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Effectiveness of the Implementation of the Sub-Catchment Management Plan- *A case study of Awach Kano Water Resources Users Association*

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Abstract: *A Sub Catchment Management Plan gives a scrutiny of problems related to water within a specific area and prioritizes set of activities to deal with these problems over a period of 3-5 years. In Kenya, this plan is made by the Water Resource Users Association to support in the management, conservation and protection of water resources along a particular catchment e.g a long a river basin. This is in line with the Integrated Water Resources Management guidelines that ensure involvement of all partners (State bodies, Civil Society organizations, private entities, CBOs among others) responsible in water resources management.*

This study assessed the Awach Kano Sub Catchment Management Plan vis a viz the Water Resource Users Association development Cycle, and the Global Water partnership toolbox to determine how effective the plan was implemented.

Kenya has made tremendous steps in incorporating integrated water resources management practices in Kenya by establishing the Water Resource Management Authority with the mandate of protecting, managing, conserving and apportioning of water resources together with other trans boundary waters. At the regional level, Water Resources Management has regional offices with the Catchment Area Advisory committees responsible for management, protection and conservation of water resources. At the Catchment Areas, the Authority has sub regional offices who work together with Water Resources Users Associations.

The study findings show that the WRUA effectively implemented the Sub Catchment Management Plan however in a small scale. Nevertheless, challenges such as inadequate funding, inadequate personnel, slow understanding of WDC and delayed funding impeded the rate of the implementation of activities.

Keywords: *Sub Catchment management Plan, Global Water Partnership, Water Resources Management, Integrated Water Resource Management.*

1. BACKGROUND

1.1 Introduction

Water Resources Management Authority (WRMA) was established following enactment and reforms of the Water Act 2002 (Republic of Kenya, 2002). WRMA is mandated to develop the National Water Resources Management Strategy (NWRMS) which is meant to prescribe the principles, goals, processes and institutional arrangements for the use, protection, management, conservation, development and control of water resources at the National level.

At the Sub-Catchment level, the Act established the Water Resources Users Associations, which are mandated to develop Sub-Catchment Management Plan (SCMP) which is used to manage, use, develop, conserve, protect and control water resources at the sub-catchment level. This SCMP is what is being used by the Awach Kano Water Resource Users Associations (Republic of Kenya, 2002).

Awach Kano is one of the WRUAs under the jurisdiction of Lake Victoria South Catchment Area which has the regional office in Kisumu.

1.2 Objectives

1.2.1 Overall Objective

The overall objective of the study was to assess the level of implementation of Awach Kano Sub-Catchment Management Plan in Water resources Management in the sub-catchment area.

1.2.2 Specific Objectives

1. To determine the roles played by the WRUA members, the WRUA management committee and

the WRMA Regional Office in coming up with the Sub-Catchment Management Plan (SCMP).

2. To evaluate the success of the steps taken by Awach Kano WRUA to ensure reduction in pollution of water resources in the Sub-catchment area
3. To access the effectiveness of actions taken to reduce pollution of water resources in Awach Kano Sub-catchment area.

1.3 Problem Statement

WRMA and WSTF have established a Water Resources Users Association Development Cycle (WDC) process which is being used by the WRUAs to come up with the Sub-Catchment Management Plan (SCMP). The SCMP is used in the implementation of activities in the management of water resources by WRUAs. Most of the WRUAs have identified several activities in line with the problems/challenges that their catchment area faces and how they want to tackle these challenges in the next 3-5years. However, it is worth noting that these WRUAs have experienced challenges in the implementation of the SCMPs. The study therefore sought to find out what the challenges were and their solutions in the implementation of the SCMPs and in particular focusing on Awach Kano WRUA.

2. MATERIALS AND METHODS

2.1 Study Area

The Study was conducted in Awach- Kano Sub-Catchment Area. Awach Kano WRUA is an association of water users whose collective interests are based on Awach River Basin which is within Bureti, Nyakach, and Nyando Sub Counties. The WRUA was established in 2008 located in Nyando Sub County.

2.2 The framework for the assessment of the implementation of the SCMP

The assessment of the implementation of the SCMP was done with reference to

2.2.1 WDC document

- Level of involvement of relevant stakeholders (members of the WRUA, Management Committee, WRMA, and WSTF)
- Activities undertaken by the WRUA as per the WDC.
- Activities done by WRMA in the development and implementation of the SCMP
- Activities undertaken by WSTF as per the WDC.
- Activities undertaken by WSTF in relation to implementation of the SCMP

2.2.2 Global Water Partnership toolbox

Under this study, the implementation of the SCMP was measured under the following criteria in the GWP toolbox

- Development of policies in relation to water resources
- Legislation for water quality
- Building partnerships/collaborations
- Improved efficiency of use
- Regulation for water quantity

2.3 Sampling

In administering the semi structured questionnaire, the members of the WRUA were selected randomly from the catchment area.Since 60.1% of the rural populations (CRA, 2011) have access to improved safe drinking water, Cochran (1963:75) formula was used to determine sample size with degrees of accuracy set at 0.05.

$$n = \frac{Z^2 pq}{d^2}$$

n- Estimated sample size

Z-z value for the chosen confidence interval (usually 0.95 α=0.05=1.96)

p- Prevalence estimate Kisumu (60.1%) (CRA, 2011)

q- 1-p

d^2-the precision required for the estimate (0.1)

Hence n= $(1.96^2*0.601*0.399)/0.1^2=92.1$=> Rounded off to 98

2.4 Study Population

The study population comprised of the members of the WRUA (98), Management Committee of the WRUA (5), the WRMA sub regional office in Kisumu and WSTF staff in Nairobi.

2.5 Data Collection Tools and Methodologies

The semi structured questionnaires were randomly administered to the members of the WRUA. FGD guide was administered to the management committee of the WRUA. The two KIIs were administered to the officials of WRMA sub regional and to the official of the WSTF.

Water sampling was also done from Awach Kano River to test on its suitability for safe drinking and analysis

for bacteriological and chemical tests were conducted at WRMA Lake Victoria regional office.

3. RESULTS AND DISCUSSIONS

3.1 Roles played by the Water Resources Management Entities in the development of the SCMP.

3.1.1 WRUA members and WRUA Management Committee

According to the members of Awach Kano WRUA, 83% (n= 81) knew about the existence of the Awach Kano SCMP while the rest (17%, n=17) did not know of its existence. It was expected that all the members were to know about the existence of the SCMP which was not the case. This was because some members were recruited but did not participate in the activities of the WRUA since most activities were voluntary and required a commitment. For those who knew of its existence, 86% (n=70) were involved in its development while 14% (n=11) were not involved.

Those who were not involved cited the reason as late recruitment when the SCMP had already been developed. For those who were involved, they were either involved in drafting and validation (48%, n=34), only drafting (12%, n=8) or only validation (40%, n=28). The major problems that were considered were; gully erosion, water pollution, deforestation, riverine cultivation, siltation of pans/dams, poor access to portable water, inadequate finances and illegal water abstraction.

According to Awach Kano SCMP (Awach Kano WRUA, 2010), the SCMP was developed during a five day workshop involving different stakeholders –key among these were members of Awach Kano WRUA, WRMA and Major step Consultants. The development of the SCMP involved:

1. Identification of key problem (water) in the sub catchment area.
2. Identification of solutions to the problems.
3. Formulation of action plan including.
4. A time frame for the action plan.

The development of the SCMP was in line with the WDC process module 3 and module 4 which demands that communities have to do stakeholder mapping, problem identification and analysis and development the SCMP (WSTF, 2009). At the same time, the development of this SCMP was in line with the GWP toolbox (A1.2) on the recommendation of development of policies with relation to water resources. The GWP suggests that Governments at both national and local level should come up with plans, policies, and programs which affect WRM (GWP, 2010).

3.1.2 WRMA sub regional office

WRMA undertook a sensitization to the members of the WRUA, provided technical assistance in the development of the Constitution, problem identification/ analysis and community mobilization during the development of the SCMP. WRMA office linked the WRUA with the relevant institutions like National Environmental Management Authority, Ministry of Agriculture and Kenya Forest Services.

3.2 Steps taken by Awach Kano WRUA in WRM in the Sub-catchment area

3.2.1 WRUA Activities

Among those who were interviewed, 98% (n=96) were aware of the activities undertaken by the WRUA while only 2% (n=2) were not aware. The activities mentioned by those who were aware were planting trees 30% (n=29), building gabions 30% (n=29), desiltation of pans 15% (n=15), mapping polluters 10% (n=10), water quality survey 8% (n=8), and mapping of water abstractors 7% (n=7).

Comparing the findings of this study with that of WWF (2008), the activities of the WRUA were; facilitation of implementation of irrigation by-laws, facilitation of exchange visit among water users, spearheaded the formation of Community Forest Association. It can be noted that this WRUA was dealing with conservation of Lake Bogoria as compared to Awach Kano WRUA which was dealing with conservation of river Awach hence the difference in activities.

As per the WRUA WDC (WSTF, 2009), these activities undertaken by the WRUA are in line with the objectives of the WDC and in particular related to;

- Enhancing water resources quality and quantity in supporting livelihoods;
- Improving the capacity of provision of hydrological services by catchment and riparian areas
- Developing well governed and self-reliant WRUAs

3.2.2 Water Quality management and access improvement

According to the respondents, 97% (n=95) felt that the quality of water has improved since Awach Kano started its operation along the river while only 3% felt that the quality of water has remained the same. Before 2008, due to gully erosion, the river water was more

turbid as compared to the current status in which the WRUA has undertaken gully erosion management as reported by Management Committee members. Majority 72% (n=71) of the respondents felt that through the activities of the WRUA, there has been improved access to water sources. This could be attributed to creation of access to water sources; desiltation of dams/ ponds/pans and construction of water pans. Apart from the domestic water use, the other major use of water in the catchment area was irrigation. This could be due to the fact that majority of the respondents were farmers.

Since the people interviewed indicated that they use Awach Kano Water for drinking purposes, it was therefore important to determine if this water was safe for drinking. Table 2 below indicates that the water was too turbid and the total suspended solids were slightly higher than the recommended standards by WRMA.

Table 1: *Results of water quality tests carried out by WRMA on Awach Kano River*

Date Sampled	pH (Scale)	DO (mg/l)	Turbidity (NTU)	EC (µS)	TSS (mg/l)	TDS (mg/l)
14/6/2008	7.80		54	93		45
24/10/2011	7.66		150	80		40
6/11/2013	7.80	7.17	153	106	73.5	53
23/7/2014	7.70		269	42		21
22/6/2015	7.24	6.65	150	102		51

From the results of the bacteriological tests carried out during the research at WRMA regional office, it was evident that Awach Kano Water was not safe for human drinking without treatment. This is because, the result showed that there were too numerous total coliforms to count. The number of E.coli present in the water was also too numerous to count indicating that the water was total not safe for direct drinking (WHO, 2011).

Table 2: *Results of water quality analysis*

Parameters	Unit	Results	Effluent Standards	Remarks
			Discharge into Environment WRMA	
pH	pH scale	7.6	6.5-8.5	Okay
Conductivity	µ S/cm	170		
BOD5 days at 200C	mgO2/l	31	30	Okay
COD	mgO2/l	64	50	Okay
Total suspended solids	mg/l	45	30	Okay
Total dissolved solids	mg/l	85	1200	Not okay
Turbidity	mg/l	180	0.1	
Dissolved Oxygen	mg/l	7.7		

Table 3 above indicates that the results pH, BOD5, COD and total suspended solids were within the recommended standards by WRMA and WHO standards (WHO, 2011). However, the turbidity of the water was too much and therefore unsafe for direct human consumption. This is an indicator of the effects of runoff from agricultural practices, construction, discharges, logging activity and other sources within the sub catchment. This means that the WRUA still has a lot of responsibility in ensuring the water was safe for human consumption.

3.2.3 Water pollution reduction

Most of the respondents (58%, n=57) felt that there were no illegal water polluters in the area. FDG with members of the WRUA indicated that pollution from livestock was a key source of pollution due to lack of livestock drinking troughs along the river banks. Pollution from human wastes was because of lack of water at the homestead level hence the community members use water for bathing and washing at the river source. Chemicals from horticultural farms were due to irrigation along the river banks where the chemicals used for the horticultural crops are washed into the river. Washing of motorbikes into the river was due to lack of water within the homesteads.

Steps taken against water polluters included: reporting to local administrators (55%, n=31); creation of awareness on the importance of not polluting the water sources (29%, n=17) and restricting bathing along the river banks (14%, n=8). Reporting to local administrators was not very effective according to the FGD conducted. This was because the polluters could be reported but would later be released without taking any action against them due to bribery/ corruption. The most effective method was restricting bathing along the river banks.

The major polluters in the Sub Catchment as per WRMA were Soin Sugar Company and Kiboiywo Farmers' Cooperative Society. This inventory was developed through literature review, water abstraction and pollution survey. The two are illegal polluters since they have not developed effluent discharge control plan hence WRMA sub regional office had not given them the effluent discharge permit. However, Soin Sugar Company was closed down during the time of research. Samples taken and tested by the WRMA sub regional office on 1st June 2012 indicated that the effluent characteristics for Soin Sugar was higher than the recommended effluent characteristics as indicated in Table 4.

Table 3: *Effluent Discharge characteristics for Soin Sugar Company*

No	Elements	Soin Sugar values	Recommended values
	BOD (mg/L)	4500	30
	TSS (mg/L)	1060	30
	pH	4.4	5-9
	DO (mg/L)	3.7	
	TDS (mg/L)	Above 2000	1200
	Temperature ^{o}C	30.1	$\pm$ 5 Ambient Temp

(Source: WRMA, 2015))

This activity undertaken by the WRUA is in line with the recommendation of the GWP toolbox A2.2 which talks about Legislation for water quality. GWP suggests that measures be put in place to protect the quality of water resources (GWP, 2010). At the same time GWP toolbox C6.1 on regulations for water quality suggests that there should be regulatory instruments for controlling water quality (GWP, 2010). Therefore, the WRUA is lacking legislation/by law on regulation of water quality.

3.3 Effectiveness of actions taken by Awach Kano WRUA in WRM in the area

3.3.1 Changes in the management of water resources

Since the beginning of the operations of the WRUA, 100% (n=98) of the respondents felt that there has been a change in the management of water resources in the catchment. This is because all the WRUA members could have been involved in at least one of the activities. The changes reported in order of priority were:

- Reduction in deforestation.
- Reduction in water pollution/ improvement in water quality.
- Reduction in gully erosion.
- Reduction in illegal water abstraction.
- Distillation of pans.

The changes are in line with the objectives of the WRUA as stipulated in the WRUA WDC (WSTF, 2009).

3.3.2 Effectiveness of the implementation of the Sub Catchment Management Plan

Based on a scale of 1 to 10, (very bad (1&2), bad (3), below average (4), average (5), fair (6), good (7), excellent (8, 9 and10)) the WRUA members were asked how they would rate various efforts undertaken by the WRUA. The effectiveness of reducing water pollution activities had a rating of 8.5 meaning excellent, effectiveness of reducing illegal abstraction activities had 8.6 also meaning excellent, effectiveness of gulley reduction activities had 8.2 (also excellent). The average of the effectiveness of these activities was 8.6 which translate to 86% meaning the actions taken by the WRUA were very excellent and very effective.

Based on a scale of 1 to 10, the WRUA Management committee, and WSTF were asked to rate the implementation of the SCMP. The WRUA Management Committee gave an average rating of 9, while WSTF gave a rating of 8. This rating averages to 8.5 equivalent to 85% for both level of implementation and efficiency which was an excellent performance. Based on a scale of 1 to 10, the WRMA gave a rating of 8.5 which is equivalent to 85% as the level of implementation of Awach Kano SCMP. This implies that the level of implementation of the SCMP excellent.

In a scale of 1-10, the Water Services Trust Fund also rated the implementation of the SCMP at 8.5 which is equivalent to 85%. This therefore means that the average rating of the SCMP is at 85% meaning that the implementation was excellent hence quite effective.

From all the effectiveness from WRUA members, WRUA management Committee and WRMA and WSTF, it can be noted that the average rating is 85%. This means that the implementation was excellent and quite effectives at 85%. However, there was room for improvement on the same.

3.3.3 Funds management efficiency and effectiveness

Almost all (97%, n=95) the respondents felt that the WRUA had used the funds provided to it in effectively and efficiently. Out of these respondents, 97% (n=92) felt that the objectives of the WRUA had been achieved as was envisioned. This was confirmed by WRMA, WSTF and the management committee. It was noted that WSTF had done an audit to determine if the WRUA qualified for the 3rdlevel funding. From this audit, it was that the WRUA had passed the audit test hence qualified for further funding.

From the analysis of the SCMP, it was noted that the SCMP had a total budget of Ksh 77,460,000 which was meant for rehabilitation of 5 water pans, establishment of roof catchment in 50 institutions and construction of 2 pans. These 3 activities carried the huge budget of the

SCMP at an amount of Kshs 73,000,000. The other activities proposed in the SCMP were establishment of baseline information, capacity building to the WRUA, determining the Sub catchment water balance, determining the water resource allocation for the sub catchment, spring and surface water source protection, protection of forests, degraded areas, and riparian zones, and Monitoring and Evaluation.

However, the WRUA has only received a total of Kshs 2,483,300 and was yet to receive approximately Kshs 5,000,000 for the 3rdlevel funding. This is much lower than what they had planned for in the SCMP. According to WSTF, part of the other funding was to be sourced through partnership of the WRUA with other organizations which at the time of the research, the WRUA had not secured. For the WRUA to effectively and efficiently manage the water resources in the sub catchment there is need for the WRUA to collaborate with other agencies and not only WSTF. This should be done in a structured manner both from the government and the other agencies. This is when the impact will be bigger and tangible.

This suggestion is in line with the GWP toolbox A3.1 Investment policies, which proposes that financing for WRM should be pursued from communities, government, individuals, the private sector, commercial banks and the donor community (GWP, 2010). This suggestion also is in line with the GWP toolbox B1.11 Building Partnerships which encourages organizations to partner with one another in the management and protection of water resources (GWP, 2010).

3.4 Challenges on the implementation of the SCMP

A close analysis of the challenges outlined above, the common challenges were:

- Low allocation of funds to the WRUA by the WSTF.
- Low technical skills in the implementation.
- Slow understanding of the WDC concept by the WRUA members as the WRUA members had not appreciated the concept of Water Resources Management as opposed to Water Service Provision.
- Lack of assets, infrastructure and transport means
- Delayed funding from WSTF as the WRUA could not continue with their activities since they lacked financial resources.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

WRUA members were adequately involved in the development and rolling out of the SCMP; had effectively implemented the SCMP based on their eligibility for the 3rd level funding as indicated by WSTF score of 85% on performance; had taken steps in ensuring that the water resources are conserved and protected in the sub catchment and had discharged their duties in line with the WDC and GWP toolbox. WRMA sub regional office had been actively involved in the development and rolling of the SCMP by sensitizing the members and capacity building them on their roles and the reforms in the water sector. They also provided technical backstopping in the implementation of various activities as confirmed by both parties.

The total funding that the WRUA had received was much less than what had been planned for in the SCMP. It is worth noting that, the effectiveness of the implementation of the SCMP requires not only adherence to the WDC and GWP but also depends on the resource available.

4.2 Recommendations

The following are the recommendations based on the study findings:

1. WRMA to advocate for more funding from the National and County Governments. The County Government in particular should have a kitty dedicated to the WRUAs for management, protection and conservation of Water Resources.
2. The WRUAs also need to partner with both civil societies and private sector so as to increase their financial base
3. The WRUA should have an office and skilled staff to support in the implementation of activities to ensure efficiency and effectiveness in the delivery of services.
4. WRMA together with WSTF should revise the WDC to ensure that it addresses the issues of sustainability of the WRUA especially on ensuring that the WRUA receives other sources of funding.

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