and recreation services amongst many other users. The NWP is supported by the Water Works Act (no.17 of 1995) and the Water Resources Act of 1969. The Water Works Act (1995) provides for the

establishment of Water Boards and established catchment areas referred to as water-areas. Furthermore, the Act mandates the Water Boards to manage the water-areas for the development, operation and maintenance of waterworks and water-borne sewerage sanitation systems. Waterworks may be constructed and maintained for the main purposes of domestic, public and business use.

On the other hand, the Water Resources Act (1969) makes the provision for the control, conservation, apportionment and use of the water resources of Malawi. It permits the abstraction of water from water bodies through a granted water permit. It also creates the Water Resources Board as the regulatory institution.

5.4 Gaps and Challenges in the Policy and Legislative Environment

The major challenge in the policy and legislative environment with regards to promotion of rainwater harvesting in cities, towns and market centres is that, the Act gave exclusive rights to Water Boards to develop and manage water resources within their catchment areas. Because of this, water boards generally do not support use of multiple water sources within their catchment areas. Integrated Water Resources Management (IWRM) is therefore a challenge in areas controlled by water boards. Encouraging multiple water uses within the water boards catchment areas would affect revenue streams and jeopardize the business of water provision exclusively given to water boards.

The second shortcoming is the recognition that you can have different water sources (of varying quality) for different domestic usage. Not all uses of water in cities and towns require high quality potable water from Water Boards. For example, water from roof-top rainwater harvesting could be used for landscaping, gardening, washing and bathing while water from the water boards could be used for drinking and cooking. Both the policy and the Act has not allowed for this.

6.0 Rainwater Harvesting Objectives and Stake Holder Analyses and Mandates

6.1 Reasons for Adoption of Rainwater Harvesting Technologies

Table 5 highlights major reasons for adopting rainwater harvesting technologies. For cities, towns and market centres, the major reasons for adopting RWH technologies are non-agricultural. In these areas, RWH technologies are mainly adopted for domestic water use, recreation and landscaping, flood control, groundwater recharge and to some extent erosion control.

Table 5: Major Reasons for Adoption of Rainwater Harvesting Technologies

Reason for Adoption	Remarks
Improve food security	*In-situ* RWH technologies promoted to improve food security by improving soil moisture storage for rain-fed agriculture during dryspells and droughts while ex-situ technologies are promoted for small-scale irrigation.
Fish farming	Surface runoff channeled into dams, ponds and pools for fish farming.
Climate change adaptation	Build resilience in food production regardless of rainfall. The aim is to drought proof rain-fed production.
Domestic water use	*Ex-situ* RWH technologies for domestic water supply during shortages and for other home uses e.g. lawn watering.
Flood control	Excess runoff during the rainy season can be stored *ex-situ* in dams and ponds ameliorating floods.
Recreation and landscaping	Non-potable use of water for watering lawns, parks and recreational areas.
Erosion Control	In situ RWH technologies encourage promotes surface runoff infiltration thereby reducing overland flow minimizing soil erosion.
Groundwater recharge	By encouraging surface runoff infiltration using *ex- situ* and in-situ RWH, you recharge groundwater for sustainable well production.

6.2 Stakeholder Analyses by Reason for Adopting RWH Technologies

Within cities, towns and market centres (Table 6), the major stakeholders are (1) from Government (Water Department, City and Regional Water Boards, City and District Councils; (2) selected NGOs and FBOs working in the water and sanitation sectors; (3) city and town residents and private sector.

Table 6: Key RWH Stakeholders by Reason for Adopting RWH Technology

Reason for Adoption	Key RWH Stakeholders
Improve food security	Ministry of Agriculture (Depts.: Irrigation, Land Resources & Conservation, Extension), District councils, NGOs, farmers.
Fish farming	Ministry of Agriculture, Fisheries Dept, NGOS, Farmers
Climate change adaptation	Ministry of Agriculture (Depts.: Irrigation, Land Resources & Conservation, Extension), Dept of Disaster Preparedness & Relief, District councils, NGOs, farmers.

Domestic water use	Water Department, City and Regional Waterboards, NGOs, Private Sector.
Flood control	Water Department, Irrigation Department, Dept of Disaster Preparedness & Relief, NGOs and District Councils.
Recreation and Landscaping	City and town residents, City and District Councils, Dept of Tourism.
Erosion Control	Ministry of Agriculture (Depts.: Irrigation, Land Resources & Conservation, Extension, NGOs.
Groundwater recharge	Water Department, Irrigation Department, City and Regional Water Boards.

Table 7 highlights the key stakeholders, their institutional mandate and their interest in RWH.

Stakeholder	**Institutional Mandate**	**Why Interest in RWH**
Water Department, MoAIWD	Policy, regulation, M& E, water supply provision in rural areas (boreholes, gravity fed schemes, multi-purpose dams).	Runoff storage in multi-purpose dams, IWRM.
Water Boards	Sustainable provision of potable water for city, town, market centre residents at cost recovery	Groundwater recharge for source wells, possible source of water for urban centers and domestic water provision on cost recovery basis (i.e. revenue stream.
City and District Councils	Provision of sanitation, recreation and landscaping activities	Possible source of cheap water for recreation and landscaping activities as well as for sanitation (e.g. communal toilets).
City and town residents	Keep households clean and tidy	Possible source of cheap water for domestic water use, lawn watering & home garden. Reduce water bills.
Urban water and sanitation NGOS	Improved livelihoods through improved provision of water and sanitation to vulnerable urban communities.	Potable water provision and improved sanitation facilities
Private sector	Commercial entities providing a product or service at a profit.	Alternative cheap source of water for commercial or industrial use or for sanitation.

Table 7 shows the key stakeholders for RWH in cities, towns and market centres, their institutional mandates and their interest in RWH. Table 7 is instructive in that it helps explain why in particular water boards have not been at the forefront of promoting rainwater harvesting. Firstly, the Water Works Act gives them exclusive rights to provide water in their catchment areas. Water Boards would be interested in RWH if it was a possible source of water for their catchment areas and if RWH *(in-situ or ex-situ)* would help augment source well production through groundwater recharge. More critically, provision of RWH facilities to city and town residents is non-revenue generating. The water boards have nothing to gain in providing RWH facilities to city residents.

As for city councils and district councils, their interest in RWH is as a possible source of cheap water for sanitation, recreation and landscaping activities. Direct provision of RWH facilities or even RWH promotion is not within their mandates and may directly conflict with water board's mandate.

NGOs can promote RWH in cities, towns and market centres if the Water Works Act is amended and allows city residents to access multiple water sources for multiple water uses. It is clear from this analyses that city and town residents will have to meet the full cost of RWH facilities. Ex-situ RWH technologies are capital intensive and have higher technical demands. Water Boards are not likely to finance such activity without clear revenue streams.

6.3 Roof-Top RWH Required Support Services in Towns and Cities

To promote roof-top RWH facilities to residents in cities, towns and market centres, the following support services are required (Table 8).

Support Service	**Service Provider**	**Lead Institution**
Technical services (designing, construction and supervision)	Water Dept, Land Resource & Conservation Dept, Private sector	Water Department
RWH Promotion Activities	NGOs, Water Dept, RHAM	NGOs
RWH Financing	Private Sector (Banks), Individual residents, subsidy from Government	Individuals
Setting Standards	Malawi Bureau of Standards, Water Department, Land Resources & Conservation Dept	Malawi Bureau of Standards

7.0 Conclusions

This paper examined the use of roof-top rainwater harvesting for domestic use in cities, towns and market centres of Malawi given the current water shortages in these areas. An analyses was undertaken on sources of domestic water for cities, towns and market centres using baseline data for Blantyre and Lilongwe Cities; 4 rural districts and 12 market centres and the 2008 population census (NSO, 2009; CARD, 2010 and CARD 2011). The aim was to investigate the role of rainwater harvesting in the provision of domestic water to city, town and market centre residents. The paper further analyzed the policy and institutional factors contributing to this low use of roof-top rainwater harvesting at a time when cities and towns are under pressure to provide potable water.

The following conclusions are made:

1 There is low usage of rain water harvesting in Malawi's cities, rural towns and market centres for domestic use. Use of roof-top rainwater harvesting systems in Blantyre and Lilongwe Cities is virtually nonexistent with a few residents (0.2%) collecting rainwater for use. The number of residents using rainwater harvesting systems is also low in towns, market centres and rural districts.

2 While the National Water Policy has encouraged IWRM through which rainwater harvesting could be promoted, the Water Works Act (1995) has not allowed for extraction of multiple water sources within the Water Board's catchment areas in cities, towns and market centres.

3 While the Water Department has the mandate to promote IWRM from multiple sources (including roof-top rainwater harvesting) and for multiple uses it is constrained because the implementing agencies (Water Boards) in cities and market centres, see no revenue stream for operations and maintenance of RWH works. It is not in Water Board's financial interest to promote rainwater harvesting for consumers because it is a non-revenue generating activity.

4 The mandates and interests of key stakeholders in urban RWH are often at odds with the promotion of RWH technologies to city and town residents.

8.0 Recommendations

1 To promote RWH in cities, towns and market centres there is need to amend the Water Works Act to allow for water extraction from multiple sources (e.g. RWH) and for multiple uses within the catchment areas of water Boards.

2 There is need to re-define roles of various key stakeholders in the provision of RWH facilities for city and town residents.

3 To promote RWH in cities, towns and market centres, technical, extension, financing and provision of standards are required from the key stakeholders like water department, councils and NGos.

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