WATER RESOURCES IMPACT REPORT

A REPORT TO THE PUBLIC FROM THE

WATER RESOURCES AUTHORITY, KENYA

2016/2017

December 2017

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List of abbreviations

CAAC	Catchment Area Advisory Committee
CETRAD	Centre for Training and Integrated Research In ASAL Development.
CMS	Catchment Management Strategies
CoK	Constitution of Kenya
CSOs	Civil society organisations
DPs	Development partners
EDCP	Effluent Discharge Control Plan
ENN	Ewaso Ng'iro North
FY	Financial Year
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
GW	Ground water
KWSCRP	Kenya Water Security and Climate Resilience Project
LVEMP	Lake Victoria Environmental Management Program
LVN	Lake Victoria North

LVS	Lake Victoria South
LWF	Laikipia Wildlife Forum
MaMaSe	Mau Mara Serengeti
M^3/day	Cubic meter per day
M^3/s	Cubic meter per second
NGOs	Non-governmental organisation
PDB	Permit Database
RVC	Rift Valley Catchment
SCMPs	Sub-Catchment Management Plans
SW	Surface water
TSS	Total Suspended Solids
WKCDD & FM	West Kenya Community Driven Development and Flood Management
WRM	Water Resources Management
WRA	Water Resources Authority
WRUAs	Water Resources Users Associations

Foreword

Water Resources Authority (WRA), Kenya was established under Section 11 of the Water Act 2016, with all the powers to perform her mandate. The Act has made extensive provisions on the Authority's role in regulating the use and management of water resources. This Report being the 7th Edition of the Authority's Performance, covers the Financial Year 2016/2017 and focuses on water allocation, pollution control, catchment protection, basin planning, water quality and quantity monitoring, economic value for water, information systems and stakeholder participation. It also covers Kenya Water Security Climate Resilience Project (KWSCRP), capital projects, and a brief on the Water Act Transition.

Analysis of WRA's performance for the FY 2016/2017 is presented in this report and takes into account the Authority's progression since 2009. WRA continues to register improved performance especially with regards to permitting, compliance with water use charges, establishment and development of WRUAs. In particular, the Authority has conducted a number of abstractions and pollution surveys which has seen an increase in the number of legalized water abstractors. In regards to pollution, effluent dischargers have now been engaged to develop Effluent Discharge Control Plans (EDCP). It is envisaged that compliance to EDCP will continue to translate into improvement of water quality as it continues to be adopted by major water users, both public and private.

In this period WRA embarked on various capital projects across Kenya which was geared towards attainment of Vision 2030 flagship project goals. WRA enhanced its engagement with stakeholders and achieved tremendous growth in partners' collaboration in water resources activities in the spirit of Integrated Water Resource Management. Water resources monitoring network was upgraded to telemetry to ensure efficiency in real time data transmission and effective decisions in water resources in the country.

Mohamed M. Shurie
Chief Executive Officer

Executive Summary

This report entails the performance of Water Resources Authority, Kenya in the regulation of the use and management of water resources during the period July 2016 to June 2017. The major areas reported in this report with focus on the core function of WRA which is water allocation. Performance was analysed using the permitting process, and it showed that the total number of surface water permit applications handled as at the year of reporting were 3250, while ground water permit applications were 18756 and 117 for effluent discharge, resulting in 22123 applications in the Permit database. Athi had 59% of all the water permit applications, Tana and Rift Valley catchment (RVC) 12%, Ewaso Ngiro North (ENN) 7% and Lake Victoria North (LVN) and South (LVS) 5% respectively. Out of the total number of applications, 26% were permits, 68% authorizations, and 3% each approvals and applications pending processing. 94% of the permits and 42% of the authorizations were valid. 67% of the permits are for Ground water (GW), 32% Surface water (SW) and 1% for Effluent Discharge (ED). Athi had 50% of all the permits, Tana 17%, RVC 12%, ENN 8%, LVN 8% and LVS 4%. 82% of all the permits fall under category B, 13% category C and 5% category D. The highest proportions of surface water permit in the three categories are in Tana catchment area, constituting about 94%, with the lowest being ENN with 0.1%. On ground water, Athi had about 59% of all the ground water permits while LVS had the lowest with 2.3%.

Regarding volumes, 87MCM was abstracted under permit conditions. Tana permitted 94% of SW volumes, while ENN had the least at <1%. 99.9% of the permitted volumes in Tana were abstracted under valid permits. On GW, RVC was highest with 54% of permitted volumes while LVS was last with <1%. 99% of the volumes are permitted under category D, 1% category C and category B<1%. Major purposes under which water is allocated are public, domestic, livestock, irrigation, industry and hydropower. The amount of water allocated for these uses are 103.5 million cubic metres (MCM), with 102.6 and 0.95 MCM for SW and GW respectively. 99.6% of water is allocated for hydropower, which is 100% returnable as it is a non-consumptive use. Among the consumptive uses irrigation is the largest consumer, with Tana abstracting 52% while LVN and LVS are last with 1% each. Public purpose is next, with 53% abstracted from Tana for use in Nairobi city with ENN last at 1%. Industrial use followed, with LVN allocating 79% while ENN was last at 1%. Athi allocated 44% of domestic water while LVN and LVS were last at 4%. ENN allocated 60% of water for livestock use while LVS was last at 1%. Analysis indicates that more revenue is expected from SW as compared to GW. On storage, about 3.9 MCM were developed through dams and pans to enhance water availability with the largest storage under class A dams.

Pollution control management is critical to water resource management as it affects the available water for different uses. Effluent dischargers increased from 285 to 355, and were all identified through pollution surveys. The number of effluent dischargers implementing EDCP also increased from 125 to 134. Out of this, 76 have been issued with permits/authorization. This also represents an increase of 2% compared to 2015/16 reporting period. A 44% national average compliance to EDCP and ED permitting conditions was reported.

During the year ending June 2017, there was an increase in the number of WRUAs formed totally 670 out of a potential of 1237, 398 SCMPS developed and 354 SCMS implemented across the 6 catchment areas. The report also contains trend analysis on performance, which for permitting indicates that the numbers have increased from about 200 in 2006 to 5767 in 2017. Major areas of achievement are: improved data collection and transmission, protection of critical water catchments activities implementation, and enhanced data management.

The Authority made tremendous steps in the achievement of the capital projects majorly; SCMP implementation, Athi River Restoration, Abstraction and pollution surveys, drilling of exploratory boreholes, Construction and rehabilitation of monitoring stations, Kikuyu spring protection and Lamu sand dunes gazettement which have improved water quality and quantity and increased storage.

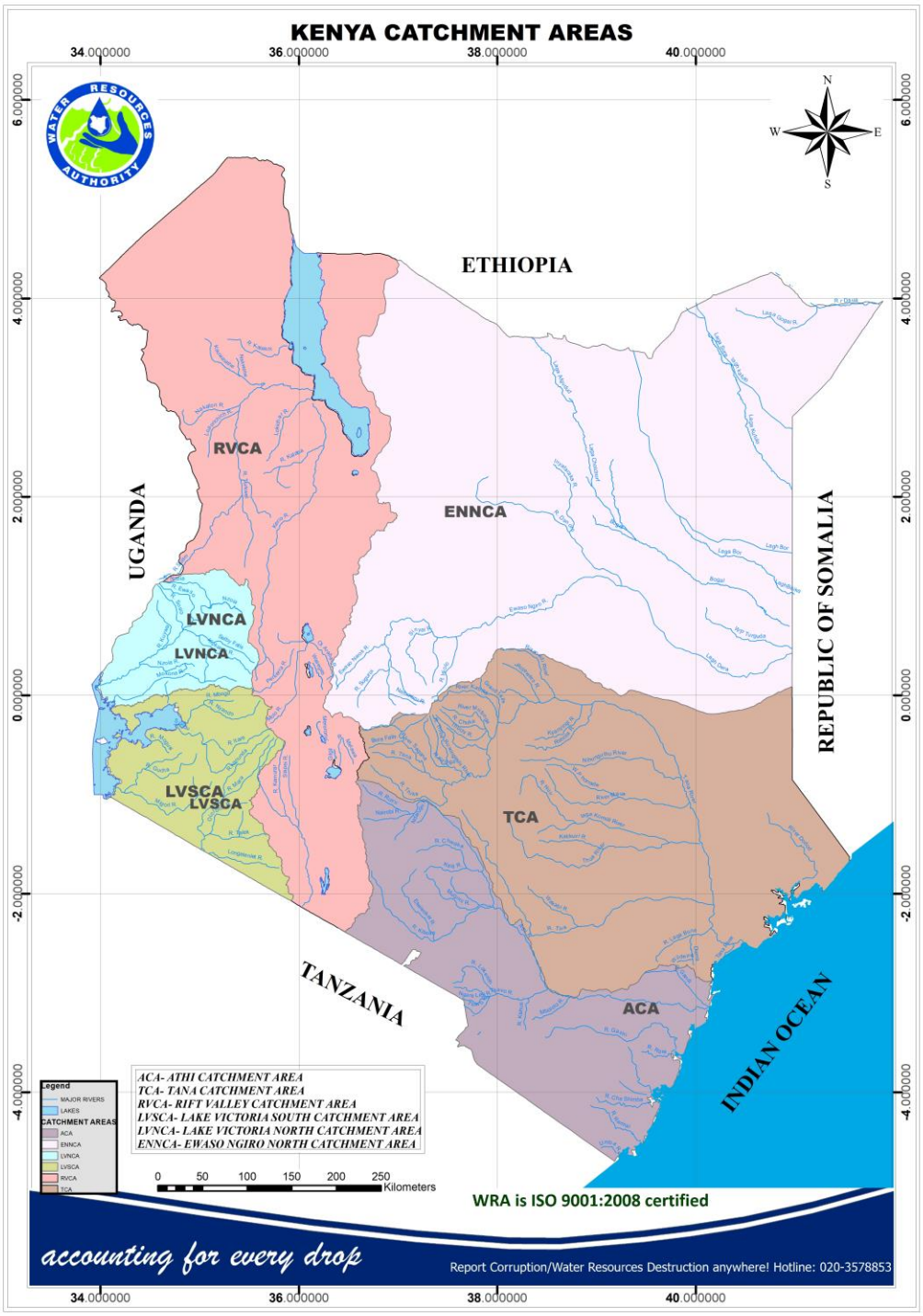


Figure 1: Water Resources Authority Catchment Areas

1 Introduction

This report highlights the performance of WRA for the assessment period July 2016 to June 2017 and has three main components. These are objectives and indicators for assessing performance, the assessment of WRA performance and trend analysis showing the progression in performance. The objectives and indicators derived from seven management functions of WRA regulation of the management and use of water resources as outlined in chapter 2. Chapter 3 describes the WRA performance based on the indicators derived in chapter 2. Progress and achievements over the years since WRA inception is presented in chapter 4.

The report emphasizes equitable water allocation of both ground and surface water is assessed through permitting process. The tool used is the Permit Database (PDB) in which the status of applications, approvals, authorisations and permits issued contained.

In an effort to ensure equitable allocation of water, the Authority has developed water allocation thresholds which informs allocation and monitoring impacts on water resources for the six-main water uses namely public, domestic, livestock, irrigation, industry and hydropower. Water allocation plans (WAPs), have been developed participatorily from data collected during the abstraction survey to ensure equity and good practice in water sharing. With regard to monitoring compliance to regulations, WRA enforces the installation of measuring devices to ascertain the actual amount of water abstracted or discharged.

Pollution and catchment conservation was assessed based on the status of effluent discharge from point source pollution. The Effluent Discharge Control Plans (EDCPs) are used as a tool to facilitate improvements towards achieving compliance to water quality standards. For non-point source pollution, assessment was based on regular water quality monitoring and pollution surveys while catchment protection, assessment was done using catchment conservation and rehabilitation measures in place.

The progress towards Implementation of catchment management strategies was assessed through the following indicators: permits issued, WRUAs established, major effluent dischargers with EDCPs, % achievement of water resources monitoring stations and protection of critical catchments were also assessed. Implementation of the IWRM through stakeholder participation is also illustrated in the activities of WRUAs and stakeholders engaged. Improvement in economic and financial management was analysed through investments in water resources management activities. Availability of water resources data and information for planning, decision making and access to the public is also discussed in this report.

In cognizance of the requirement of GoK, the Authority paid special attention to the implementation of Capital projects as part of vision 2030 flagship projects.

Chapter 4 contains trends progress and achievements of the Authority since its operationalization in 2005. The trends are presented on a yearly basis for each of the 6 regions of the Authority.

1.1 Regulation of the management and use of water resources

The Water Act 2016 being operationalized on 21st of April, 2017 vide Gazette Notice No. 59, it gave the Authority mandate of regulating the management and use of water resources. The Authority shall continue to work with WRUAs, Basin Water Resource Committee, stakeholders including the county government in water resources management.

The Authority shall develop rules, regulations, standards and procedures to implement water Act 2016.

A transition period of three years is contemplated under the Act. Water Resources Authority and representatives from the Ministry of Water & Irrigation with the support of the World Bank funded Kenya Water Security and Climate Resilience Project (KWSCRP) have developed and are implementing a transition roadmap that will ensure a timely and seamless transition process.

The powers and functions of the Authority are exercised and performed under the direction of a governing board which consists of a Chairman appointed by the President, members appointed by the Cabinet Secretary responsible for matters relating to water.

The Principal Secretaries or their representatives in matters relating to in respect to water, finance and environment also sit in the Board. The Chief executive officer is an *ex officio* member of the Board and has no voting rights. These are as follows;

i.) Formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation;
ii.) Regulate the management and use of water resources;
iii.) Enforce Regulations made under the Act
iv.) Receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits
v.) Collect water permit fees and water use charges
vi.) Provide information and advice to the Cabinet Secretary for formulation of policy on National Water Resource Management, water storage and flood control strategies
vii.) Advise the Cabinet Secretary generally on the management and use of water resources.

In addition to the mandates listed under Section 12 of the Water Act, 2016, WRA is vested with the following powers:

i) source and receive funding for the activities of the Authority;

ii) collect, analyse and disseminate information on water resources;

iii) monitor compliance by water users with the conditions of permits and the requirements of the Act;

iv) issue permits for inter-basin water transfer; and

v) delegate regulatory functions to the basin water resource committees

The Authority undertook Water resource assessment in Garissa County to assess the quantity and quality of water available and presented the report to Garissa County for decision making.

1.2 Conservation and protection of water resources

In conservation and protection of water resources, WRA engaged WRUAs and other stakeholders to enhance water availability through actions that prevent adverse impacts on water resources. The activities were implemented in collaboration with various stakeholders, the activities included; Riparian conservation in which WRA uses mobile mappers to map riparian areas for conservation, spring protection with provision of cattle trough to cater for livestock, rain water harvesting infrastructure for water storage to enhance availability of water and improve community livelihoods.

A catchment forum was held in Athi basin in a bid to bring stakeholders together in catchment management.

1.3 WRA Capital projects

Towards the achievement of Vision 2030 flagship projects, WRA undertook the following capital projects:

- Construction and rehabilitation of monitoring stations which include upgrading of 10 stations to telemetry which transmits real time data to WRA server.
- Athi River Restoration Programme (ARRP) with a focus on Ngong River clean up, Nairobi river restoration and abstraction and pollution survey for Ngong and Mbagathi river catchment.
- Drilling exploratory boreholes in Turkana and Marsabit Counties to enhance ground water monitoring.

Terametre used to carry out ground water assessment. This in turn gives the correct status of viability of exploitation of Ground Water

Ground Water Monitoring Borehole. WRA continues to monitor Ground Water and avails data for information and decision making

- Implementation of 6 SCMP activities in Theta, Olbanita, Oraimutia, Machinjoni, Asao and Upper Enziu WRUAs to increase storage and provide access to water in good quantity and quality.

Gituamba dam: Before rehabilitation

Gituamba dam: After rehabilitation

Gituamba water pan before construction and after construction an increase to 6500m^3 from 3200m^3 with a provision of cattle trough for livestock and a pump for drawing water

- Conservation towards gazettement of Kikuyu springs and Lamu sand dunes to protection sources within vulnerable ecosystems
- 6 Abstraction and Pollution Survey in Gilgil, Malakisi, Kipchorian, Teleswani, Mweteta and Thingithu rivers to inform water allocation plans and legalize abstraction.

2 Objectives and indicators for assessment of performance

2.1 Introduction

The indicators used to assess WRA performance have been derived based on seven functions in water resources regulation and management of water use and 21 objectives to be realised. The seven functions that formed the basis of the assessment are:

i. Water allocation, with consideration of social water and environmental water use

ii. Volume of water per category of use, the main input used in water allocation planning

iii. Pollution control and catchment conservation, to reduce adverse effects on water resources

iv. Catchment management plan and strategy development for systematic and participatory management of water resources

v. Water resources assessment and monitoring for data acquisition and information generation, for effective regulation and water uses management

vi. Information management and dissemination, for transparent decision making and good governance

vii. Stakeholder participation for effective coordination and consensus building for ownership

The indicators outlined below were used to evaluate the performance of WRA in the seven thematic areas.

2.2 Equitable and efficient water allocation

This indicator emphasizes water resources allocation, which is a means of sharing water resources among various users taking into account social, economic and environmental water needs. The process is subject to regulations where permitting is used as a tool that ensures equity in water sharing among competing uses. WRA operates a permit database that stores, processes and gives information on the status of water allocated for various uses. Permitting takes into account the different classes of water resources divided into four categories: Category A is reserved for social water while classes B, C, and D are based on the level of economic water use where the user pays for the amount of water used. The reserve is set to guide allocation so that during all seasons priority is given to basic human needs and the environment. The system is guided by the water allocation plans (WAPs), where they have been developed participatorily, to ensure equity and good practice in water sharing. Performance based on this indicator was assessed using the reports from the permitting data base and status of water allocation for both surface and ground water.

2.3 Control of pollution of water resources

Pollution of water leads to economic water scarcity which means that water has to be treated before being available for various uses. Furthermore, health impacts such as disease burdens and mortality are also associated with polluted waters.

Control of pollution entering water sources is done through use of effluent discharge permits. This is undertaken participatorily with the involvement of stakeholders. The performance on this indicator is based on the inventory of the effluent discharger's progress in developing and implementing effluent discharge control plan. The identification of the key effluent dischargers is done through pollution surveys. The compliance to the effluent discharge standards is measured through monitoring the quality of water resources.

2.4 Catchment conservation and rehabilitation measures

Catchment conservation and rehabilitation measures are carried out to reduce degradation, which affect water resources directly and indirectly. The measures which are both on-farm and off-farm are cross cutting in nature, requiring involvement of stakeholders from public, private, civil society institutions and development partners.

To make it sustainable, the participation of stakeholders has been institutionalised through WRUAs using sub-catchment management plans as an implementation tool. With devolution, county governments are expected to play an increasing role in conservation. Involvement of development partners is mainly through projects such as the Kenya Water Security and Climate Resilience Project (KWSCRP). Under Athi River Restoration programme, Ngong River cleaning up started with a stretch of 2Km upstream of Nairobi Dam. In this report, performance on this indicator was assessed through construction of sediment control structures, spring protection and riparian and wetland conservation as outlined in the Catchment Management Strategies and SCMPs.

2.5 Integrated basin planning

Integrated basin planning is a way of implementing IWRM which is a holistic framework for coordination, bringing together diverse, regulatory, policy and planning. WRA implements this through catchment management strategies (CMS), which is a tool that considers participation, sustainability, data and status of the water resource for both surface and ground water. This objective was assessed through the number of permits issued, proportion of allocated water with valid permits, major effluent dischargers complying with EDCPs, and water resources data monitoring stations. On stakeholder participation, assessment was also done on WRUA formation and SCMP development, which was enhanced through WRUA SCMP implementation under capital projects. WRA also engages with stakeholders on a working arrangement to execute specific activities as provided for in the CMS.

2.6 Protection of vulnerable water resources

Vulnerable water resources are those that are prone to degradation and are valuable in enhancing the status of water resources in terms of quality and quantity. The vulnerability relates to the status of the catchment areas which, due to their value, are prone to exploitation and hence need to be protected. Such areas or resources include springs, wetlands, ground water recharge and riparian zones. Towards this endeavour, WRA undertook protection and gazettement of Kikuyu springs and Lamu sand dunes. The status of conservation of vulnerable areas in all regions was used to assess performance on this indicator.

2.7 Monitoring compliance to water abstraction and effluent discharge

WRA determines the effectiveness of compliance to abstraction and effluent discharge through permitting. Installation of measuring devices has been introduced as one of the conditions to monitor compliance to permitting. WRA is therefore able to ascertain the actual

amount of water abstracted or discharged by water user where such devices have been installed. This however is challenging as many abstractor are still unable to comply with this condition. WRA is enhancing this through a partnership with Kenya Airport Parking Services (KAPS) in installing smart meters. In this report, this indicator is measured by the number of measuring devices installed against the number of permits issued for each use. Regarding effluent discharge, the status of compliance to EDCPs is also used in assessing performance.

2.8 Monitoring water quantity and quality

Water resources quantity and quality monitoring form an essential part of water resources assessment, a core function of WRA that provides information for determining the status of water resources. The monitoring applies to both surface and ground water and uses regular gauging stations (RGSs) and monitoring boreholes for both surface and ground water respectively. These are specific to each of the six catchment management strategies where targets have been set. The same monitoring stations are used for water quality monitoring with focus on non-point source pollution. Surface water monitoring was enhanced through of construction of telemetric stations which are supposed to provide real time data to WRA. The percentage of functional RGSs and boreholes were used to assess performance in this report.

2.9 Improving water use efficiency and economic value for water

Efficient water use and economic value for water are increasingly being emphasized by WRA, as the demand for different water uses increases. Improvement in water use efficiency requires emphasis since it will result in improved water availability for other uses. WRA allocates water through permit data base whereby authorizations are first issued for construction of abstraction works. The timeline given for this is one year after which the authorization is converted into a permit for water use. Efficiency in water allocation was measured by time taken to process authorizations within the stipulated service charter timeline. Categories B, C & D conforms to the 'user pay' principle, which is one of the fundamental principles in integrated water resources management (IWRM).

2.10 Information systems for water resource management

WRA has put in place a National monitoring and information system that comprise of data, tools and information. This is the medium within which the data is processed and packaged for the end user. The relevance of an organisation is also viewed in terms of how such products are readily availed to the users. In addition to the WRA also operates a permit database for allocating water to different users. For purposes of assessing performance in operations of the database, information on surface water, ground water and water quality was extracted from the database. These are operational stations and duration of data

collection. These were used to measure performance in information system functionality. Profiling of the data contained within WRA has also been done. This exercise involved generating summaries of the data for each monitoring station which has also acted as a metadata for the monitoring stations.

2.11 Stakeholder participation and networking

Stakeholder participation is one of the fundamental principles of IWRM and it is essential for shared commodities such as water resources. Networking on the other hand is necessary in order to build synergy with partners and be more effective in our function. Stakeholders involved in water resources management can be grouped into three: private, civil society organisations/NGOs and development partners. Those established and supported by WRA are mainly WRUAs. The number of these stakeholders involved in water resources management, has been used in assessing WRA performance with regard to this indicator. The other stakeholders currently playing some role in water resources management are academics and the faith-based organisations. WRA intends to formally engage them and will be reporting achievements where they are involved in a similar way.

3 WRA Performance

3.1 Water Allocation

3.1.1 Permitting of water resources

Permitting is a process through which WRA regulates water abstractions by various users. It involves the user submitting a prescribed water application form with information which has information on the details of the Applicant, amount of water to be abstracted, location, mode of abstraction, relevant assessment fees, as well the proposed purpose of water use. The application then undergoes a thorough vetting process at all WRA offices after which an authorisation to construct works is issued to the Applicant. The authorisation to construct is given to an Applicant to them prepare the site and fulfil all the conditions as required by regulations. Such authorization conditions include but not limited to installation of measuring devices, submission of water quality analysis report, as well as notification to the authority of the various stages of construction to enable the Authority undertake or organise supervision of works. An authorisation is valid for one year, after which it is either extended for two terms of one year each after completing requisite application for extension form and paying requite fees if construction of works have not been finalized; or a certificate of completion of works is completed by the applicant to signify that the construction of abstraction works has been completed.

Once the works are constructed an inspection is carried out by WRA personnel to affirm that such works have been constructed as was authorized. If the works are found satisfactory an abstraction permit is issued to the Applicant after payment of relevant water abstraction permit fees. The permits contain conditions for water use as provided in the Water Resources Management (WRM) Rules 2007. A water abstraction permit is issued on a pro-rata basis depending on the purpose for water use, with 5 years being the maximum validity period. Water Permits are issued with conditions such as but not limited to efficient use of water, maintenance of the works, submission of data on water use, payment of water use charges, timely renewal and penalties accrued in late renewal, as well as safe disposal of effluent arising from water use. Non-compliance to permit conditions is contravention to regulations and offenses are prosecutable under the Act. Permitting process is the same in all WRA offices countrywide.

Region	Applications pending processing			Number of approvals			Number of authorizations			Number of valid authorizations			Number of permits			Number of valid permits			Total			Combined
	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	(SW, GW, ED)
LVN	15	36	7	60	65	18	52	410	0	30	240	0	102	375	0	93	371	0	229	886	25	1140
LVS	19	59	3	42	66	0	72	611	0	43	437	0	102	91	3	87	89	1	235	827	6	1068
RVC	20	45	6	38	41	1	118	1605	8	41	769	4	131	544	19	118	511	19	307	2235	34	2576
Athi	26	240	7	8	56	1	214	9680	6	77	3537	6	580	2293	2	557	249	2	828	12269	16	13113
Tana	81	26	12	97	31	2	360	1125	2	181	473	1	679	315	4	584	296	4	1217	1497	20	2734
ENN	33	38	5	67	26	0	71	719	6	40	399	2	263	259	5	206	245	5	434	1042	16	1492
TO	19	44	40	31	28	2	887	141	2	41	58	1	18	38	3	164	37	3	32	187	117	2212

TAL	4	4		2	5	2		50	2	2	55	3	57	77	3	5	61	1	50	56		3
	All permits									Valid permits									Total			Combined
	Category B			Category C			Category D			Category B			Category C			Category D						
	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW	GW	ED	SW, GW &ED
LVN	65	362	0	24	11	0	13	2	0	57	359	0	23	11	0	13	1	0	102	375	0	477
LVS	42	86	1	38	5	2	22	0	0	37	84	1	31	5	0	19	0	0	102	91	3	196
RVC	57	322	18	40	100	1	34	122	0	48	300	18	37	92	1	33	119	0	131	544	19	694
Athi	446	2053	2	112	211	0	22	29	0	435	2014	2	103	209	0	19	26	0	580	2293	2	2875
Tana	610	297	4	47	6	0	22	12	0	520	286	4	43	1	0	21	9	0	679	315	4	998
ENN	174	194	2	78	54	3	11	11	0	140	184	2	58	51	3	8	10	0	263	259	5	527
Tota	139	331	27	339	387	6	124	176	0	123	322	27	295	369	4	113	165	0	1857	3877	33	5767

I	4	4								7	7											
All permitted volumes (x1000 m^3/d)										Valid volumes (x1000 m^3/d)												
Region	Category B		Category C		Category D					Category B		Category C				Category D		Total				
	SW	GW	SW	GW	SW		GW			SW	GW	SW		GW		SW	GW	SW	GW	COMBINED		
LVN	7.8	7.1	8.4	0.5	264.6		0.2			7.2	7	8		0.5		264.6	0.1	280.8	7.8	288.6		
LVS	2.2	2	22.6	0.8	2774.3		0			2	1.9	17.1		0.8		2771	0	2799.1	2.8	2802		
RVC	5.9	9.4	25.2	20.7	1796.1		184.9			4.9	8.2	23.4		19.5		1792.7	178	1827.2	215.0	2042		
Athi	6	52.2	126.6	38	217		47.5			5.9	51	112.4		37.5		179.7	44.3	349.6	137.7	487.3		
Tana	352.6	6.5	346.4	1.6	80626		10.5			316.3	6.2	333.4		0.1		80606	3.3	81325	18.6	81344		
ENN	33.1	7.1	78.1	10	44.6		7.7			26.3	6.8	59.6		9.3		38	7.1	155.8	24.8	180.6		
Total	4073.6	84.3	607.3	71.6	85723		250.8			362.6	81.1	553.9		67.7		85652	232.8	86738	406.7	87145		

SW is Surface water, GW is groundwater, and ED is Effluent Discharge

Water Abstraction

Weir

struction of weirs bles the regulation of water flow in the r this helps in ntaining the reserve and ensuring there dequate water for the atic life.

Common Water Intakes ensures equity for the different water users /uses. This supports regulation of the use of water during droughts and ensures reduced conflicts among users and different uses

Common Water intake

Permitting is given a lot of emphasis because it is the main tool in water allocation which is WRA's core function, coupled with the increasing demand for water and the declining per capita fresh water availability. Also, the recognition of the economic value of water and the need for users to appreciate it through water use efficiency requires extra effort. To achieve this mandate, WRA has continued to use Permit Database (PDB), a software that facilitates permitting processing. The PDB is installed in all WRA offices, where applications are received and processed according to the category of permits. The categories range from A, which is the lowest category, to D which is the highest, depending on the Water Allocation Thresholds. Categories A, B and C applications are processed at the regional offices, while category D, which involves large abstractors with major impact on water resource are processed at WRA headquarters. Regional offices can view all the applications within their sub regions, while all permitting applications can be viewed at the headquarters.

Permitting data is summarized in Table 3.1 and it includes data on the number of pending applications, approvals which are general category As, authorizations, permits, as well as the permitted volumes per region, clearly stated and reflecting the level of engagement in permitting and performance. The table is structured into three parts: Part 1 contains the entire permitting data from those pending to the permits for surface, groundwater and effluent discharge. In Part 2, all permits are presented alongside valid permits in categories B, C and D. Expired permits that require renewal are not presented but they form part of all permits. Part 3 contains data on the permitted volumes of water in m^3/day for both surface and ground water. The total permits and volumes of water permitted indicate the level of engagement of every region in water allocation. Performance is therefore measured in terms of the proportion of valid permits and volumes of water per region. That aside, it should be appreciated that the regions are endowed differently with water as a resource.

Analysis of performance show that 678 applications were pending processing while 619 Approvals, 15059 Authorizations and 5767 Permits were issued at the 33 WRA offices. This is a great improvement on the reduced number of pending applications as at the end of last financial year and increased number of authorizations and permits. LVN (53) was the best with the least number of pending applications (8%), while Athi last with highest number of pending applications at 270 (42%).

Pic 1

Figure 3: 1 Distribution of Permitting data across the application process June 2017

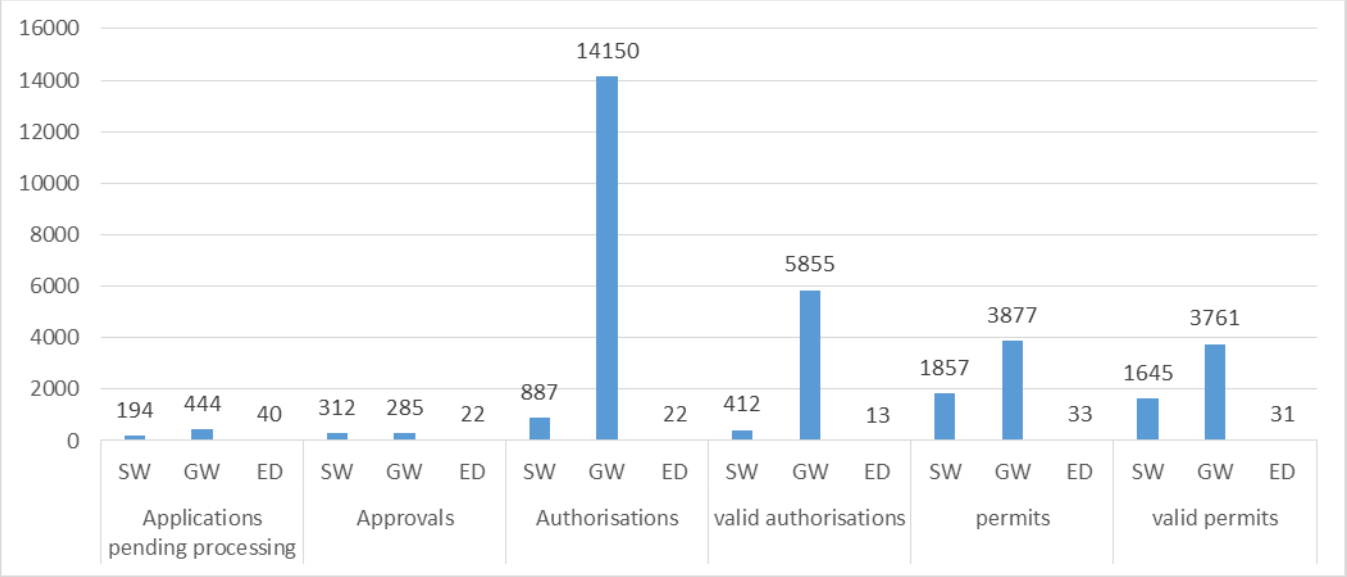
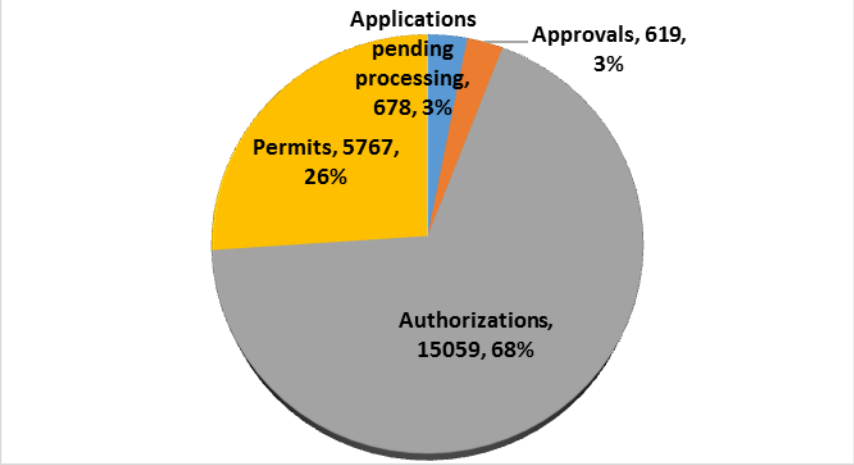


Figure 3: 2 Percentage Distribution of Permitting data across the application process June 2017

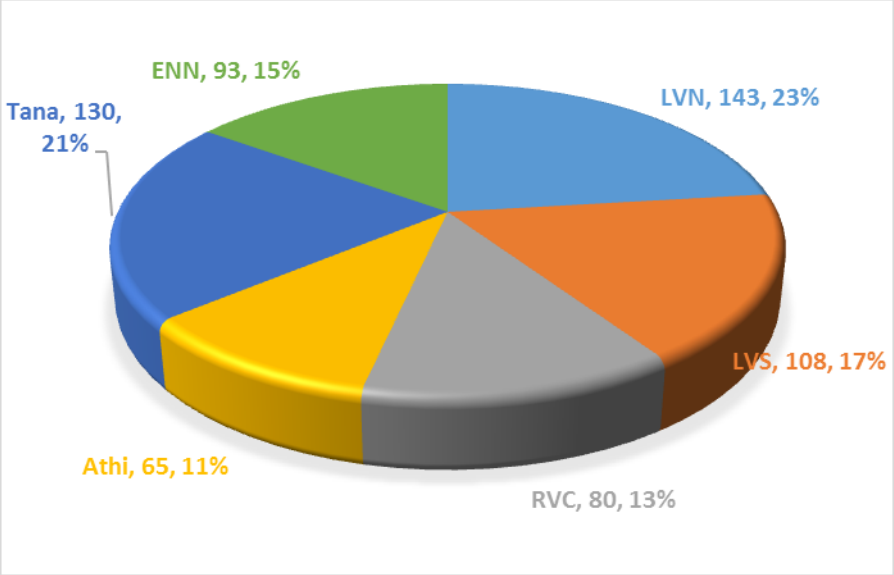


There were **619** Approvals nationally, an increase from 522 from the previous year. This indicates an increased volume of water allocated for social good. **96**% of the approvals were for SW (312 - 50%) and 46% GW (285), while ED stood at 22 approvals as was in the previous year.

Category A approvals for Effluent Discharge have lowest impact on water quality, but they attract Effluent Discharge fees as a measure to deter dischargers

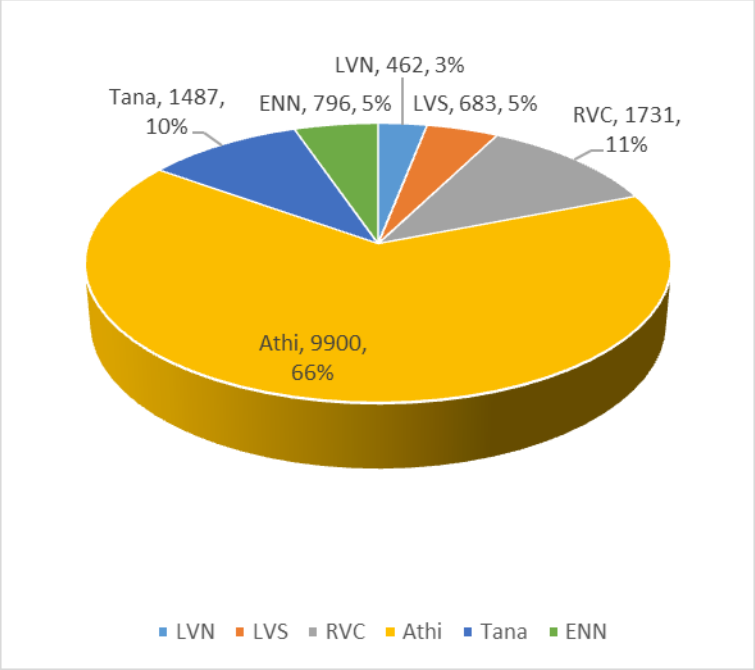
	from polluting water resources.

Figure 3: 3 Cumulative Approvals June 2017

	LVN had the highest number of approvals at 23%, followed by Tana at 21% while Athi had the lowest approvals at 11%. Tana had the highest number of SW approvals, whereas Athi (8) had the lowest. The high values in Tana could be a pointer to larger amounts within category A thresholds, unlike Athi which has lower thresholds.

Authorisation is a temporary and intermediary stage in permit processing that provides for water abstraction works to be constructed and other conditions fulfilled before a permit is issued. The users are therefore obliged to provide feedback to WRA before they are permitted to use water for the various purposes they intended. However, most water users start abstracting water with authorisations, which is illegal. There were **15059** category B, C and D authorizations during the reporting period, up from 11844.

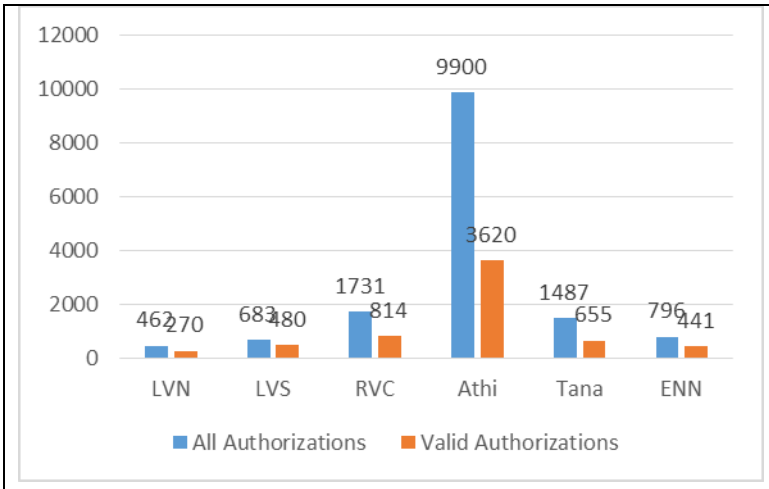
Figure 3: 4 Cumulative Authorizations June 2017



3215 authorizations were processed within 201617 FY, giving a cumulative of **15059** nationally. Athi took the lead with **66**% (**9900**) of the total number of authorizations issued, while LVN was the last with **3**% (**462**).

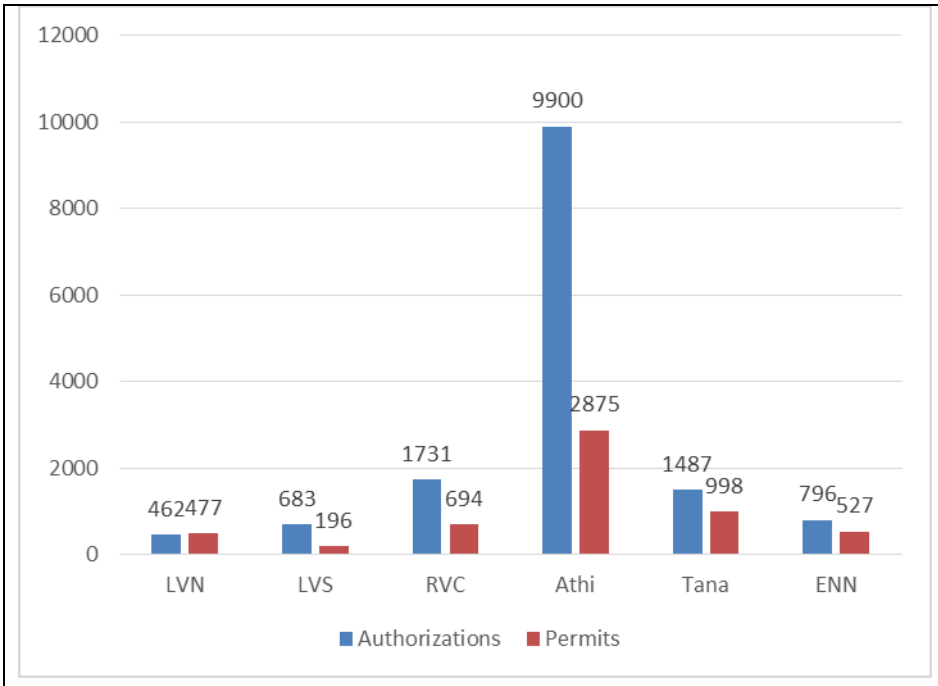
94% (**14150**) were GW authorizations, **5.9**% (**887**) for SW, and ED was last with 0.1% (22). The number of authorizations increased while the number of expired authorizations decreased, as compared to the previous reporting year, which is very positive and a pointer to the inspections carried out during the reporting period.

Figure 3: 5 Comparison of All Authorizations and Valid Authorizations June 2017



(42%) 6280 of all authorizations were valid as at the reporting period. 70% of all authorizations in Lake Victoria South (LVS) were valid, while Athi had only 37% valid authorizations. The high number of authorisations is dependent on the number of applications and hence the demand, which is higher in Athi and least in Lake Victoria South and North. Much effort is still needed to convert more authorisations into permits.

Figure 3: 6 Comparison of Authorizations and Permits per region June 2017



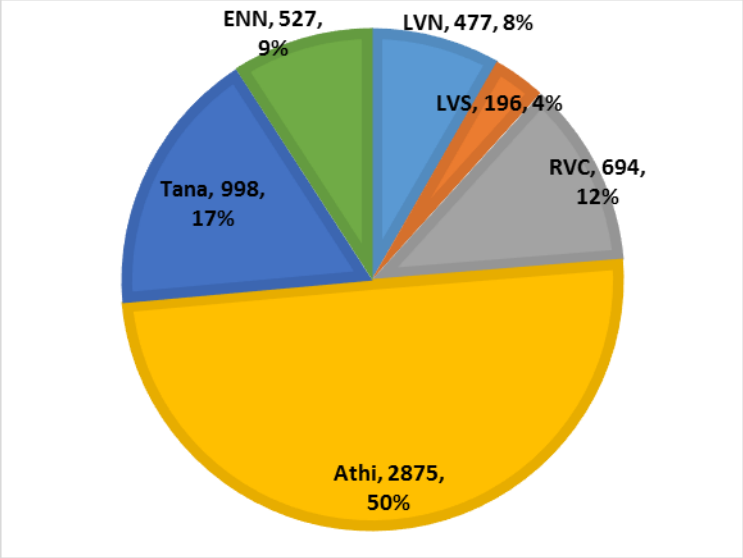
There were 15059 (72%) Authorizations and 5767 Permits (28%). Athi has the highest number of Authorizations and Permits, followed by RVC and Tana. LVS has the least number of permits.

The numbers depend also on water resources endowment as well as the demand in the various regions.

More effort is needed to

	convert the authorizations into permits.

Figure 3: 7 Cumulative Permit distribution per region June 2017



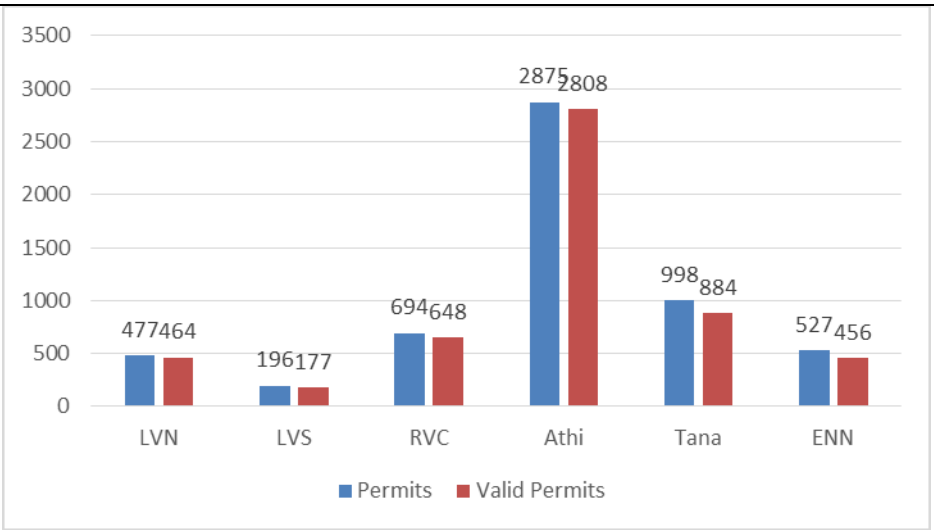
There were 5767 cumulative permits at the end of the reporting period.

67% of the permits were for GW (3877), while 32% for SW (1857). ED (33) permits constituted only 1%.

Athi was best with 50% of all the permits, followed by Tana at 17% and RVC at 12% in the third place.

LVS was least in permits issued at 4%.

Figure 3: 8 Comparison of all permits and valid permits per region June 2017

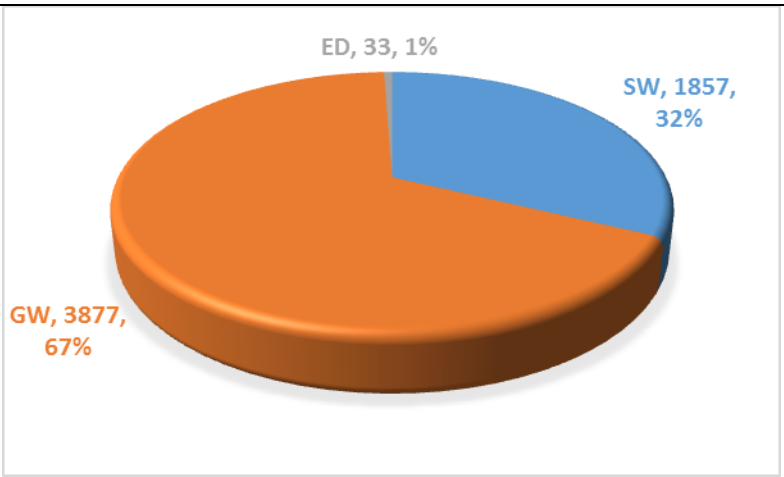


94% (5437) of cumulative permits were valid as at the reporting period, a 1% increase from the previous year.

98% (2808) of the cumulative permits in Athi were valid.

100% of the cumulative ED permits in RVC were valid.

Figure 3: 9 Composition of Permits by type June 2017



GW permits are the highest at 67%, followed by SW at 32%. ED was the least at 1%.

Tana region had highest SW permits while LVN & LVS (102) had the lowest.

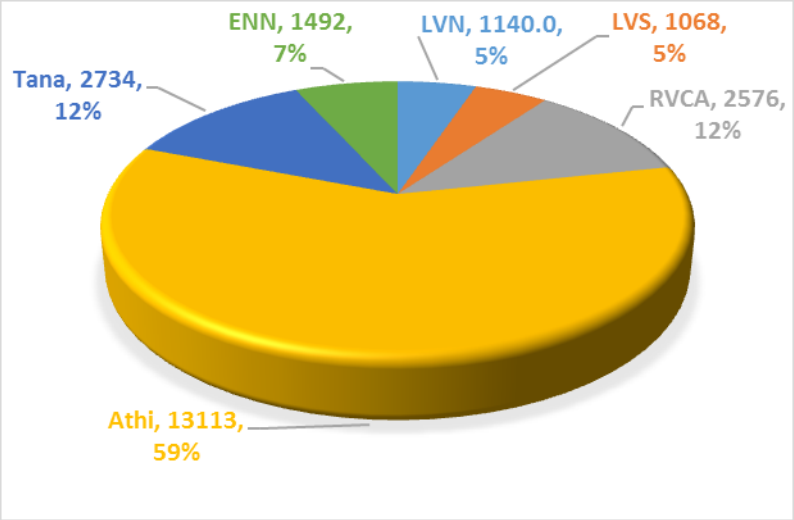
Athi was best in GW permits while LVS was the last.

RVC led in cumulative ED permits while LVN had none, though the region was highest in ED

	approvals.

There was a total of **22123** permit applications in various stages in the permit database during the reporting period. **18756** 85% were for GW abstraction, while 15% (3250) were for SW. ED (117) contributed to less than 1%. This implies that 83% of all permit applications are for GW extraction.

Figure 3: 10 Status of Permits Applications by region June 2017



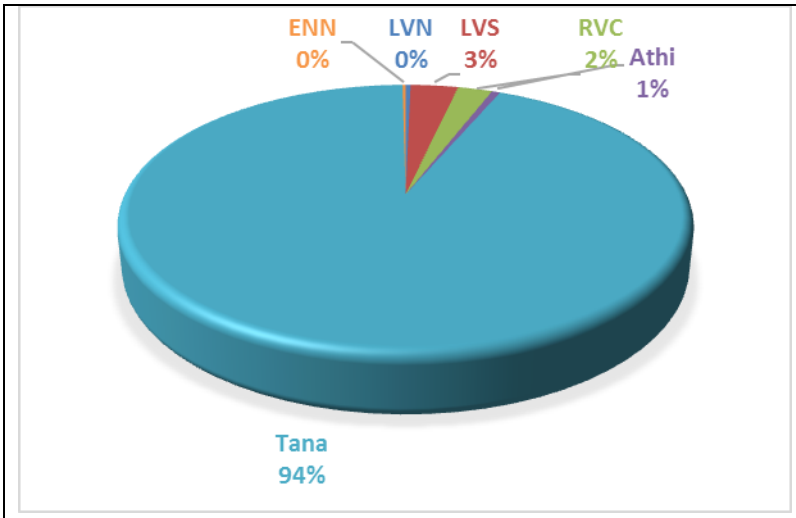
There was a total of **22095** applications in the Permit database.

Athi had the highest applications with 13113 **at 59%,** followed by Tana with 2734 (12%) and RVC at 2576 (12%). LVS was last at 1065.

Athi was best in GW, Tana best in SW and RVC best in ED.

Out of the total permitting figures 13113 (59%) were from Athi, an indication that Athi was leading in permitting as at the reporting period. 94% (12269) of the permit applications from Athi were for GW. Athi was followed by Tana (2734) and RVC (2576) both at 12% of cumulative applications. The Lake regions trailed at 5% with LVN at (671) and LVS (1068) respectively in the cumulative number of applications received. Of all applications, 26% (**5767**) were permitted, 71% (15,678) had authorizations and approvals. Only 3% (678) of the applications were pending as at the reporting period which was a very great improvement.

Figure 3: 11 Percentage Permitted volumes by region June 2017

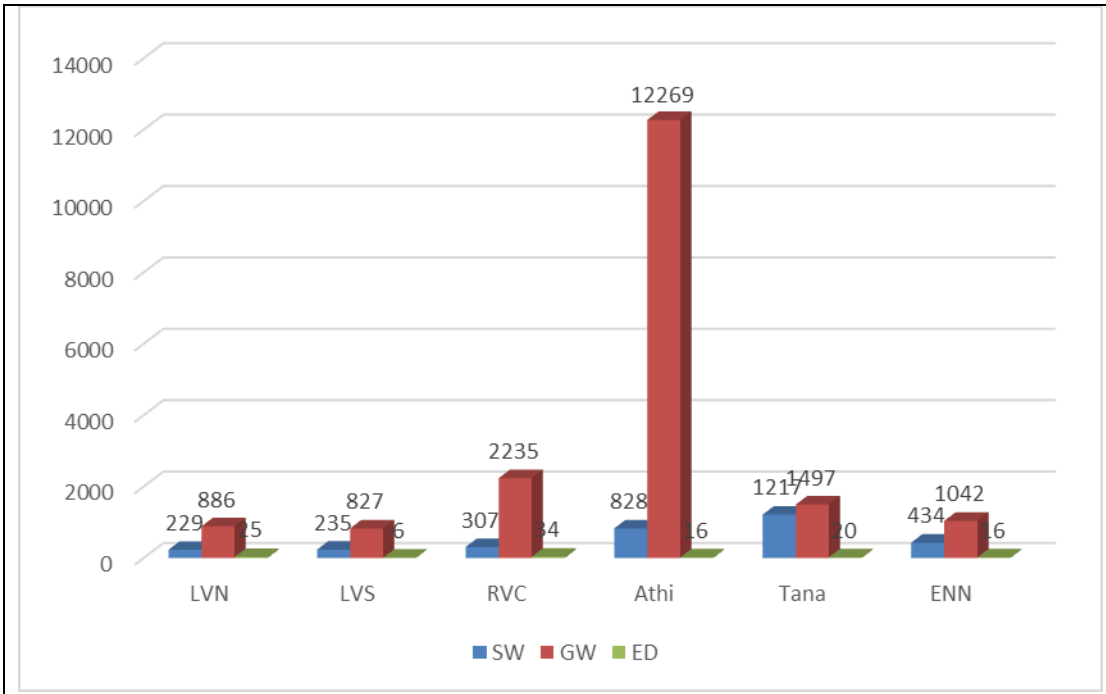


There was a total of 87,144,600 m^3/d abstracted under permit conditions by June 2017. Tana (81,344,000 m^3/d) had permitted the highest volumes at 94% followed by LVS (2,801,900 m^3/d) at 3% and RVC (2,042,200 m^3/d) at 2%. ENN (155,800 m^3/d) permitted the least volumes. RVC was highest in GW volumes under permits.

99.5% (86,738,000 m^3/d) of cumulative volumes of permitted water was abstracted under SW while GW constituted a meagre 0.5% (406,700 m^3/d)! This is interesting especially when viewed from the cumulative permits of 67% GW and 32% SW! The high volumes of water are attributed to water allocated for Hydropower development in Tana as will be seen later in this report.

Further analysis confirms, as earlier alluded that GW in overall has more applications, authorisations and permits as compared to SW and ED applications, an indication of increased GW use. This is could be attributed to dwindling SW resources, decreased water quality and or even Climate Change.

Figure 3: 12 Distribution of SW, GW, and ED applications per region June 2017

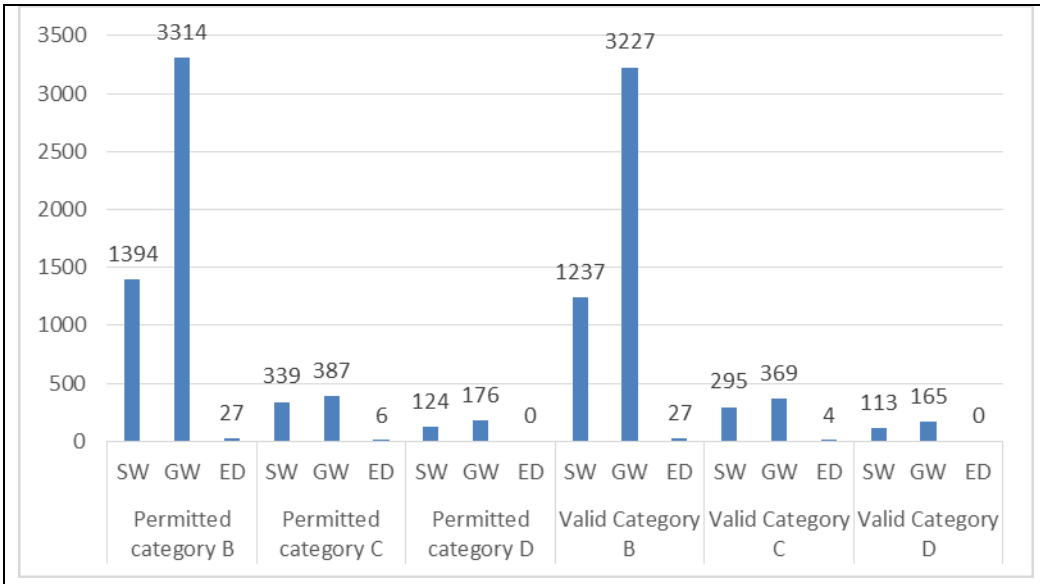


Athi led in GW followed by RVC then Tana.

Tana was highest in SW followed by Athi then ENN. RVC was best in ED followed by LVN

The second part of Table 3.1 shows the number of permits for the three categories B, C and D. As earlier mentioned, applications are categorised into A,B,C and D depending on their impact on water resource, where category As having no impact and category D with major impact, including trans-boundary waters. As such category D applications undergo thorough evaluations and are processed at WRA headquarters. Category A applications do not mature into permits, and as such are issued with Approvals. The remaining three categories B, C and D have economic value and therefore stakeholders and interested parties are involved in processing them. Categorization is determined by the Water Resources Allocation Thresholds for classification of permits.

Figure 3: 13 Comparison of no. of permits per category June 2017



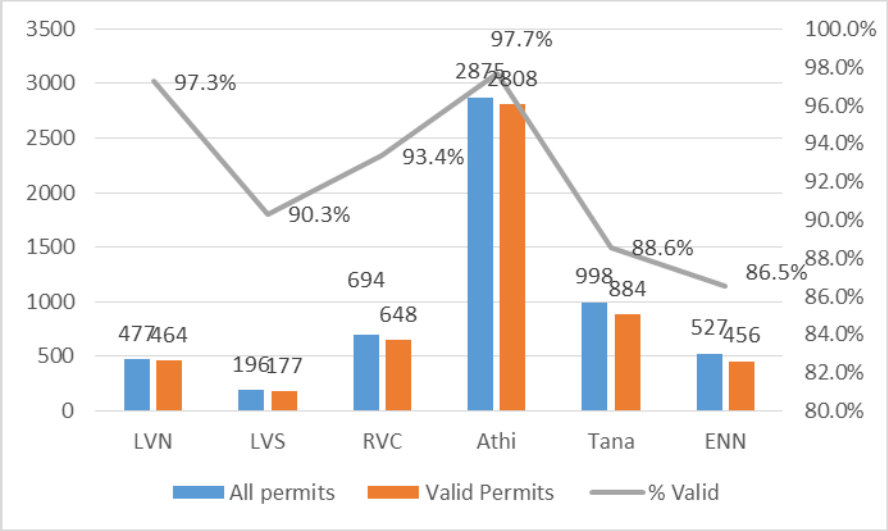
82% (4735) of all permits fall under category B, followed by category C at 13% (732) then category D having 5% (300).

Tana was highest in category B SW;

Athi best in GW; and RVC best in ED

The figures affirm that majority of permitted water users (81%) are in category B where they abstract 19% of the allocated volumes. The top abstractors comprise 19% and abstract 91% of the permitted volumes. Likewise SW constitutes 99.6% (86,527,400 m^3/d) of cumulative water abstracted under permit conditions while GW constitutes only 0.4% with 130,100 m^3/d. As seen in the figure, the number of permits nationally drops from category B to C to D. This is because of the increase in thresholds of water required, with large incremental volumes of water as permit category increases. The higher categories require more stakeholder participation with categories C and D being subjected to Public Notification in the Newspapers. The time allowed for processing higher permit categories is also longer, essential for building consensus and balancing interests, hence fewer permits as the category increases.

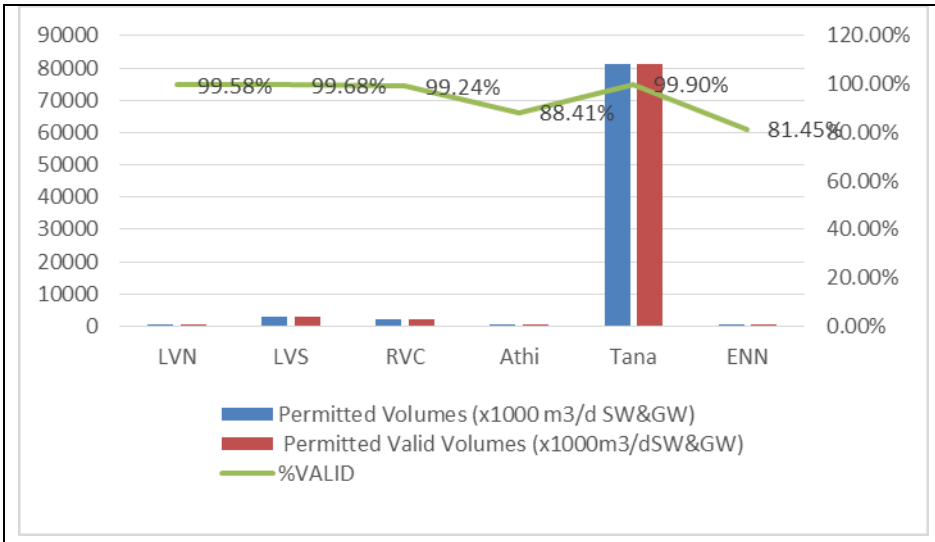
Figure 3: 14 Comparison of cumulative permits, valid permits and % Valid June 2017



Comparison of performance based on valid permits indicates that Athi is the best performer with 98% of permits being valid followed by LVN at 97% while ENN trails the rest with 87% valid permits.

Every permit issued has a specific amount of water that the user is allowed to abstract, store or discharge. A valid permit is an indication of compliance.

Figure 3: 15 Comparison of % Permitted volumes and Valid Volumes per region June 2017



Tana had the highest permitted volumes and the highest valid volumes at 99.9% valid.

LVS was second in permitted and valid volumes at 99.7

Whereas Athi region performed highest in the number of permits, Tana permitted the highest volumes of water. As illustrated, the percentage of valid permitted volumes are relatively high with most of them above 90%. Tana catchment area was the best performer where the valid permitted volumes for both ground and surface water in categories B, C and D were 99.9%. ENN was the last with 81%. LVS, LVN, and RVC followed Tana at 99.68%, 99.58%, and 99.24% respectively. Overall performance nationally was 95% an indication that most volumes of water are abstracted under valid permits, and which is very commendable.

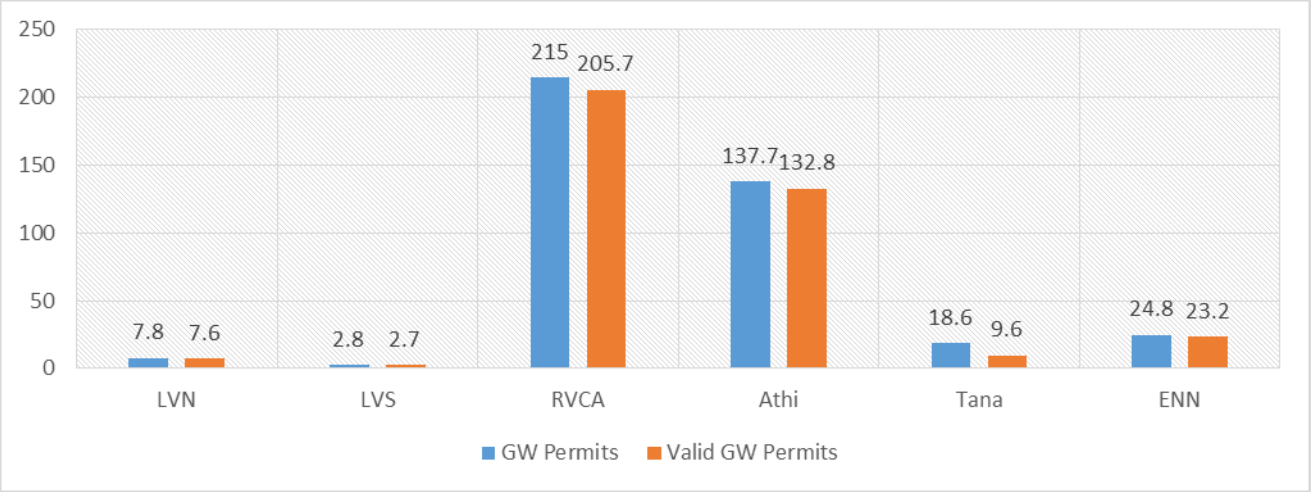
Table 3: 1 Comparison of Permitted volumes and Valid Volumes per region June 2017

Region	All Permits	Valid Permits	Permitted Volumes (x1000 m3/d)	Valid Volumes (x1000 m3/d)
LVN	477	464	288.6	287.4
LVS	196	177	2802	2793

RVC	694	648	2042	2027
Athi	2875	2808	487.3	430.8
Tana	998	884	81344	81265
ENN	527	456	180.6	147.1
Total	5767	5437	87145	86950

Whereas Athi is highest in permitting followed by Tana and Athi with the Lake regions trailing, on the permitted volumes Tana is highest followed by LVS then RVC. On the contrary Athi is third last.

Figure 3: 16 Comparison of Permitted and valid GW volumes per region June 2017

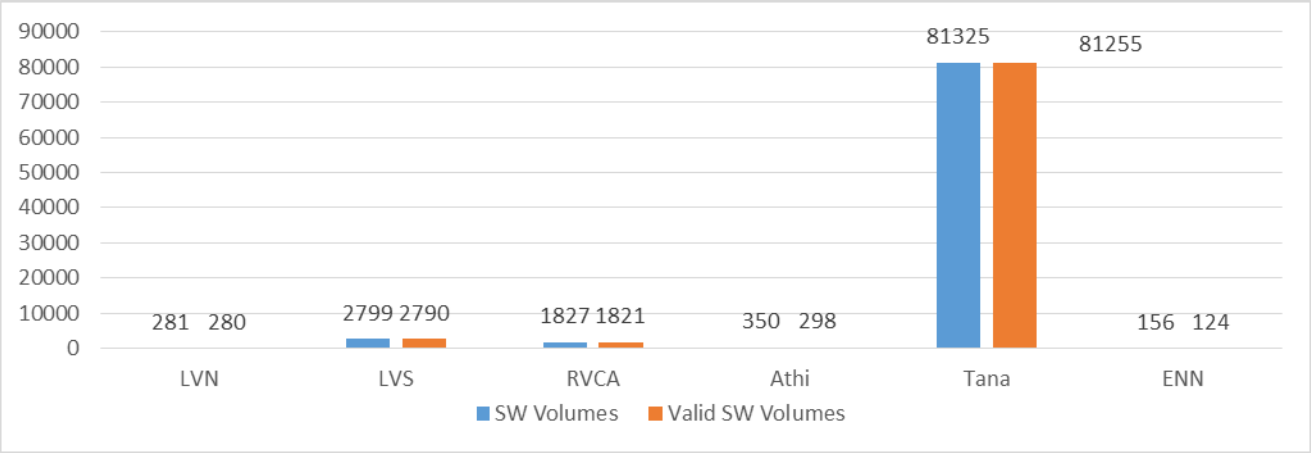


Further analysis indicates that in GW permitting RVC is the best performer having permitted 54% of the total GW volumes, followed by Athi came second with 35%. LVS was the last with less than 1% volumes. Success in RVC can be attributed to high volumes abstracted from the Lake Naivasha Lakeland aquifer coupled with high awareness and strengthened partnerships, as well as an active Water Resource Users Association (WRUA). Water users in this area comply with regulations, which include but not limited to timely renewal of permits. GW volumes abstracted from the aquifer is also high as compared to other regions, and the

usage is mainly for commercial, which enhances the economic value for water resources. It is also noted that most of the abstracted volumes in Athi are in category B because the main use in this region is domestic purposes as compared to RVC where most of GW abstractions are in category D and used for irrigation which has relatively high water demand. In LVN and LVS water supplies depend very little on boreholes.

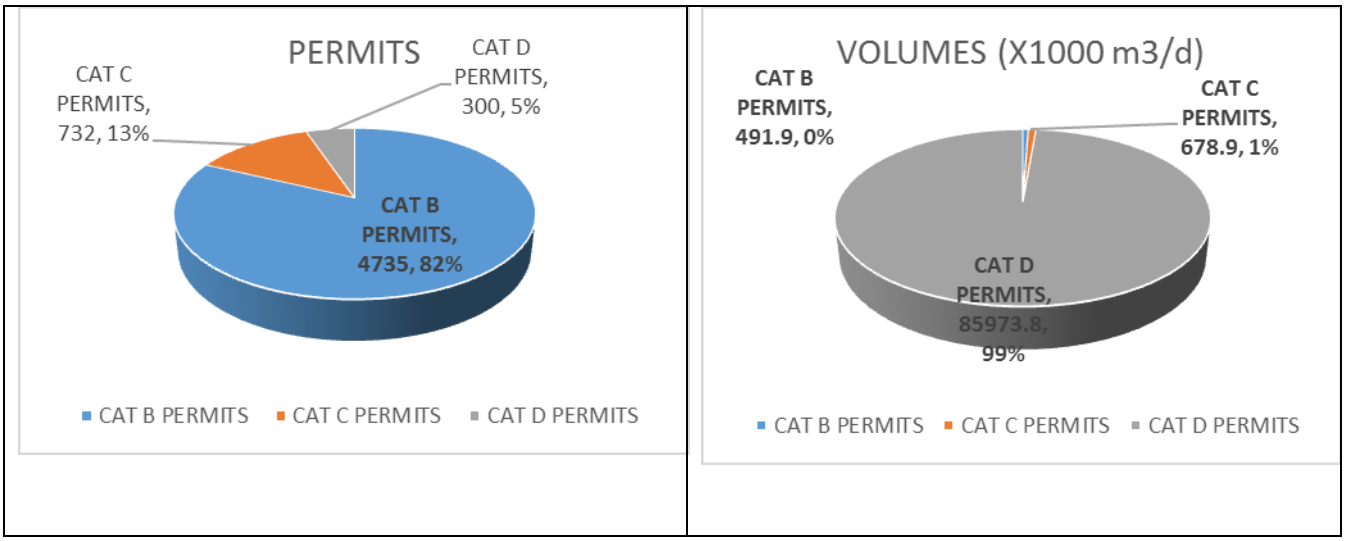
Analysis of surface water usage based on permitted and valid volumes shows that Tana catchment area was the highest and way above the other five regions where they abstract 94% of all the permitted volumes with a near 100% validity.

Figure 3: 17 Comparison of Permitted and valid SW volumes per region June 2017



Out of the total surface water permitted of 86.7 MCM, Tana Region alone had 81.3 MCM. This constitutes about 94% of the total, leaving only 6% to be shared by the other five regions. This can be attributed to hydropower permitted allocations which are majorly in Tana region. From the remaining 6%, LVS follows with 3% then RVC at 2%. The lowest was ENN with 0.2%. In summary, SW permitted volumes for all the permit categories are higher than the GW volumes, while the GW permits are more than the SW ones.

Figure 3: 18 Comparison of All permits and permitted volumes per category June 2017



3.1.2 Criteria for water allocation

Permitting is a tool used in water allocation to ensure equity and transparency. Criteria in water allocation is based on priority of use, where domestic use gets the first priority among the allocated water, when a water permit application is being considered for approval (Water Act, 2002). This is based on the fact that the reserve which comprise water for ecological and basic human needs is not allocated, but should be left in the sub basin. The purposes for which water use is allocated are mainly six comprising public water supply, domestic, livestock, irrigation, industrial and hydropower. Irrigation is usually divided under subsistence and commercial use, where subsistence irrigation is carried out in an area less than a hectare. Subsistence irrigation has priority over commercial irrigation. For purposes of this report, irrigation constitutes both subsistence and commercial use. Table 3.3 shows the water allocated for each purpose from both SW and GW. Analysis show that the highest volume (99.6%) of SW is allocated for hydropower generation, which is a non-consumptive use, and this 100% returnable.

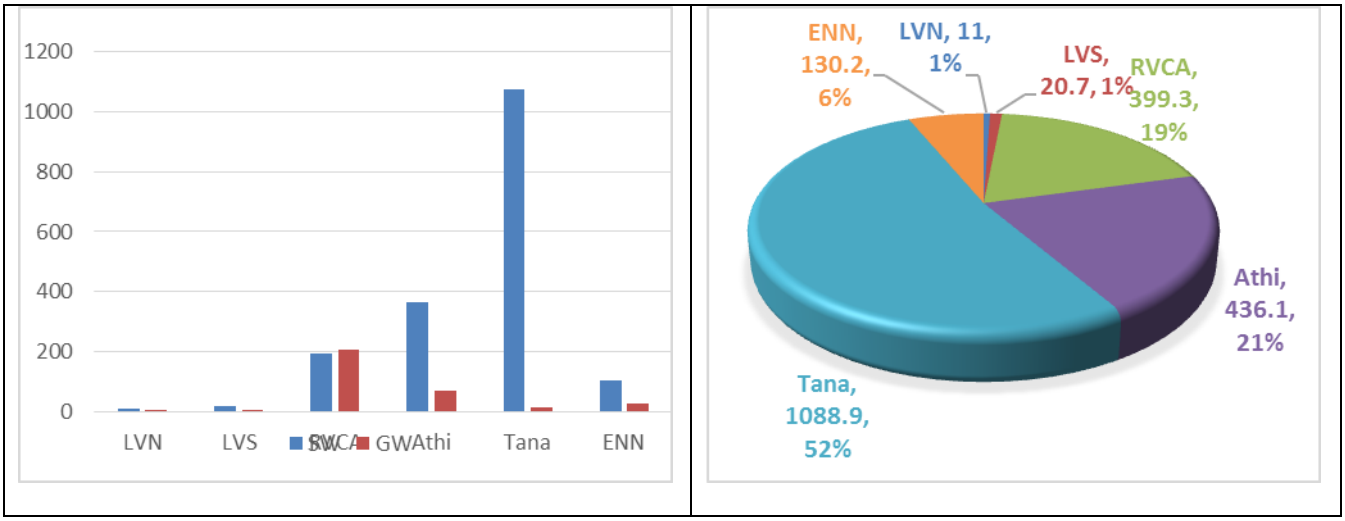
Table 3: 2 Cumulative volume of water allocated for each purpose June 2017

Volume of water by category of water use up to June 2017 (x 1000 m^3/day)																	
Region	Public		Domestic		Livestock		Irrigation		Industrial		Power		Other		Total		Combined
	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	
LVN	125.9	0.9	9.5	14.7	2.2	0.3	10.6	0.4	583.3	0.1	5832.7	0	12.7	0.1	6576.9	16.5	6593.4
LVS	227.4	0.5	11.9	15.2	0.4	0.4	19.6	1.1	32.8	1.4	2646.5	0	3.3	0.1	2941.9	18.7	2960.6
RVC	11.7	36.7	22.3	37.1	8.9	4.1	194.3	205	14.1	4.2	1684.7	4.3	7.6	12.6	1943.6	304	2247.6
Athi	82.8	101.8	14.1	252	0.4	7.2	365.2	70.9	40	40.7	5000.8	1.6	25.2	5	5528.5	479.2	6007.7
Tana	666.7	12.2	118.8	44	7	2.8	1074.3	14.6	13.2	0.5	83402.3	0	63.1	1.1	85345	75.2	85420.6
ENN	15.1	5.8	48	20.7	47.8	3	105	25.2	4.3	0.7	0.4	0	5.1	1.9	225.7	57.3	283
TOTALS	1129.6	157.9	224.6	383.7	66.7	17.8	1769	3172	687.7	476	98567	5.9	117	20.8	102562	9509	103513

SW – Surface water; GW - Groundwater

84.6% of the total volume allocated for power is from Tana catchment. LVN and ATHI follows, Tana with a combine 11% of the total water allocated or power. RVC and LVS had less than 5% with ENN being the least allocation of SW for hydropower generation. Less than 1% was allocated for power from GW. RVC and Athi are the only regions which have allocated GW for hydropower generation, as a result of geothermal development.

Figure 3: 19 : Water allocated for irrigation x 1000 m3/d June 2017

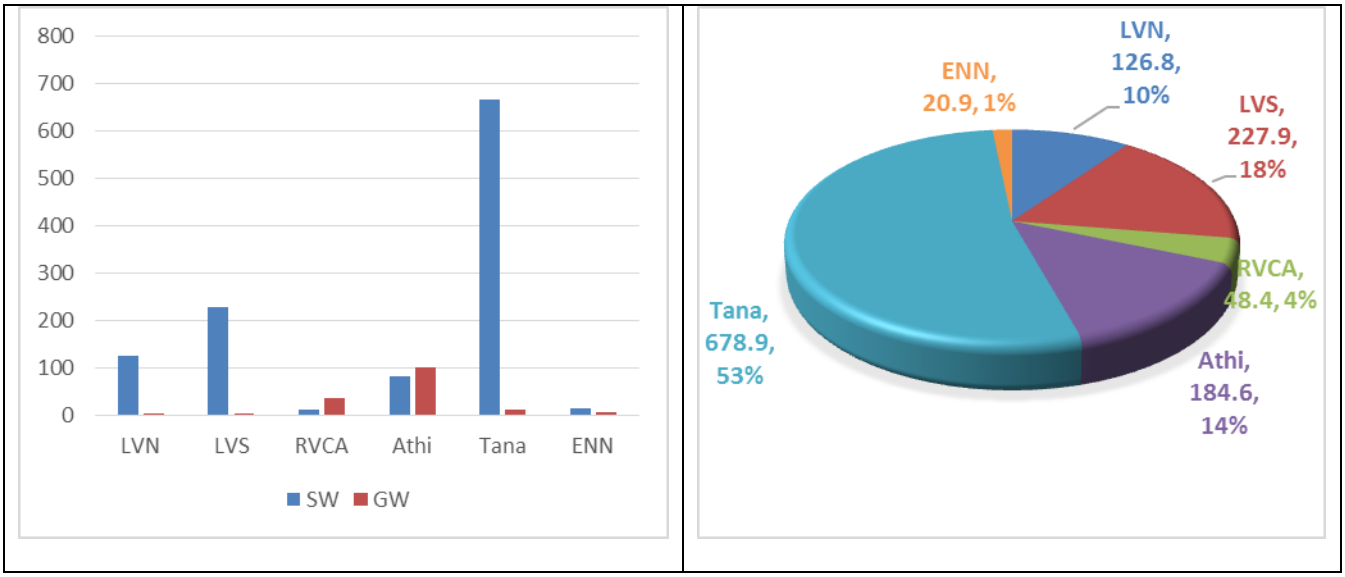


Among the consumptive uses irrigation was the largest water user with 2,086,200 m^3/d allocated to the sector. Tana catchment has allocated 61% (1,074,300 m^3/d) of the SW volumes for irrigation making the catchment the highest water user for irrigation purposes. This could be attributed to the irrigation projects in the catchment. Athi catchment (365,200 m^3/d) followed Tana in SW allocated for irrigation, then RVC took the third largest SW user for irrigation with a volume of 194,300 m^3/d. LVN was the last fin SW volumes allocated for irrigation. RVC has allocated the highest GW volumes for irrigation, followed by Athi which has nearly the same percentage for both SW and GW. The Lake regions have lowest allocations for irrigation use from both SW and GW. Tana allocated more than half of the total volumes for irrigation followed by Athi and RVC.

Third slot and second consumptive largest water use was allocated for public purpose with allocation of 1,129,600 m^3/d SW and 157,900 m^3/d GW. Tana allocated 666,700m^3/d (59%)

of the total SW allocation for public use, followed by LVS at 20% and LVN at 11%. ENN was the last in SW allocation for public purpose at 1.3%. Athi on the other hand allocated 65% of the GW volumes followed by RVC at 23.2%.LVS was the least in GW allocation for public purpose at 0.3%. It is clear that the highest amount allocated for public use was from Tana catchment, followed by Athi, then LVN and LVS. Tana's performance is as a result of the inter-basin transfer where water is abstracted from Tana for use in Nairobi city, situated in Athi.

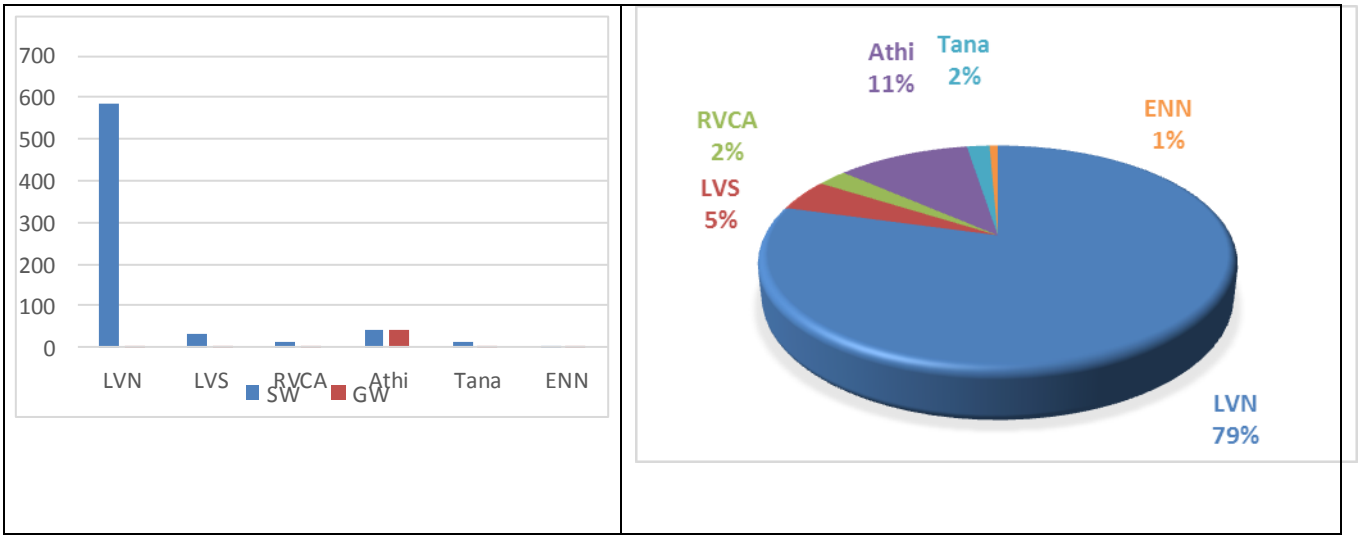
Figure 3: 20 Water allocated for Public use from SW and GW x 1000 m3/d June 2017



SW – Surface water; GW – Groundwater

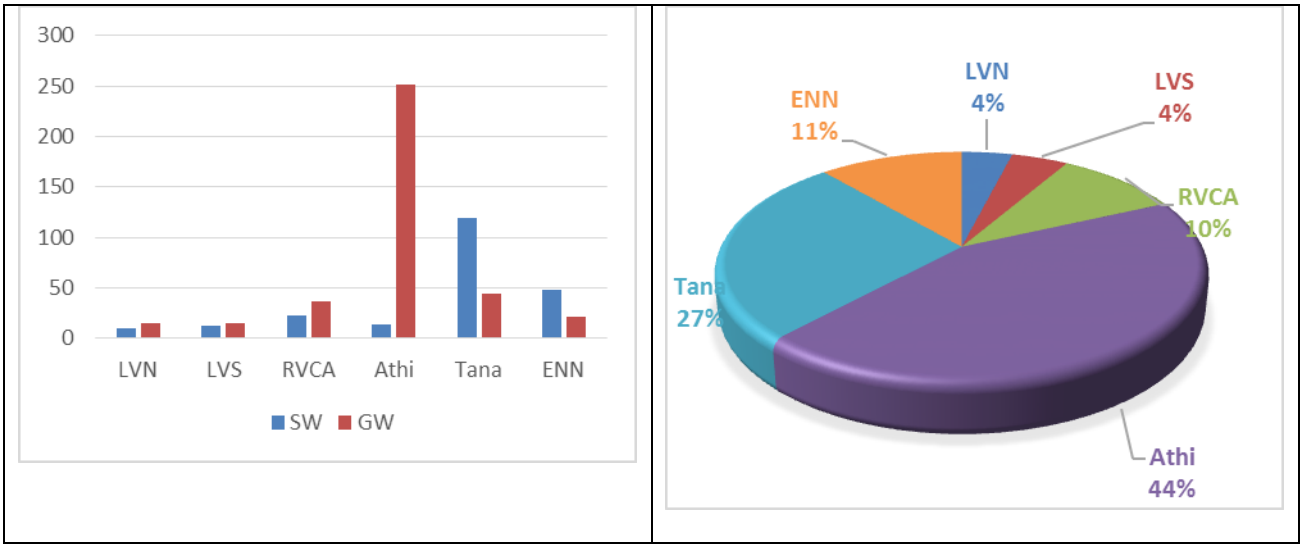
Fourth slot and third consumptive largest water use was allocated for industrial use with allocation of 687,700m³/d SW and 47,600 m³/d GW. LVN allocated 583,300m³/d (85%) of the total SW allocated for industrial use, followed by Athi at 6% and LVS at 5%. ENN was the last in SW allocation for industrial use at less than 1%. Athi allocated 86% of the GW volumes while LVN was the least in GW allocation for industrial purposes. It is clear that 79%, the highest amount allocated for industrial use was from LVN catchment, followed by Athi, then LVS. It is clear that many industries are in LVN followed by Athi.

Figure 3: 21 Water allocated for Industrial use from SW and GW June 2017



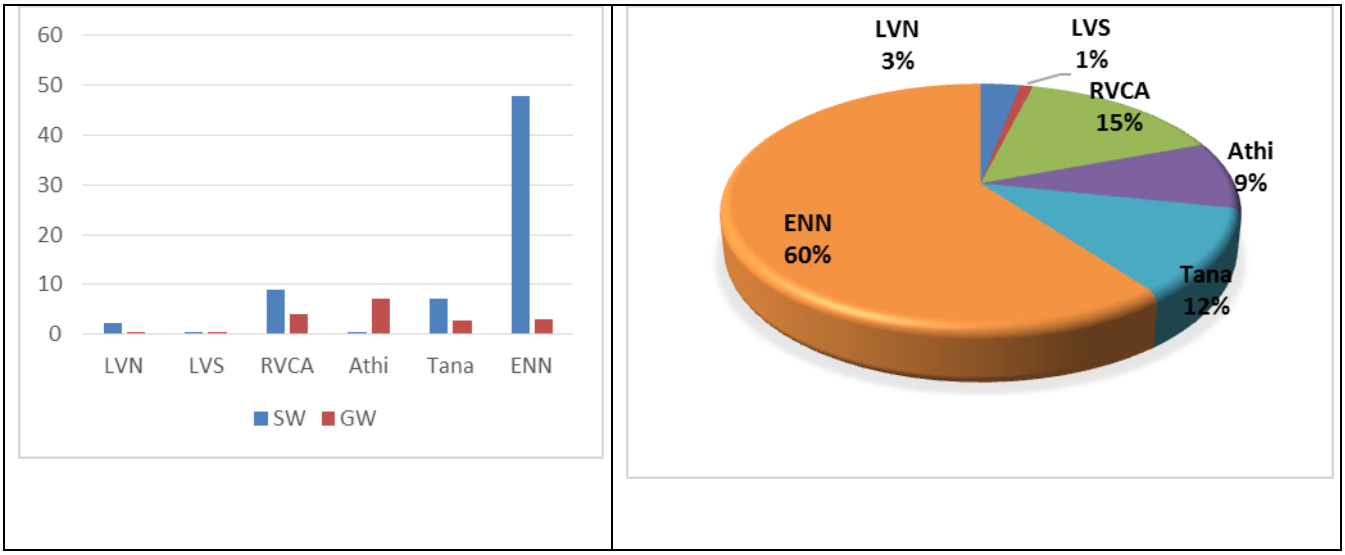
Fifth slot and fourth consumptive largest water use was allocated for domestic use with allocation of 224,600 m³/d SW and 383,700 m³/d GW. Tana allocated 118,800m³/d (53%) of the total SW allocated for domestic use, followed by ENN at 21.4%. LVN was the last in SW allocation for domestic use at 4.2%. Athi allocated 66% of the GW volumes followed by Tana and RVC while LVN was the least in GW allocation for domestic purposes. It is clear that the highest amount allocated for domestic use was from GW, with Athi catchment leading in this sector.

Figure 3: 22 Water allocated for Domestic use from SW and GW June 2017



The least volume allocated from consumptive use was for livestock with allocation of 66,700 m^3/d SW and 17,800 m^3/d GW.

Figure 3: 23 Water allocated for Livestock use from SW and GW June 2017



ENN allocated the highest amount at 47,800 m^3/d (72%) of the total SW allocated for Livestock use, followed by RVCA at 13.3%. LVN and ATHI were the last in SW allocation for livestock use at 0.6%. Athi allocated 40.4% of the GW volumes followed by Tana and RVC while LVN was the least in GW allocation for Livestock purposes. It is clear that the highest amount allocated for Livestock use was from GW, with Athi catchment leading in this sector.

Table 3: 3 Abstraction surveys by June 2017

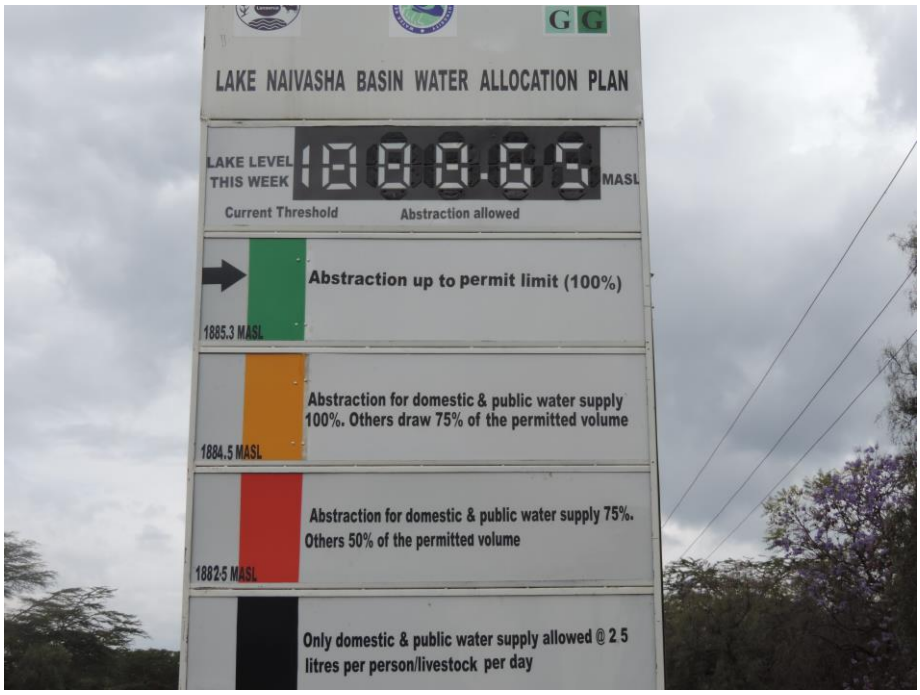
Region	No. of Abstraction Survey	No. of abstractors identified	No. of legal abstractors identified	No. of WRUA	% Abstraction Survey
LVN	5	1174	729	7	9
LVS	12	1051	273	16	21
RV	9	2213	139	9	16
ATHI	4	981	726	4	7
TANA	16	1539	103	16	28
ENN	12	701	113	12	21
Total	58	7659	2083	64	100

A cumulative of 58 Abstraction surveys have been undertaken, Tana was the highest at 28% followed by LVS and ENN at 21%. Athi was last at 7%. The total number of Abstractors identified in the Abstractions surveys were 7,659. Out of these 5576 (73%) were legal abstractors. The surveys were undertaken within 64 WRUAs in various sub catchments.

Table 3: 4 Water Allocation Plans (WAPs) by June 2017

Region	No. of Abstraction Survey	No. of WAP	No. of WRUA
LVN	5	2	4
LVS	12	4	9
RV	9	2	6
ATHI	4	0	0
TANA	16	1	1
ENN	12	4	10
Total	58	13	30

13 WAPs had been developed out of the 58 Abstraction Surveys Carried out. The WAPs are less because their development requires more time and resources, as well as the fact that a basin WAP could have several Abstraction surveys from the sub basins.




LAKE NAIVASHA BASIN WATER ALLOCATION PLAN
LAKE LEVEL THIS WEEK
1880.65
MASL
Current Threshold
Abstraction allowed
Abstraction up to permit limit (100%)
1885.3 MASL
Abstraction for domestic & public water supply 100%. Others draw 75% of the permitted volume
1884.5 MASL
Abstraction for domestic & public water supply 75%. Others 50% of the permitted volume
1882.5 MASL
Only domestic & public water supply allowed @ 25 litres per person/livestock per day
SPONSORED BY:
german cooperation

Table 3: 5 Cumulative status of abstractions with measuring devices June 2017

Region	All Permits			Permit with measuring devices			Regional % of permits with measuring devices			Total No. Meters
	SW	GW	ED	SW	GW	ED	SW	GW	ED	
LVN	107	375	0	10	39	0	6.7	3.6	0	49
LVS	102	94	3	10	7	0	6.7	0.6	0	17
RVC	134	550	19	26	196	0	17.3	18.2	0	222
ATHI	580	2296	2	35	662	0	23.3	61.4	0	697
TANA	678	315	4	17	54	0	11.3	5.0	0	71
ENN	267	257	5	52	120	0	34.7	11.1	0	172
Totals	1868	3887	33	150	1078		100	100	0	1228

Before any water use permit is issued, the abstractor is required to install a meter to measure amount of water abstracted. This is one of the conditions included in the authorization. It is the responsibility of the water user to maintain the measuring device in order to ensure that it functions effectively. Compliance to this condition has been challenging and majority of abstractors do not have meters. Table 3.6 shows the distribution of meters in all the six regions, with Athi being the highest at 697 followed by Rift Valley at 222. The least is Lake Victoria North with only seventeen. In the same table, the number of permits is also included, which shows that only 21.2% of the permits have meters. Most of the meters have been installed on GW abstraction points, as compared to SW. There was no record of ED with a measuring device. A lot of effort is required through involvement of all stakeholders to have more operational meters in place for effective accounting of water consumed in the country.

In order to improve the level of compliance to measuring devices, Water resources Authority in partnership with Earth view Management Limited, a subsidiary company of Kenya Airports Parking Services (KAPs) initiated installation of Smart Meters. The pilot project entailed deployment of a Communications platform with Advanced Metering Infrastructure (AMI) on behalf of WRA for installation of 30No. meters to measure surface and ground water

abstracted at every abstraction point and establish their levels of abstraction through real time data. As the reporting period, only 15 smart meters had been installed. This was phase one, and the exercise will spread throughout the country, and will ultimately be installed to the works of all water use abstractors. The table below shows the distribution of the already installed Smart meters

Table 3: 6 Status of Smart Meters installed June 2017

Region	No of Smart Meters
Lake Victoria North	3
Lake Victoria South	1
Rift Valley	1
Athi	6
Tana	2
Ewaso Ngiri North	2
Totals	15

3.1.3 Surface water availability

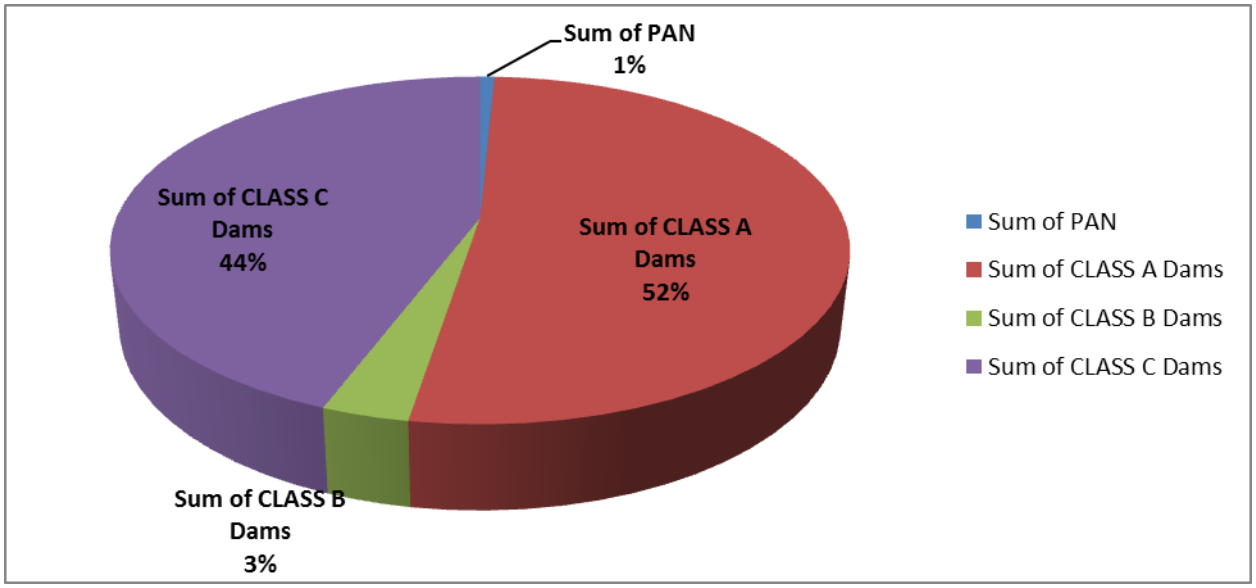
Surface water storage is another area essential in enhancing water availability, where water users are encouraged to store water for use during low flows. Activities undertaken to increase storage include the development of water pans and dams by the water users. Dams are categorized from class A to C, depending on their storage capacity. Pans are those storages constructed off course. The table and figure below have details.

Table 3: 7 Cumulative Status of surface water storage June 2017

	Sum of PAN	Sum of CLASS A Dams	Sum of CLASS B Dams	Sum of CLASS C Dams	Total
LVN	0	1	1506.5	0	1507.5
LVS	0	738	1	1	740
RVC	247	2357	5	1	2610
ATHI	1	1056503.8	11016.50339	9437.168	1076958
TANA	29031	838298	90551	1705912.4	2663792
ENNCA	0	114307.42	22335.194	751	137393.6
Grand Total (m3)	29279	2012205.22	125415.1974	1716102.568	3883002

There was cumulative volume of 3.9 MCM. Tana has stored the highest volumes followed by Athi. Class A has the highest storage capacity of 2 MCM followed by Class C with 1.7 MCM. The former, given its lower category, is likely to have a higher number of structures than the latter. Given the likely high number of structures for Class A dams, the spread is also likely to be wide, thereby resulting in more water brought closer to the people than where Class C dams are dominant.

Figure 3: 24 Status of surface water storage June 2017



Towards water resource regulation and use, WRA operates a network of regular gauging stations along the main rivers and lakes within the six catchment areas. There has been concerted effort to upgrade priority stations to automatic water level recorders where data is collected continuously read and stored electronically in a data logger. This is then tramsmitted to a server at WRMA headquarters at specified intervals. The water level recorder installed is a data logger and submersible pressure transducer combination designed for remote monitoring and recording of:

- Water Level
- Relative Humidity
- Temperature
- Rainfall(Precipitation)

It also supports USB Cable interface for Laptop and Desktop Data downloading.

During the year under review, 10 telemetric stations were identified for acquisition and installation of telemetric equipment and the work executed in rivers; Nyangores 1LA03, Awach kibuon 1HD09, Yala 1 FG02, Mutonga 4bEA07, Maragua 4BE01, Thiba 4DD02, Nairobi 3 BA29, Athi 3F09, Isiolo 5 DA07 and Kerio 2 C07.


Tana at Rukanga

3.2 Pollution control and catchment conservation

3.2.1 Management of major effluent dischargers

Pollution to the environment has a negative impact on the quality of water in the surface and ground water. Pollution can be broadly classified as non-point or point source in origin. Strategy used in pollution control require identification as the first step. This is followed by a detailed study and remedial action to correct the impact or prevent a potential pollution. Point source pollution is generally easily identified and then in a participatory way effluent discharge control plan (EDCP) is developed. When the conditions of effluent discharge are met, a permit is issued.

Ngong River Clean Up
Effluent on Ngong river WRA engaged the youth in Ngong River clean up in which 5 km of the River was cleaned and garbage disposed

Diffuse sources are more difficult to manage and requiring land use management and community (WRUA) participation at sub basin level. Table shows performance of the various indicators subsequently discussed below.

Table 3: 8 Inventory of effluent discharge June 2017

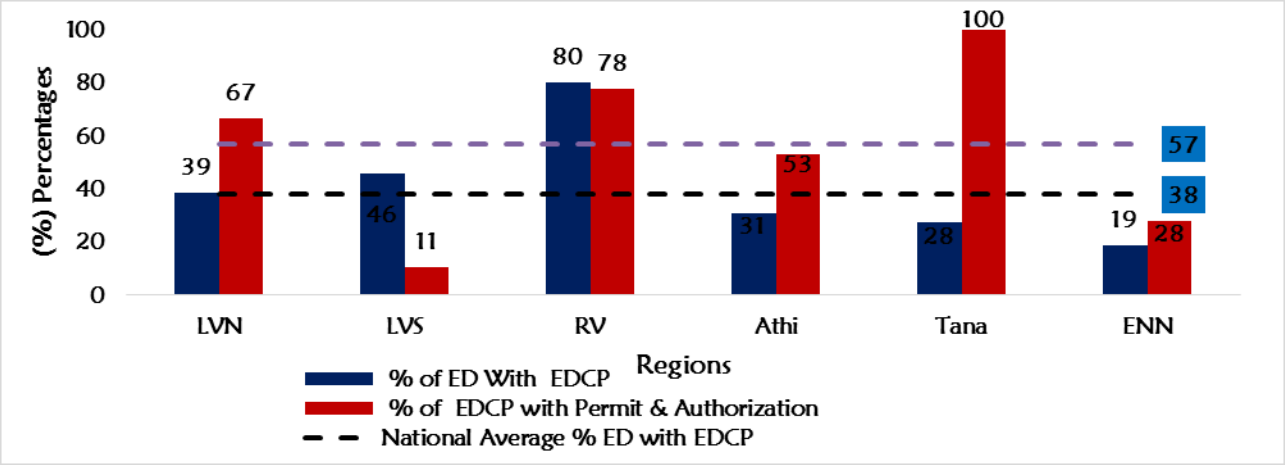
Region	Number of Effluent Dischargers	Number of Effluent Dischargers with EDCPs	Number of Effluent Dischargers without EDCPs	Number of Effluent Dischargers with ED permit and authorization
LVN	70	27	43	18
LVS	61	28	33	3
RV	45	36	9	28
Athi	55	17	38	9
Tana	29	8	21	8
ENN	95	18	67	5

Total	355	134	211	76

From Table the region with highest number of ED was ENN (95) while the Tana had the least number at 29. The total number of ED naturally was 355 by the end June 2017. Nationally the total number of ED with EDCP as at June 2017 was 134. In regard to the number of EDCP developed/implementing, RV and Tana region had the highest (36) and the lowest (8) number of EDCP respectively (Figure). Nationally RV had the highest number of permit (28) and authorization followed by LVN (18) while the least was LVS at 3.

The development of EDCP represent the effort in plan for improving the effluent discharge in order to meet the recommended standards. This is with a view of being issued with permit. It is developed by ED and approved by WRA. The plan are progressive steps done aimed at meeting the conditions permit. This is also an indication of commitment in meeting the effluent discharge standards by the ED. Therefore, the percentages of ED with EDCP was used as an indicator to assess the performance and the results are presented in Figure 3.1 below.

Figure 3.24: Shows the proportion of effluent dischargers with effluent discharger control plan and permit



From Figure, nationally 38% of the total ED inventoried in WRA as of June 2017 had developed/implementing EDCP. RVA had highest proportion of ED with EDCP at 80% while ENN had the least at 19 %(). Although the national average has dropped by 6% compared to FY 2015/16(44%). This could be attributed to the large number of ED discharger identified and the fact that EDCP development is process which takes time. Furthermore, it should be

noted that most of these ED identified were all through pollution survey and currently in the process of implementing the development of EDCP. So this values are expected to increase when 2017/18 reporting is done.

Also from the graph, the proportion of the ED with EDCP that were issued with permits/authorization are shown which is an indication of the EDCP that improve and were able to meet effluent discharge standards. Tana region had all their ED implementing EDCP issued with permits/authorizations while LVS had the lowest in this indicator at 11%. Nationally, the performance of this indicator was at 57%, which shows that WRA and ED have made commendable effort in compliance to the EDCP condition in order to be issued with permits. This subsequently ensures that our water bodies are protected from pollution impacts.

3.2.2 Non-point source pollution control and pollution surveys

In addition to regulating pollution, WRA also collects information of the pollution hot spot in the catchment. This information is subsequently used to formulate strategies in tackling the pollution issues identified. Pollution survey is one of the tools that is used for such purposes. Furthermore, it is done at the basin level and is detailed enough than the normal data captured using the regular monitoring stations network.

The number of pollution surveys and the achievement of the target is a good indicator of the progress made in pollution management. Cumulatively the number of pollution surveys stood at 60 with Tana contributing the majority (22) and Athi least (4) just like the previous financial year. In the financial year under review, a total of 14 out of 12 planned were done, and 4 out 6 of the regions achieved their target.

Table 3: 9 Inventory of pollution surveys and inspections carried out by June 2017

Region	Number of Pollution Survey as of	Pollution surveys by June 2017					
		Target	Undertaken	Performance (%)	Number of discharger	Numbers dischargers	Number of Discharger

	June 2017				s identified	complying	s with Permits
LVN	5	1	1 (Upper Malakisi sub catchment)	100	13	0	1 (Moi University)
LVS	5	1	1 (Kipchorian)	100	15	0	0
RV	5	1	1 (Gilgil River)	100	4	0	0
Athi	4	3	3 (Kikuyu springs, Ngong-Mbagathi & Mweteta	80 (Kikuyu was completed but Ngong-Mbagathi are ongoing)	12	3	0
Tana	22	1	4 (Upper Thika, Kiama, Saba Saba and Upper Thingithu)	72.5 (Only Lower part of Thingithu was remaining)	16	0	0
ENN	19	5	5(Naromoru, Combined, Ngusishi, Ewasonark ,Teleswani)	100	57	29	2
Total	60	12	14		117	32	3

From these pollution surveys, a total of 117 effluent dischargers were identified which is 29 more than that of the financial year 2015/16. 32 of them were complying with effluent discharge standards and only 2 had permits to discharge in the water bodies.

The pollution issues varied across the different catchment that the surveys were done. And one key observation is that there is need address the new emerging pollutant such as plastics (micro and macro) and veterinary pharmaceutical pollutant that have been observed. Some of the key findings across the surveys were;

a. In Thingithu sub catchment; non-point sources were mainly from poor solid waste management (plastics) and soil erosion from farms, and the 15 point source identified were mainly coffee factory origin. Both non-point and point source were found in mid-section of the catchment, the upper section/headwaters was from the unsettled Mt. Kenya which is a protected zone. The water quality here is of good quality,
b. Kipchorian survey identified the main issue of pollution is due diffuse pollution from farming activities and point sources mainly from cattle dip (62%) presenting emerging veterinary pharmaceutical pollutant. To add to these washing clothes and animal water was also a key pollution problem, and,
c. Similar to Thingithu and Kipchorian surveys, Malakisi sub catchment was also affected by mainly coffee industrial waste and diffuse pollution from farming activities and cloth washing and animal watering directly in rivers still remains a key problem.

Waste disposed into the River, the ban of plastic bags will realized a reduction on clogged water courses as depicted

	
Perforated Manholes at Mavoko Sewer Line	Ponds created for the safe disposal of effluent for a certain industry in Mavoko

3.3 Catchment Management Strategy

3.3.1 Basin planning tools

The extent of CMS implementation was evaluated in terms of permits, WRUAs established, Effluent discharges and water resource monitoring stations maintained. The achievement realized using these indicators are as listed in the table below.

Table 3: 10 Progress towards implementation of CMS up to June 2017

	CMS Implementation cumulative achievements up to June 2017						
Region	No of permits issued	%volume of water with valid permit	No of established WRUAs	%of Valid permitted water use	Major Effluent dischargers with EDCP	% achievement of target stations	
						GW	SW
LVN	477	97.3	94	97.3	27	95	100
LVS	196	90.3	109	91.2	28	100	84
RV	694	93.4	75	93.2	36	92	68
Athi	2875	97.7	150	97.7	17	44	94
Tana	998	88.6	153	88.5	8	60	100
ENN	527	86.5	89	86.4	18	44	92
Total	5767	94.3	670	92.4	134	72	89

‡Number of water and effluent discharge permits

In regulating water use, permits are issued to water abstractors and by June 2017. Athi had the highest cumulative number of permits issued to abstractors and the lowest was LVS. The performance for all the regions was on average above 92% for the volumes of water with valid permits. The improvement in permitting has been attributed to more awareness on the WRM regulation on water among water users. The highest number of WRUAs formed was Athi Region with the lowest being RVCA. The good performance of Athi in WRUAs was due to enhanced stakeholder engagement by the KWSCRP. Against the WRUA optimum it is LVN that achieved the highest formed WRUAs. In water resources monitoring the target stations for GW was highest in LVN, LVS at 100% and the lowest Tana at 39%. In Surface water monitoring station LVN was the highest at 100% with the lowest being Tana at 61%. The Overall performance of the CMS targeted activities was above average for all the regions.

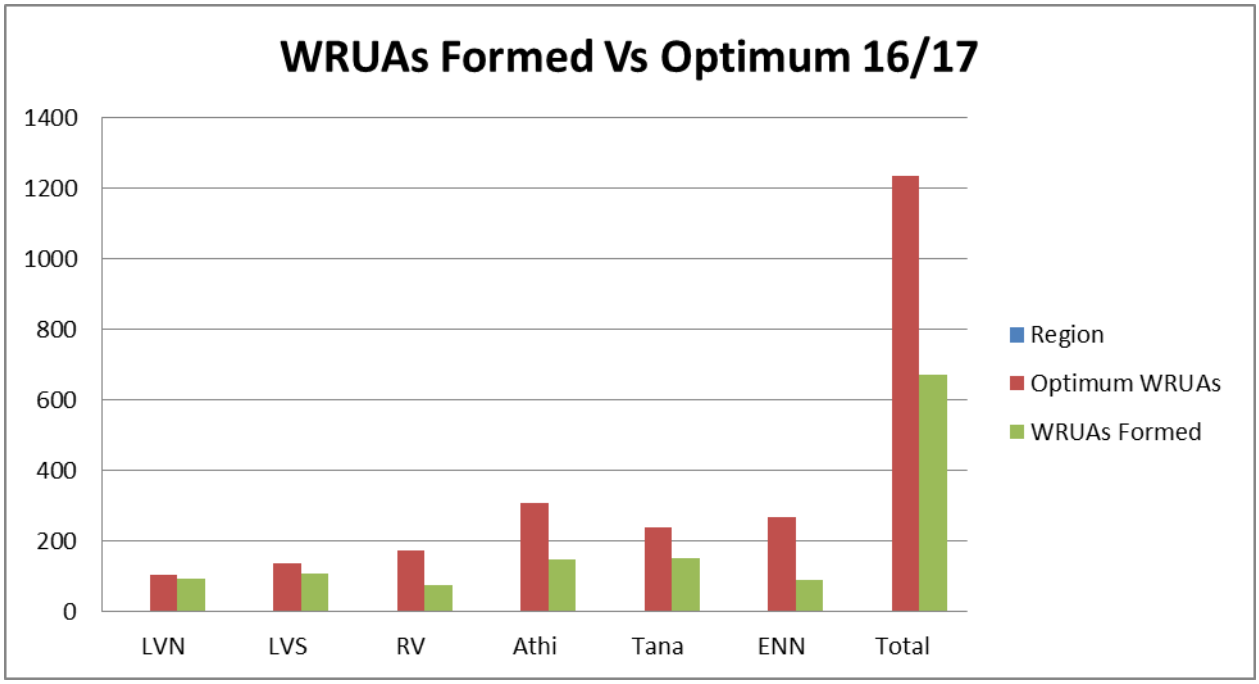
Table 3: 11 Progress in formation of WRUAs and SCMP implementation up to June 2017

Region	WRUAs Formation Status			Status of SCMP Development			SCMP Implementation		
	Potential	Achieved	Proportion (%)	WRUAS Formed	Achieved	Proportion (%)	SCMP Dev	SCMP implemented	Proportion %
LVN	106	94	89	94	50	53	50	46	92
LVS	137	109	80	109	59	54	59	50	85
RV	175	75	43	75	37	49	37	30	81
Athi	309	150	49	150	93	62	93	80	86
Tana	240	153	64	153	106	69	106	100	94
ENN	270	89	33	89	53	60	53	43	81
Total	1237	670	54	670	398	59	398	354	89

Rehabilitation of degraded riparian by marking and pegging the riparian areas and planting trees this helps in healing the degradation and reducing sediments into the river

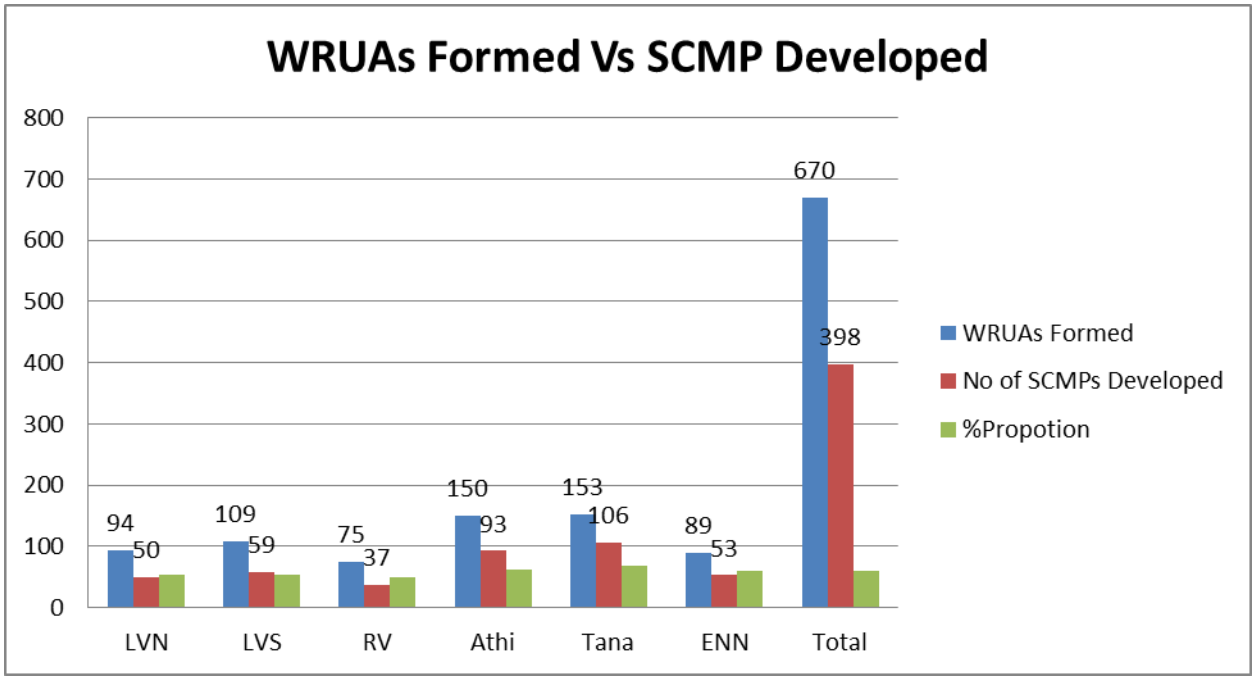
Photo of a well conserved catchment

Figure 3: 25 Status of WRUAs formed Vs Optimum WRUAs 2017



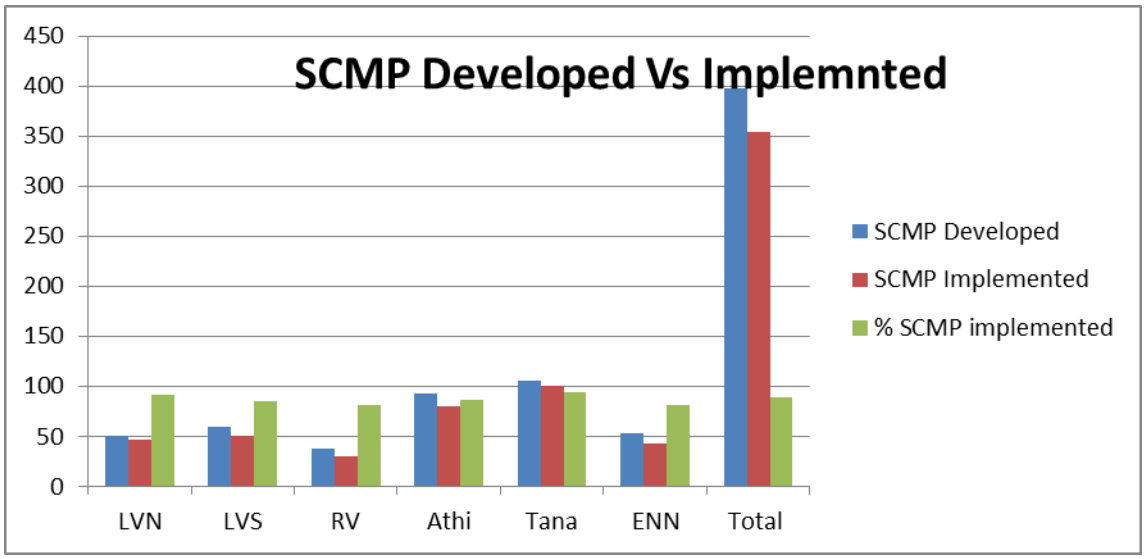
WRA practices IWRM principle in which they undertake activities at community level through the WRUAs. WRA has delineated WRUA sub catchment to an optimum of 1234, in the FY 2016/2017 a cumulative total of 670 WRUAs were facilitated to form which is 54% of the optimum WRUAs nationally. LVN has formed 89% of its optimum WRUAs Vis a Vis the optimum followed by LVS, Tana, Athi, RVC the lowest is ENN which has formed 33 % of the optimum this is due to it being the largest Catchment area in Kenya. LVN was supported by KWSCRP in which they facilitated formation of WRUAs under the Nzoia Watershed project.

Figure 3: 26 Status of WRUAs formed Vs SCMP developed 2017



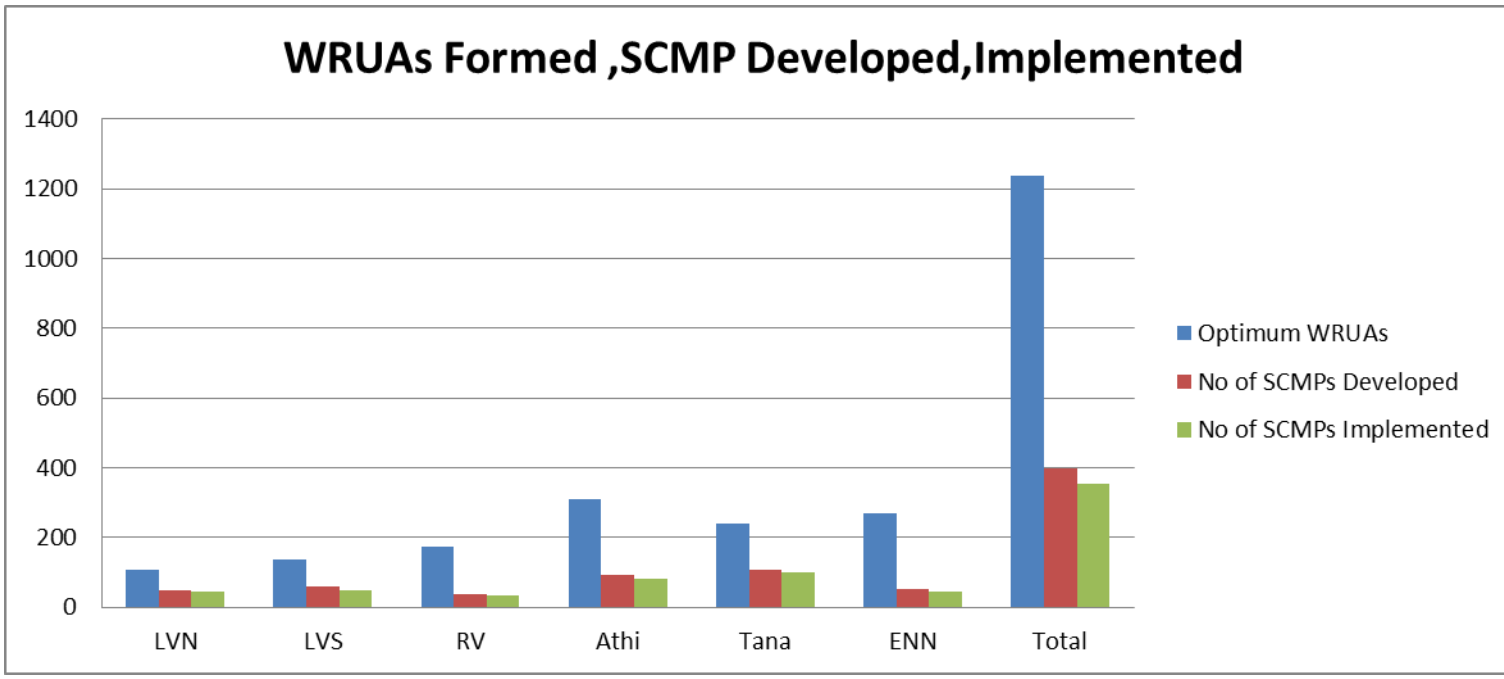
FY16/17 there was a cumulative of 398 SCMPs developed out of a total of 670 WRUAs formed. Tana had the highest number of SCMPs developed this was enhanced by the UTaNRM Project and MTAP2 WRUAs.

Figure 3: 27 SCMPs developed Vs Implemented June 2017



Overall 89% of the SCMPs Developed are being implemented, Tana has the highest 94% SCMPs implemented this demonstrates the highest number of projects in the catchment. LVN has 92%, ENN and RVC has the lowest both at 81% implementation of the SCMPs developed.

Figure 3: 28 WRUAs formed, SCMPs developed & Implemented June 2017



WRA gives the WRUAs Technical Support in implementing the activities. The implemented activities were: Soil and water conservation structures especially in LVN which included terraces , gabion construction, cut off drains, water conservation activities including not limited to construction of water pans Gituamba IDP , sand dams Enziu in ASAL areas Enziu

Bomani sand dam implemented by LKWRUA and WRA

Roof water harvesting tanks in public institutions, spring protection river bank protection Livelihood activities to complement catchment management :fruit trees and orchard establishments, beekeeping , poultry , rabbit rearing , energy saving jikos. This year special attention was on the capital project for WRUA SCMP implementation

SPRING PROTECTION MACHINJONI WRUA

WRA supports communities to develop springs and uses its Laboratory to test the quality of water. The protected springs have better utilization of spring water it reduces wastage increases yield the catchment is enhanced and brings together communities for cohesion and empowerment.

The provision of cattle trough reduces contamination of water and thus eliminates waterborne diseases

Livelihood activities in the SCMPs implemented by the WRUAs is key in the protection of the catchment areas as this generated income for the community members and improves livelihoods among the communities. Bee keeping activity by Witu WRUA and WRA

Conservation and protection of critical catchment

Critical catchments are identified as the ones that are vulnerable and easily degraded and therefore, require protection and conservation. The aim of the sediment control measures

and conservation is to trap sediment runoff before it leaves the site. This prevents negative effects on the water resource likely to compromise its quantity and quality. Critical catchment areas WRA protects and conserve are steep slopes, vulnerable soils and riparian areas for lakes, rivers, wetlands.

Fencing of Magina Hills 3km by Korondo Nyasare

To ensure protection of water resources the catchment must be conserved including the hills and rehabilitation of degraded areas to prevent encroachment and further destruction

WRA has put in place the riparian conservation demarcated area regulation with reference to the Water Resources Rules. 2007.

Wetlands and springs are important water sources for people and ecosystems. During the financial year 2016/17, the major issues identified on water shed included loss of vegetation at the areas surrounding water sources; encroachment and degradation. The wetland extent within the country in the public and private land has drastically decreased. The WRA interventions included protecting the already identified springs, wetlands, Ground water Recharge and the riparian zones as shown in Table 3.14.

Slaughter house spring before spring protection after

Table 3: 12 Inventory of cumulative identified and conservation of critical catchments

	Springs		Wetlands		GW recharge zones		Riparian zones (Km)names of location by river system or water body	
	Identified	Protected	Identified	Conserved	Identified	Conserved	Identified	Conserved
LVN	84	58	18	1	-	-	40	Liyala stream 4km Firatsi River 6km Mumias 16km
LVS	23	14	1	1	-	-	1	-
RV	37	15	9	-	2 Naivasha, Kabatini	1 Naivasha Gazetted	9	-

ATHI	42	25	51	2	4	1	26	18Km along Nairobi River 48Km along Ngong River 9 Km along Kibagare stream 10 km along Shimalabandu stream 24.9km Mwache Mnyenzeni
TAN	32	5	36	7	12	1	37	Thingithu 4km Luguso 4km Thanantu 4km Thagatha 20km Bwathonaro 4km Gachiege 4km Thungu 4km Maara River 20Km
ENN	4	3	6	-	-	-	1	-
Total	222	120	121	11	18	3	114	195.9km

By June 2017 out of the 222 springs identified, 120 had been protected with LVN leading (58). On wetlands out of 121 identified, 11 were conserved with Tana catchment leading (7). 18 Ground water recharge areas had been identified out of which 3 had conserved. Out of 114 No. of riparian areas identified, 195.9 kms were conserved. For example in LVS Siala spring, which is perennial, comes from Maragoli hills and it serves a population of 2000 people that use it for domestic and irrigation purposes. The Nyanchwa springs is major supplier of water to about 5,000 residents.

It is worth noting that the riparian area plays an important role in water resources regulation. A well conserved riparian area result in decrease in water flow and hence helps the sediments to settle before reaching the water course. In addition, a conserved riparian area has other benefits such as river bank stabilization, floodwater storage, maintain biodiversity and provide products such as fodder for livestock, timber and medicines.

Asao WRUA conservation of springs with cattle trough and water kiosk in a well conserved catchment

WRA has identified crucial groundwater recharge zones that are threatened. These have been outlined in studies that proved the nature of threat and mitigation measures. In this respect, the Kikuyu Springs Groundwater recharge area system recharges the Kikuyu Springs and the Nairobi aquifer as well. The special threat was identified to be over abstraction and encroachment onto crucial wetlands. WRA has undertaken necessary stakeholder consultations and sensitization on possible gazettement. Another crucial groundwater recharge zone is the Lamu Sand Dunes. These dunes form the reservoir for the only fresh aquifer for the Lamu Island and the Archipelago. WRA has sensitized the general public and stakeholders on the need to conserve it and as well as liaised with the National Land commission since some of the land has individual entitlement. Catchment healing activities have also been carried out including planting of trees and stopping on further excision of the

land. The Authority has done this as it seeks to ensure sustainable water supply for the Lamu Island.

Table 3: 13 showing the discharge of spring before and after protection

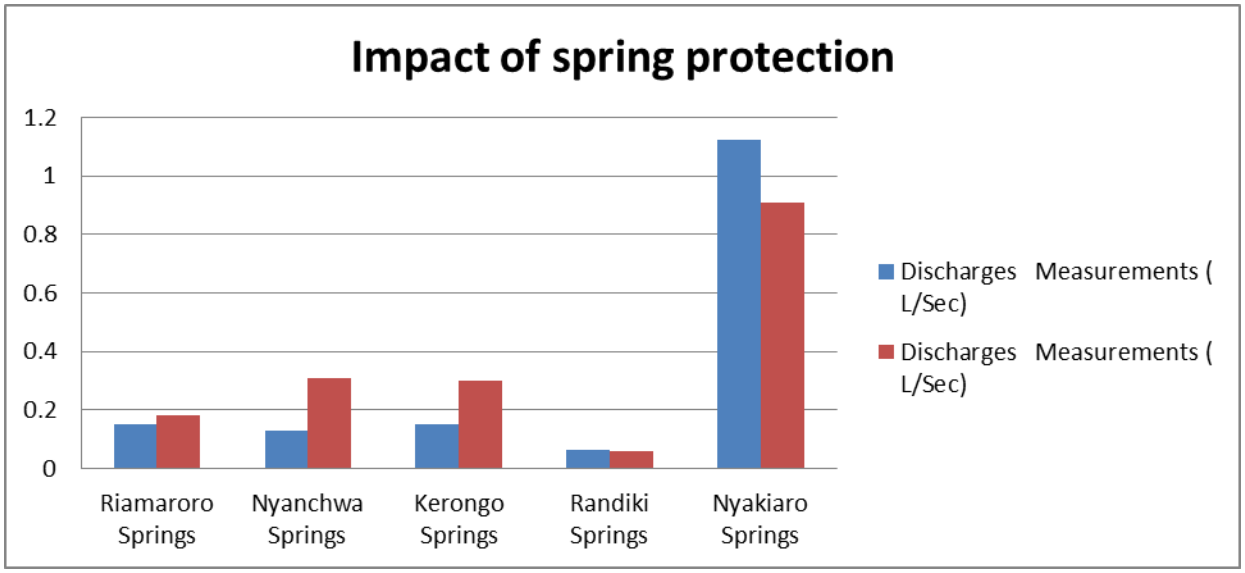
S/No	Spring Name	Discharges Measurements (L/Sec)	
		October 2016	November 2016
1.	Riamaroro Springs	0.1504	0.18
2.	Nyanchwa Springs	0.1299	0.31
3.	Kerongo Springs	0.1504	0.3
4.	Randiki Springs	0.0615	0.06
5.	Nyakiaro Springs	1.1228	0.91

The impact of spring protection is seen through comparison between the status of the yield before and after protection there was slight improvement in the discharge after one month as shown in details in Table 4.14 and Figure 4.14. The discharge of Nyakiaro springs was slightly affected due to the dry season that was experienced in the month of November 2016.

Spring Protection

Protecting our water resources and providing clean, safe drinking water allows children the opportunity to go back to school and in turn, foster economic development.

Figure 3: 29 Impact of Spring Protection



3.4 Water Resources Assessment and Monitoring

3.4.1 Effective water allocation process

Table 3: 14 Efficiency in water allocation 2016/2017

Region	No. of permits process within timeline				No. of permit processed outside timelines				Total No. of Authorizations Issued	Total No. of Authorizations processed within SC Timelines	Total No. of Authorizations Not processed within SC Timelines	% Efficiency
	A	B	C	D	A	B	C	D				
LVN	8	136	1	0	10	13	0	1	169	145	24	86
LVS	1	130	1	1	4	17	1	0	155	133	22	86
RVC	16	302	10	0	5	85	3	4	425	328	97	77
Athi	9	1331	20	0	1	484	7	6	1858	1360	498	73
Tana	12	202	0	0	12	76	2	3	307	214	93	70
ENN	0	75	1	0	12	68	2	1	159	76	83	48
TOTAL	46	2176	33	1	44	743	15	15	3073	2256	817	73

On efficiency, 2256 applications were processed within Service Charter timelines as compared to 1676 the previous year. This translates into 73% applications processed within Service Charter Timelines. In the Service Charter, category A applications are to be processed within 60 days, category B 90 days, category C 150 days while category D takes the maximum 180 days. LVN was the best performer number of authorizations processed within SC timelines,

followed by LVS at 86%. RVC was third at 77%, Athi fourth at 73% and tana fifth at 70%. ENN was the least performer at 43% efficiency.

3.4.2 Effective pollution control process

Pollution of water resources leads to water scarcity by making it unavailable. To make available, cost incurred in treating it. In order to protect these water resources from effluent discharges that have negative impact, WRA has put a pollution control system in place. This system includes the following processes; identification of effluent dischargers, development of EDCP, issuance of permit, compliance monitoring and issuance of orders and instituting court cases for non-compliance to EDCP & permitting conditions.

In order to measure the effectiveness of the systems, the proportion of effluent discharges with EDCP was used. EDCP is plan that describe how an effluent discharger intends to improve the quality of their effluent in order to meet the effluent discharge standards. The results is shown below.

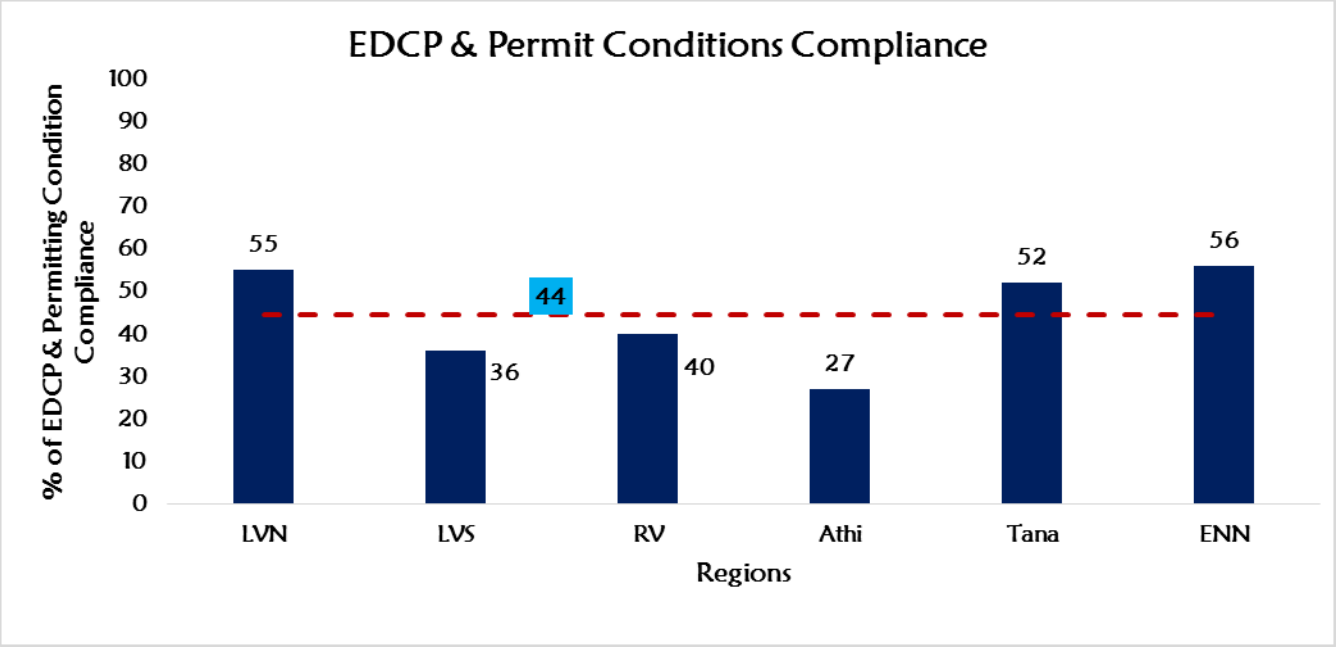
Table 3: 15 Inventory of EDCP compliance by June 2017

Region	Number of Effluent Dischargers	Number of Effluent Dischargers with EDCPs	% of ED With EDCP	% compliance to EDCP/ Permit condition of ED Monitored
LVN	70	27	39	55
LVS	61	28	46	36
RV	45	36	80	40
Athi	55	17	31	27
Tana	29	8	28	52
ENN	95	18	19	56
National Total	355	134	38	44

From the table above, RV had the highest proportion of effluent dischargers with EDCP at 80% while Athi region had the lowest at 31%. National average was 38% which shows that most of the dischargers have not developed a plan on how to continuously improve the quality of their effluent. This means more effort is required to improve on this indicator.

To ensure that the effluent dischargers are complying with conditions set in the EDCP and permits, WRA does compliance monitoring. This compliance monitoring is a good indicator for the performance and progress in protection of water bodies from pollution. The facilities with compliant EDCP are issued with permits while the non-compliant are served with WRA orders. if further non-compliance is still observed a court case is instituted with possibility of attracting a fine or their permit are revoked. The results are represented in Figure below.

Figure 3: 30 % of EDCP & Permitting Condition Compliance



In this indicator, for the FY 2016/17 the national average compliance to EDCP & permit conditions was 44 %() Figure). This compliance ranged from as low as 27 %(Athi Region) to 56% (ENN Region). From this there is still a lot of effort required in order to achieve the 100% target. The poor performance is mainly due to the outdated and depilated municipal treatment that form the majority of these dischargers.

3.4.3 Water resource availability

Reserve flow maintenance

Maintenance of reserve flow is another area crucial in resource management. The determination is based on the fact that the intra-annual and inter-annual variations in hydrologic regime support both ecological and basic human needs. This helps maintain ecological quality of rivers by a minimum flow so that the river does not dry up, or have physical regimes altered.

Analysis of abstraction patterns revealed that reserve flow was determined at 41 points in various rivers in all the six catchment areas. These are shown in Table below which also presents the values of reserve flows determined, monitoring points, and the number of days of violation of the reserve. The maintenance of reserve flow is dependent on the functionality of the monitoring stations. Stations that were not functional during the year under review were indicated by a dash as the numbers of days violated could not be calculated.

Table 3: 16 Stations with reserve flow determined and maintained by June 2017

	Region	River	Point of determination	Reserve flow (m^3/s)	monitoring Point	No of days reserve was violated
1	LVNCA	Kipkaren	Kipkaren market	1.715	1CE01	0
2		Malakisi	At Kimama	4.512	1AB01	1
3		Nzoia	WebuyeTown	11.598	1DA02	4
4		Nzoia	100m .U/Stream veculreferry at Rwambwa	21.981	1EF01	7

			on Siaya Ukwala road			
5		Nzoia	Moi's Bridge	2.5	1BB01	
6		Rongai	4Km from Naitiri Trading centre, downstream the bridge along Naitiri/ Tongaren road	0.722	1BG07	17
7		Yala	Yala Town	6.7	1FG01	
8		Yala	Bondo Water Supply	5.04	1FG02	
9		Yala	N.of Maseno on Maseno-Petro's road	7.83	1FE02	30
10	LVSCA	Amala	Kapkimolwa	0.686	1LB02	0
11		Awach	Wathorego Bridge	0.005187	1HA14	0
12		Mara	Mararianda	1.904	1LA04	0
13		Nyando	Ogilo Bridge	0.2711	1GD03	0
14		Nyangores	Bomet Town	0.252	1LA03	0
15		Sondu	Nyakwera Market	3.0607	1JG04	
16		Sondu	Sondu Market	4.97	1JG05	0
17	RVCA	Pekerra	Marigat bridge	0.294	2EE7B	-

18	ACA	Athi	Munyu	0.000332	3DA2	1
19		Thiririka	Ndarasha	0.0942	3BD05	-
20		Kamiti	Brookside	0.00001	3BB12	0
21		Ruiru	Nairobi thika Highway	0.038	3BC08	0
22	TCA	Tana	Garissa Town	4.736	4G01	0
23		Gura	Tambaya Bridge	0.0583	4AD01	0
24		Maragua	Muranga/Maragua bridge	0.1057	4BE01	0
25		Mathioya	Muranga-Sagana- bridge	0.00127	4BD01	0
26		N. Mathioya	Kiria-ini/Nyakianga bridge	1.941	4BD07	0
27		New Chania	Nyeri Town	0.016	4AC04	0
28		Ragati	Sagana-Karatina, KR Bridge	0.0078	4BB01	13
29		Rukanga	South of Rukanga pri.sch	0.328	4BE10	0
30		Sagana	Kiganjo-Marua Bridge	0.027	4AC03	0

31		Sagana	Marua-Kiganjo Sagana bridge	0.0073	4AA05	0
32		Thika	Near Thika, Ble Posts Hotel	0.0122	4CB04	0
33	ENNCA	Ewaso Narok	Sosian Ranch	0.057	5AC10	0
34		Kongoni	Gakeu	0.0007	5BE03	0
35		Ontulili	Mathagiro	0.12	5BE02	27
36		Pesi	Ndaragwa Centre	0.0007	5AB04	0
37		Pesi	Pesi Cenre at Salama	0.0002	5AB02	4
38		Teleswani	Githithina	0.0005	5BE05	1
39		Timau	Timau Market	0.08	5BE06	0
40		Sirimon	Krimara	0.17	5BE04	-
41		Isiolo	Isiolo Town	0.015	5DA07	-

Table 3: 17 Surface and groundwater monitoring stations up to June 2017 Surface & Ground Water

	Monitoring stations by June 2017							
Regions	CMS Target	Other Operational Stations	Stations with water level records	Stations with updated rating curves	Number of monitoring boreholes	Number of operational boreholes	% operational	Boreholes with Water Rest data
LVN	28	9	37	6	19	18	94.7	18
LVS	38	26	58	4	28	28	100	9
RV	41	-	28	5	51	47	92.1	36
Athi	31	-	29	23	41	18	44	18
Tana	47	27	74	29	40	24	60	24
ENN	38	-	35	0	16	7	44	8
TOTAL	223	62	261	67	195	142	72	113

Surface water section operates a total of 223 designated monitoring stations documented in catchment management strategies (CMSs). Apart from these, other stations also exist and are used for monitoring the status of surface water in all the regions. In the Table above the data shows that Lake Victoria South has 58 stations with water level records, over and above the target of 38 and Tana has 74 stations with water level records over and above the target of 47 stations. Athi and Lake Victoria North were operating slightly above their targets, while the other 2 regions of Rift valley and Ewaso Ng'iro North had operational stations lower than their respective CMS targets.

Stations with updated rating curves are 67 and they are found in all regions except ENN. This challenge may have been cause by lack of discharge data transmission to the region office where this kind of analysis is done. Updating the rating curves is important as it allows for concise converting of daily water levels into discharge using the equation developed. This is important for providing information for water allocation and flood forecasts, drought preparedness, rationing programs and enforcement.

River Gauging Station for Data Collection at L.Challa

In the Figure below, performance on monitoring is compared for the different regions with Tana having the highest number (74) operational while Rift valley has the lowest (28).

Figure 3: 31 Surface water monitoring stations

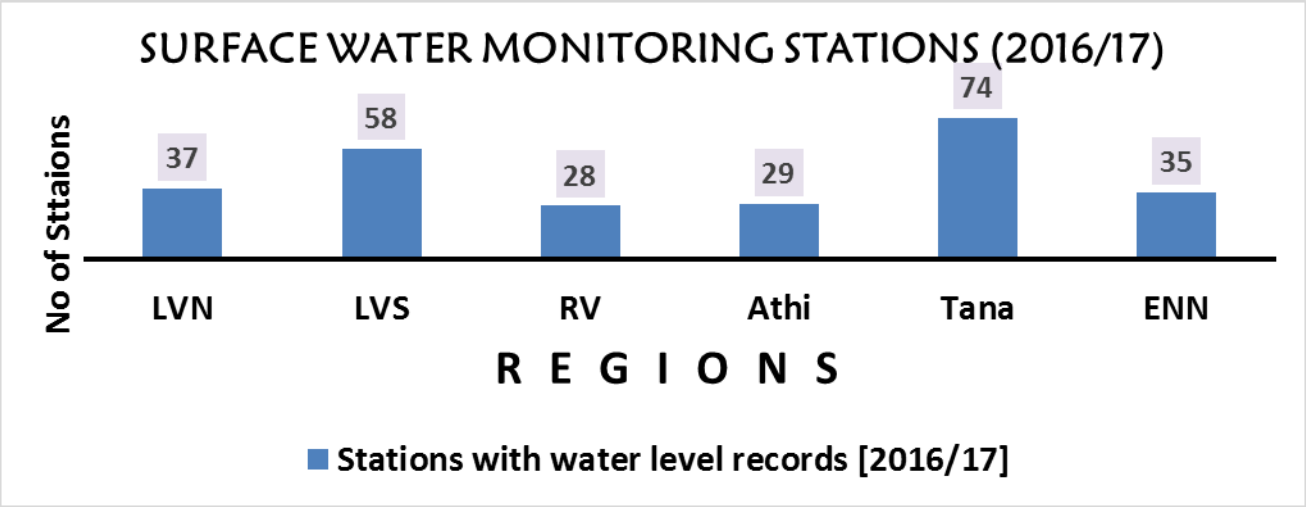
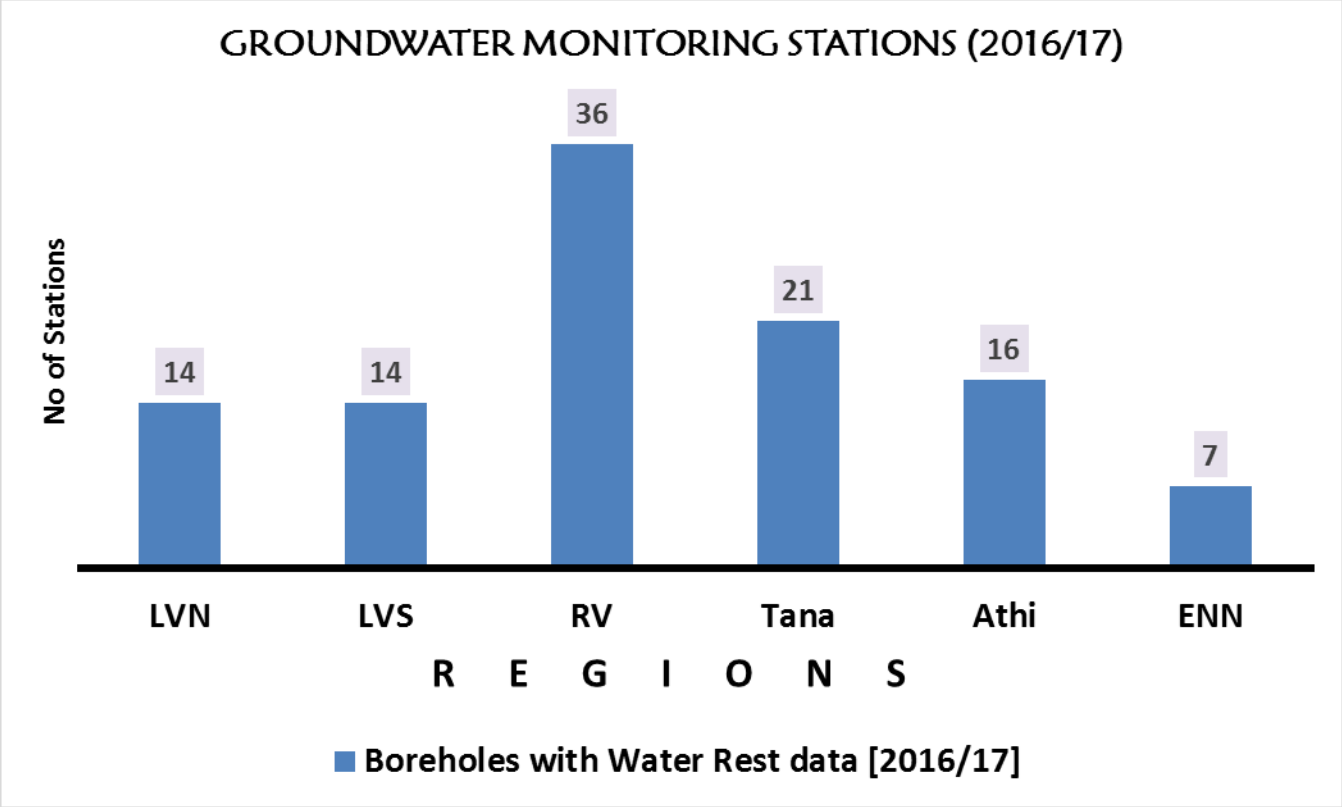


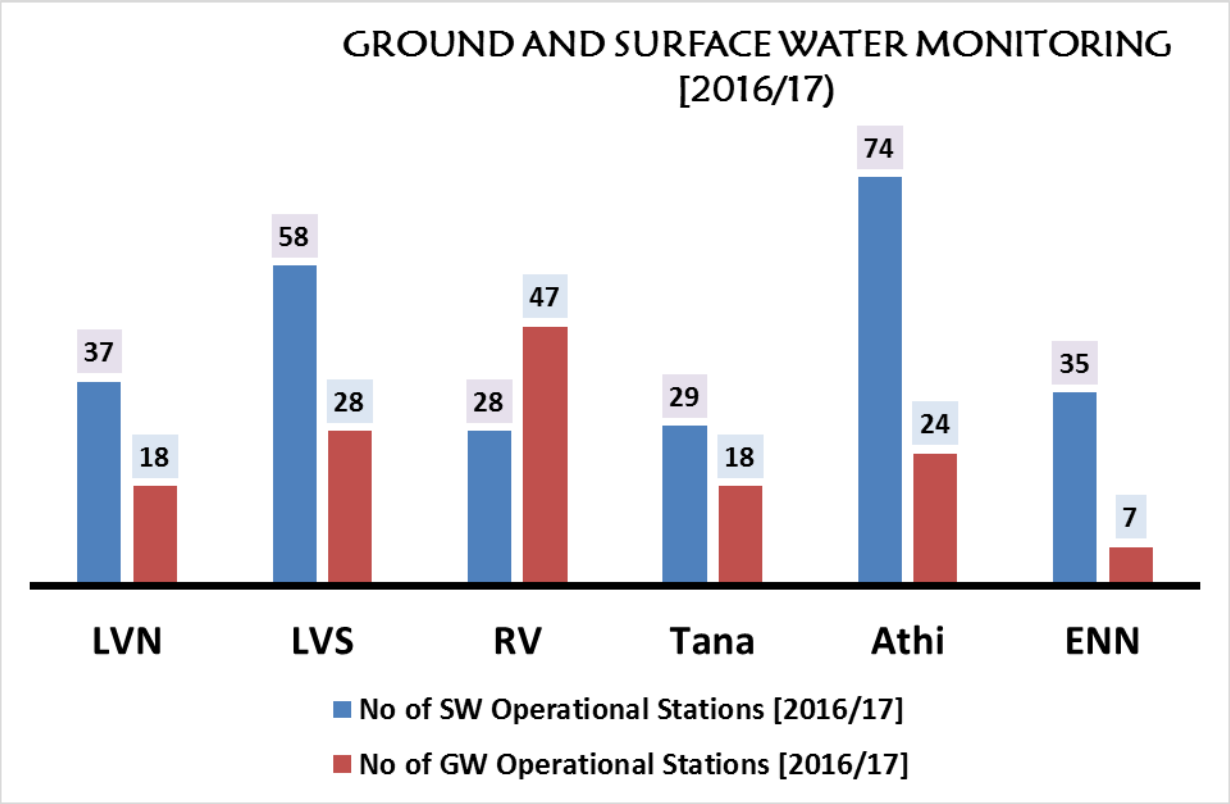
Figure 3: 32 Ground Water Monitoring stations end of June 2017



The purpose of groundwater monitoring is to provide data on groundwater levels as well as its quality. This data guides, WRA in groundwater allocation decisions and for the sustainable management of the groundwater resources. In doing this, WRA has an agreement with owners of production wells to be able to collect this data. However WRA is improving the network by plans to have WRA dedicated monitoring wells. In the year 2016/17 the highest number of operational monitoring GW station was in LVS at 100%, followed by LVN at 94.7% and the lowest Athi & ENN at 44%. Within the year there was identification and assessment of sites towards a dedicated monitoring network. The desired infrastructure will comprise of automated instrumentation and also provide data oriented to the groundwater monitoring objectives.

Most of the groundwater monitoring stations are mostly production boreholes used for water supply to institutions or individuals. The instrumentation in production boreholes in order to facilitate for possible data collection is usually an airline piezometer. There are few stations like the Kreative Roses monitoring well that has been giving telemetric data. There are also two stations with data loggers namely Lolmarick and Backlit in the ENNCA. WRA also in recognition that the current groundwater monitoring network is limited continues incorporating new boreholes whenever they are found to stem the gap.

Figure 3: 33 Comparison of SW and GW monitoring



Overall there are more SW monitoring stations than GW this is for the reason most volumes of water abstracted is from SW. Tana has the highest surface water abstracted for power generation and irrigation. RVCA has the highest GW abstractions

Moving towards telemetric stations this is real time data collection and transmission electronically with no need for manpower. This has ensured efficiency in data collection and formulation of Flood Early Warning & Drought Management Strategies and Plans

Further to monitoring both surface and ground water WRA under took several special water resources assessment studies as part of information gathering for decision making. These studies includes physiographic survey of Nzoia Watershed, Assessment of the Impact of drought on surface and ground water resources, Exploratory wells in Turkana, Marsabit, Wajir and Garissa Counties, abstraction and pollution survey of Gilgil, Malakisi, Mweteta, Kipchorian, Thingithu, Ngong, Mbagathi and Kikuyu river catchment. The findings from the studies were used in objectively developing action plan shown in the table below

Figure 3: 34 Summary of special assessment studies up to June 2017

Region	Number and type of assessment		Achievements of the assessment studies		Main findings from the assessments	Action Plans
	Surface water	Groundwater	Surface water	Groundwater		
LVN	Assessment of the Impact of drought on SW resources	Assessment: Impacts of drought on GW resources	Surface water bodies affected by the drought of Oct 2016 to Feb 2017 identified. Status of reserve flow analysed	Dry boreholes, shallow wells and springs were identified	Catchment conservation is a requirement for adequate GW recharge There was need to regulate GW abstractions to avoid depletion of GW resources	Study results disseminated to stakeholders in all the sub regions. Options to mitigate the impacts of drought discussed
	Physiographic survey of Nzoia Watershed	Physiographic survey of	Erosion hotspots identified. Sediment	Erosion hotspots	High risk areas are Mt. Elgon and Cheranganyi	Review of 5 SCMPs to

		Nzoia Watershed	loads quantified	identified. Recharge areas identified		incorporate study findings
LVS		-		-	-	
RV		Exploratory wells in Turkana		Ascertained the existence and depth of Aquifer formations within Turkana County.	Drilling on-going	Dessimination of the report to County Government of Turkana and stakeholders
	Gilgil abstraction and pollution survey survey		Identified the abstractors	The groundwater abstractors were identified	Many abstractors using mobile pumps. About 80 % of the abstractors were illegal. The farmers use pesticides and fertilizers in the irrigated farms next to the river	Enforce compliance. Carry out water quality sampling for heavy metals and pesticides
Tana		Exploratory wells in Garissa,		Ascertained the existence and depth of	Drilling on-going	Dessimination of findings of the Garissa water resources

				aquifer formations within Garissa County.		assessment
Athi	Pollution and abstraction survey in Kikuyu, Mweteta, Ngong/Mbagathi	Pollution and abstraction survey in Kikuyu, Mweteta, Ngong/Mbagathi		Identified inventory of abstractors and polluters to enhance management of water resources in the sub-catchments for water use conflict resolution, efficiency and quality control. Abstraction and pollution surveys for Kikuyu, Ngong Mbagathi and Mweteta sub	Kikuyu springs aquifer is under threat from encroachment and pollution of the recharge zones. Mweteta, Ngong/Mbagathi still on-going	Development of water allocation plans

				catchments.		
	0	GCA management guidelines abstraction and pollution surveys and)		Kikuyu GCA management guidelines developed.	Stakeholders identified and documented the desired future conditions for the GCA	
		Assessment and mapping of dedicated monitoring borehole sites		Nairobi and Tiwi aquifers mapping/assessment	13 sites for dedicated monitoring boreholes identified (Nairobi suite 9, Tiwi 4)	Drilling of the dedicated monitoring boreholes
		Geotechnical investigations at Mwache dam		Technical support on geotechnical investigations at Mwache dam to assess geological condition of the dam foundation.	Dam site foundation is composed of highly fissured and permeable sandstone rock formation	

		Physiographic study for the Mwache Watershed	Erosion hotspots identified. Sediment loads quantified	Erosion hotspots identified. Recharge areas identified		Implementation of mitigation measures for the hot spots
ENN		Exploratory wells in Marsabit and Wajir		Ascertained the existence and depth of the aquifer formations within Marsabit and Wajir Counties	Drilling on-going	Dessimination of the reports to the Wajir and Marsabit County Governments

3.4.4 Water resources quality assessment

Monitoring provides information for decision making. As such WRA has water quality monitoring network for surface water and ground water across the country. The setup is such that there are fixed monitoring station that are monitored regularly based on CMS for ambient and special stations for Effluent Discharge.

In order to measure progress and performance, the proportion of the established station that are monitored at least once a year were used as the indicator and are referred to as operational station. The parameters measured ranged from 4 - 15 No with an average of 4 (pH, Temperature, Conductivity and Salinity) regularly monitored across the region. These parameters are measured insitu and at the laboratory.

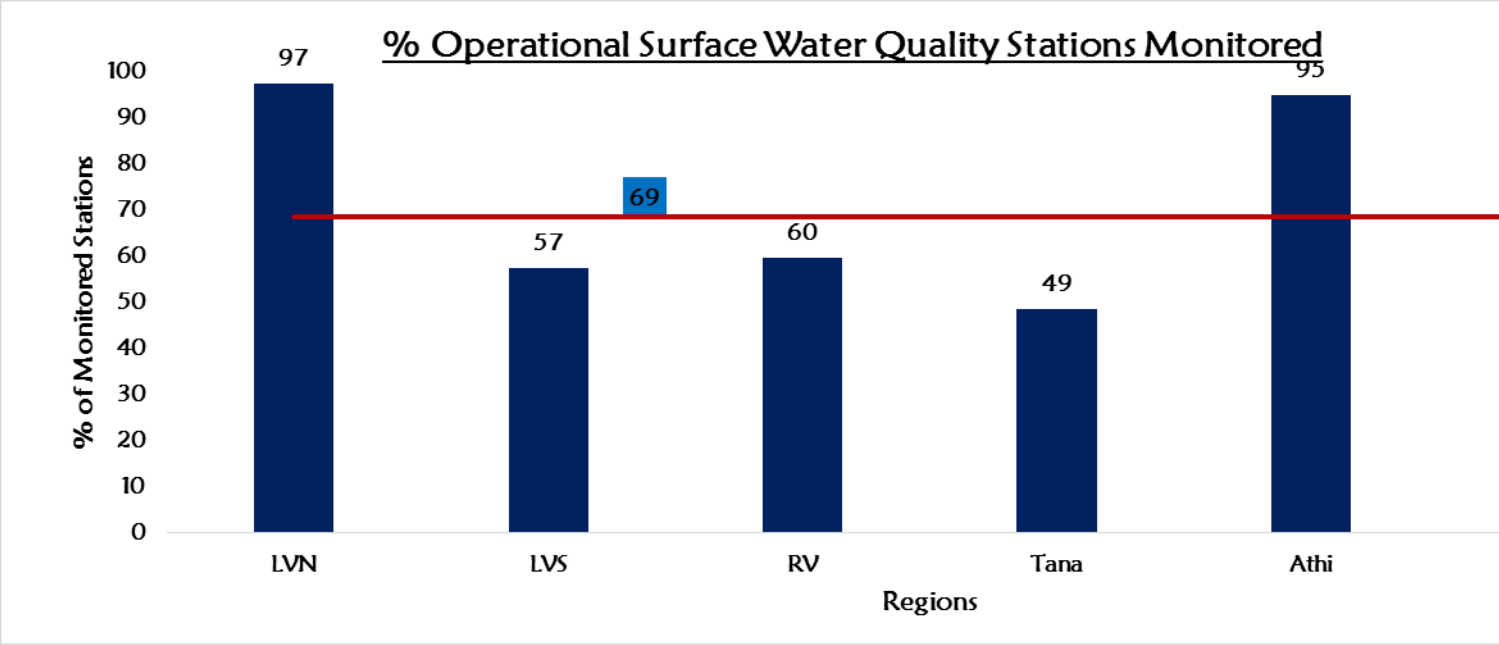
Table 3: 18 Status of water quality monitoring

Regions	Surface Water			Groundwater		
	All stations	Operational	% Operational	All stations	Operational	% Operational
LVN	38	37	97	13	12	92
LVS	47	27	57	18	16	89
RV	42	25	60	40	19	48
Tana	68	33	49	25	4	16
Athi	39	37	95	28	27	96
ENN	40	29	73	16	8	50
Total	274	188	69	140	86	61

In 2016/17 financial year, the total number of surface water quality monitoring station nationally was 274 as shown in the Table above. Tana had the highest number of surface water quality monitoring stations (68) while the least number of stations were found in LVN catchment (38).

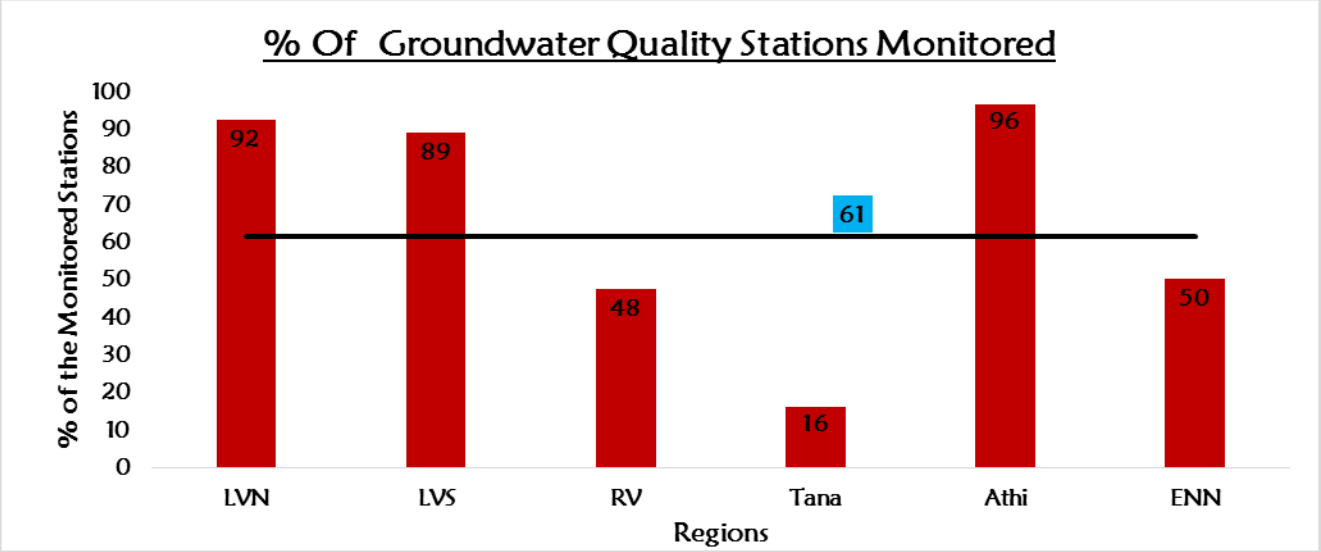
In ground water quality monitoring out of 140 stations only 86 were operational. The highest number was in Athi(27) while the least was in Tana(4).

Figure 3: 35 % Operational Surface Water Quality Stations Monitored



The percentage of the operational station is an indication of stations that have available data for decision making. In this indicator, there was 69% average national performance for surface water quality monitoring stations as shown in Figure above. From the graph, LVN had 97% of their target stations monitored which was the best performance in the country. Tana catchment on the other hand had least performance where only 49% of their target stations were monitored.

Figure 3: 36 % Of Groundwater Quality Stations Monitored



The national average performance of groundwater quality monitoring was 61% as shown in the Figure above. Regionally Athi catchment recorded the best performance at 96% while Tana catchment was the lowest at 16%.

Additional information on water quality status is captured in the pollution survey section above. Other special studies such as Isotope analysis of the water resources at Mzima spring and Chyulu hills aquifer (IAEA programme) are shown in the table below, where type of assessment, achievement and findings are detailed.

3.5 Economic, Financial Management & Partnerships

3.5.1 Improving water use efficiency

Fresh water is finite and it is essential to improve water use efficiency for equitable water allocation. WRA set targets for water use collection during year under review (FY 2016/17). A total of kshs.721 Million was realized vis-à-vis a 12 month target of Kshs.991 Million (indication of 72.84 percent collection) as per the table below. The efficiency for water use collection is shown for the different regions as percentage for set targets.

Table 3: 19 Internally Generated funds

	Office	TOTAL (M)	ANNUAL TARGET (M)	% Collection
	Head Quarters	359.89	305.29	117.9
	Athi Catchment Area	123.65	175.00	70.7
	Tana Catchment area	60.74	168.00	36.2
	Ewaso Ng'iro C.A	34.96	75.30	46.4
	Rift Valley C.A	81.83	138.85	58.9
	LVNCA	33.90	65.00	52.1
	LVSCA	27.03	63.69	42.4
	Total	721.99	991.14	72.84

Challenges

I. Government institution's not able to liquidate debt held. To date a total of Kshs.852.90 Million is owed to the Authority
II. Low water use tariffs
III. Drought experienced in the whole country significantly reduced available water and hence reduced water use.
IV. Lack of Political good will especially at the county level
V. Public reluctance to pay WRA Effluent Discharge fees due to conflicting legislations.

3.5.2 Installation of smart meters

During this reporting period, the ICT Department in collaboration with Permitting Secretariat have successfully piloted the installation of 15 No. digital smart meters for various abstraction customers as shown in the table below. The project when fully implemented will enhance WRA's mandate to regulate and manage water abstractions by providing accurate abstraction data and boost water use revenue.

Table 3: 20 Installation of Smart Meters

	Abstractor	Region	Installation Point	Meter Size inches/mm
1	Runda Water and Sanitation company	Athi	River	8"/200mm
2	Machakos water and sanitation company	Athi	Treatment works	10"/250mm
3	Beacon of hope	Athi	Borehole	1.5"/40mm
4	Fresh Del Monte company	Athi	River	16"/400mm
5	Gatundu Water and Sanitation Company	Athi	River	12"/300mm
6	Kibwezi Water and Sanitation Company	Athi	River	12"/300mm

7	Embu Water and Sanitation Company	Tana	Treatment works	12"/300mm
8	Murang'a Water and Sanitation Company	Tana	Dam	16"/400mm
9	Moi University	Lake Victoria North	Treatment works	16"/400mm
10	Nandi Kapsabet Water and Sanitation company	Lake Victoria North	Dam	6"/150mm
11	Western Seed Company Limited	Lake Victoria North	River	8"/200mm
12	ACK Oloosuyian girls secondary school	Rift Valley	Borehole	1.5"/40mm
13	JM Kariuki Memorial Hospital Ol Kalou	Rift Valley	Borehole	1.5"/40mm
14	GK Prisons Nyahururu, Laikipia County	Ewaso nyiro north	Borehole	1.5"/40mm
15	Mini Bakeries Company of Kisii	lake Victoria South	Borehole	1.5"/40mm

3.5.3 Increasing investment in water resource management activities

WRA is involved much on governance and water stewardship and therefore requires state funding since it is a provision of social economic service. The Authority has put in place structures and tools that it is uses in the management of its financial resources. The structures and tools include a functional accounting and financial system which is applied in all the functional areas/offices, a financial manual that was developed to guide operations, a five year Strategic Plan that sets the strategic direction and spells out key priority activities to be implemented, and the Annual Budgets that are prepared periodically. The Authority automated its financial management systems when it rolled out the Navision Dynamics financial systems (FMIS). This system is functional and all the Regions and Sub-Regions have been connected to it for use in processing financial data and information, and generating financial reports.

3.5.4 Financial Resource Releases

The main sources of finance for the Authority are three, namely; Internally Generated Funds (internal revenue/AIA), Government Grants, and External Resources (donor funding). The funds from these sources are used to finance the Authority's development programmes as well as its operational activities.

Funding FY 2016/17 has declined drastically, such that in only Kshs.62.6 million was released to the Authority by development partners. The funds received by the Authority is as summarized and shown in Table below.

Table 3: 21 Funds Received

Type/Source	FY 2016/17 Kshs. "000"
Internally G. Funds (Revenue/AIA)	721.990
Government Grants	803.877
External Resources (Donor funds)	62.573
Total	1,588.440

Expenditure on Programmes Expenditure on operational activities for FY 2016/17 was Kshs.1, 225.6 billion. Development expenditure, for both government supported programmes and donor funded projects in the FY 2016/17 was Kshs.954 million. The summary expenditure per programmes is as shown in Table below.

WRA's Budget on average has been under-financed over the past years. In the FY2016/2017, WRA Management rationalised its budget in order to reflect the GOK approved financing for development projects. WRA management however given the reduction in budgeted figures ensured that the actual budgetary funding for the period FY2016/2017 improved by over 60% compared to the FY2015/16. WRA, however needs financial resources that will enable it undertake its mandate countrywide therefore budget reductions indicates limitations in achievement of its mandate.

The figure below indicates the FY2016/17 budget financing deficit of 14%, compared to the 80% deficit experienced in FY2015/16. Rationalisation is the processes of reducing the budgeted expenditures so as not to exceed the approved and available financial resources.

Table 3: 22 Budget analysis for the reported period

Items	Budget (million KES) 2015/16	Budget (million KES) 2016/17
GOK grants (Recurrent Funds)		
Budgeted/approved	500	407
Actual/received	91	407
Financing gap	409	0
GOK grants (Development Funds)		
Budgeted/approved	950	526
Actual/received	200	400
Financing gap	750	126
Total	1,159	126

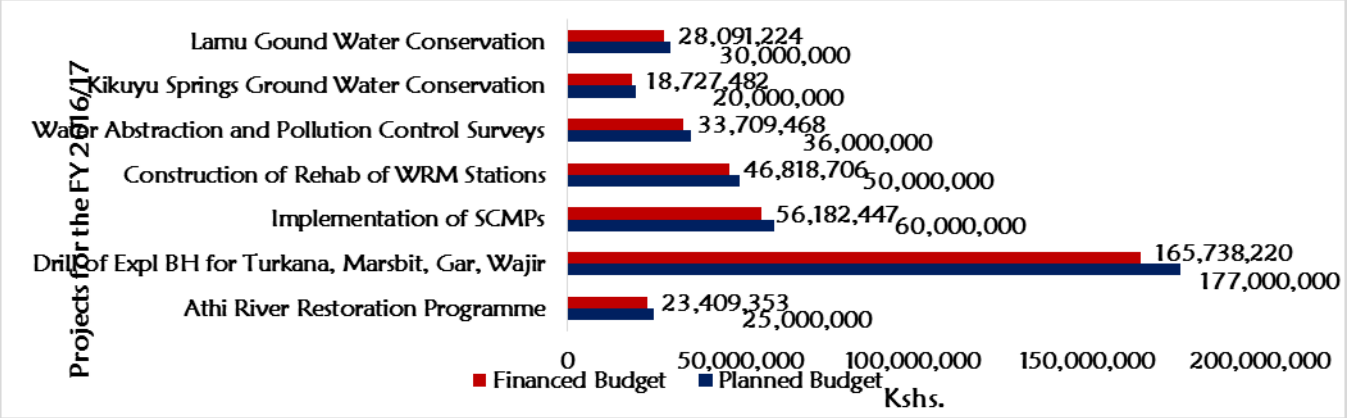
Table 3: 23 Capital Projects Report funding FY2016/2017

Capital Projects Report funding FY2016/2017		
Project	Planned Budget	Financed Budget
Athi River Restoration Programme	25,000,000	23,409,353
Drill of Exploratory Borehole for Turkana, Marsabit, Garissa, Wajir	177,000,000	165,738,220

Implementation of SCMPs	60,000,000	56,182,447
Construction of Rehabilitation of Water Resources Management Stations	50,000,000	46,818,706
Water Abstraction and Pollution Control Surveys	36,000,000	33,709,468
Kikuyu Springs Ground Water Conservation	20,000,000	18,727,482
Lamu Gound Water Conservation	30,000,000	28,091,224
Total	398,000,000	372,676,901
Budget financing deficit		25,323,099

The Table above shows the investment that were made to specific programmes and projects in water resource management prioritized areas.

Figure 3: 37 Projects Vs Budgets



3.6 Information Management

3.6.1 Managing water resources monitoring data and information

WRA operates a database management system that allows data to be easily collected, stored, accessed, manipulated, updated and disseminated. The system enables efficient sharing of data for effective management of water resources. For purposes of assessing performance in operations of the database, information on surface water, ground water and water quality have been extracted from the database in three categories. These are operational stations, duration of data collection and frequency of updating data. The details are in Table below which shows the operational stations and duration of data collection.

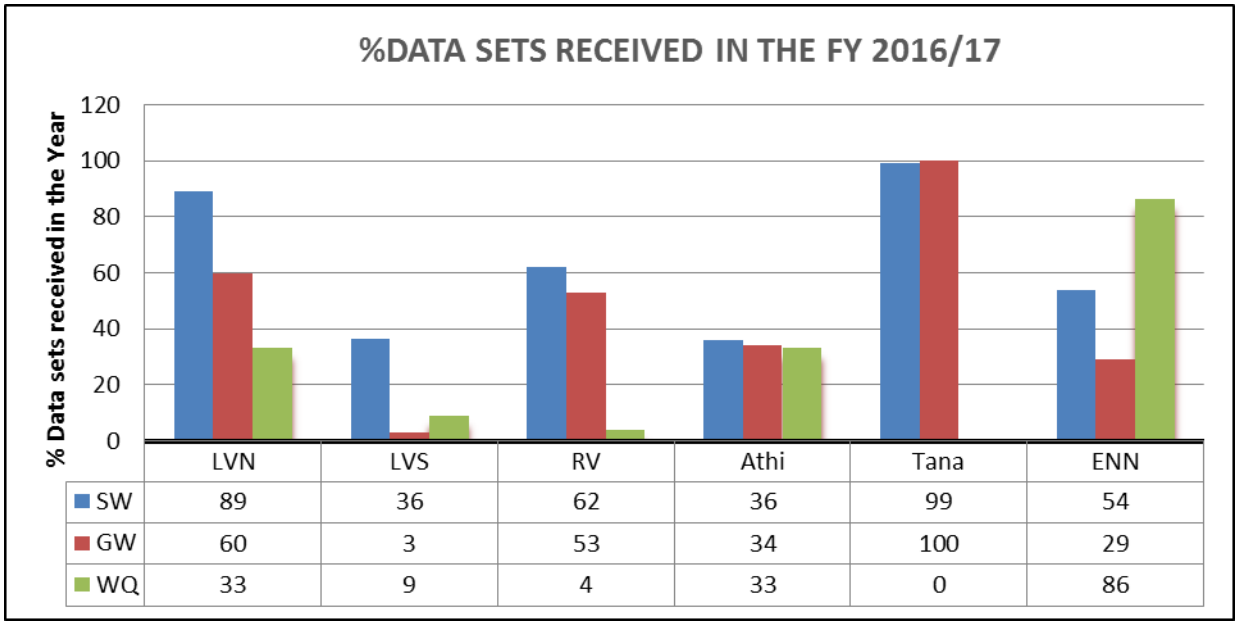
The status of the data as generated by the database for the operational stations in the six catchment areas is shown in Annexes 3 and 4.

Table 3: 24 Status of water resources monitoring database up to June 2017

Water resources monitoring stations and data frequency up to June 2017						
Region	Operational stations			% Duration of data collection		
	SW	GW	WQ	SW	GW	WQ
LVN	36	0	58	89	60	33
LVS	37	49	91	36	3	9
RV	40	53	40	62	53	4
Athi	23	40	49	36	34	33
Tana	44	18	33	99	100	-
ENN	33	12	-	54	29	86

SW: surface water; GW: groundwater; WQ: water quality

Figure 3: 38 %DATA SETS RECEIVED IN THE FY 2016/17



	LVN	LVS	RV	Athi	Tana	ENN
SW	89	36	62	36	99	54
GW	60	3	53	34	100	29
WQ	33	9	4	33	0	86

The **table** above displays the total no of operational stations which collected Surface Water, Ground water and Water Quality data in each region with their respective number of dataset received in relation to the ultimate target. Tana performed best in data entry for surface and ground water while ENN performance was the best in water quality data entry.

The surface water data is collected by gauge reader who visits the gauging stations at least once and at most twice a day to manually read the gauge plate and the data is recorded in the data sheets and sent to SRO for further transmission to regional office and HQ national database. While ground water and water quality data is collected by WRA specialist.

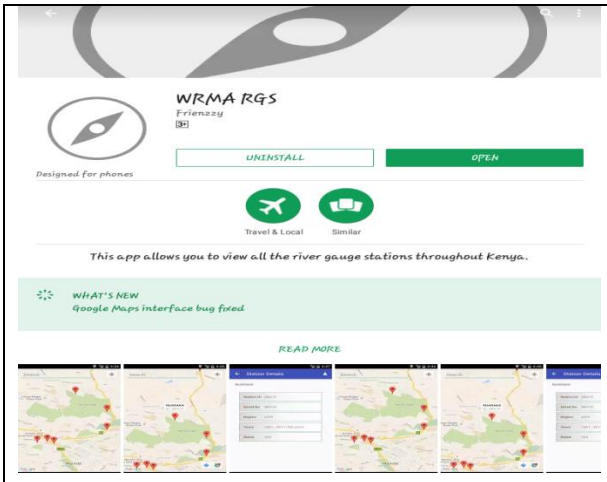
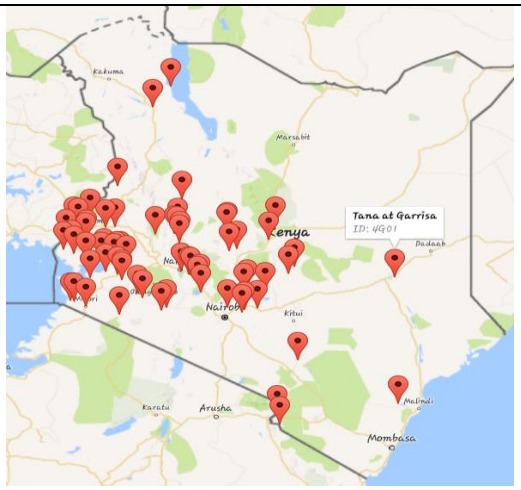
3.6.2 ODK mobile phone interface

ODK interface and forms have been developed and implementation is ongoing. 10 forms were developed by the technical department and uploaded to the cloud servers by WRA HQ team. The forms were posted in all the Sub regional offices ODK aggregates and configured in the Sub regional mobile phones for use by the SRO staff to collect data and submit.

Another outstanding achievement in the Database department in the FY 2016/2017 was the development of a mobile application which is available to all who need information on WRAs river gauging stations (RGS). The application is downloaded from goggle play store then installed in an android phone. The following figures shows the displays of the application Figure 1.

Figure 3: 39 Regular Gauging Station (RGS) Mobile Application

		
Display on a tablet		Display on a mobile phone

		
The application with a black round icon as seen on a mobile phone or tablet once downloaded.		Regular Gauging Stations as displayed on goggle map

The application uses Google maps to display basic information of the river gauging station. Expected benefits of the RGS mobile application include an improved data services and the availability of the attributes of the individual RGS to users. The analyzed data obtained will provide information that will be used by the communities to plan their water dependent activities. The information obtained will give indications on the extend of floods and drought in the year and plan on the adaptation measures that include installation rain harvesting and storage structures, crop diversification and seeking for alternative sources.

3.7 Stakeholder Participation

3.7.1 Effective participation of stakeholders in the basin

WRA highly esteems the partnerships between WRA and partners and county governments for their support inform of grants, loans, donations, technical expertise and participation. The partners support enhanced WRAs capacity in executing her mandate. The following **Table below** illustrates the various categories of the partners that collaborated with WRA.

Table 3: 25 Status of participation of partners

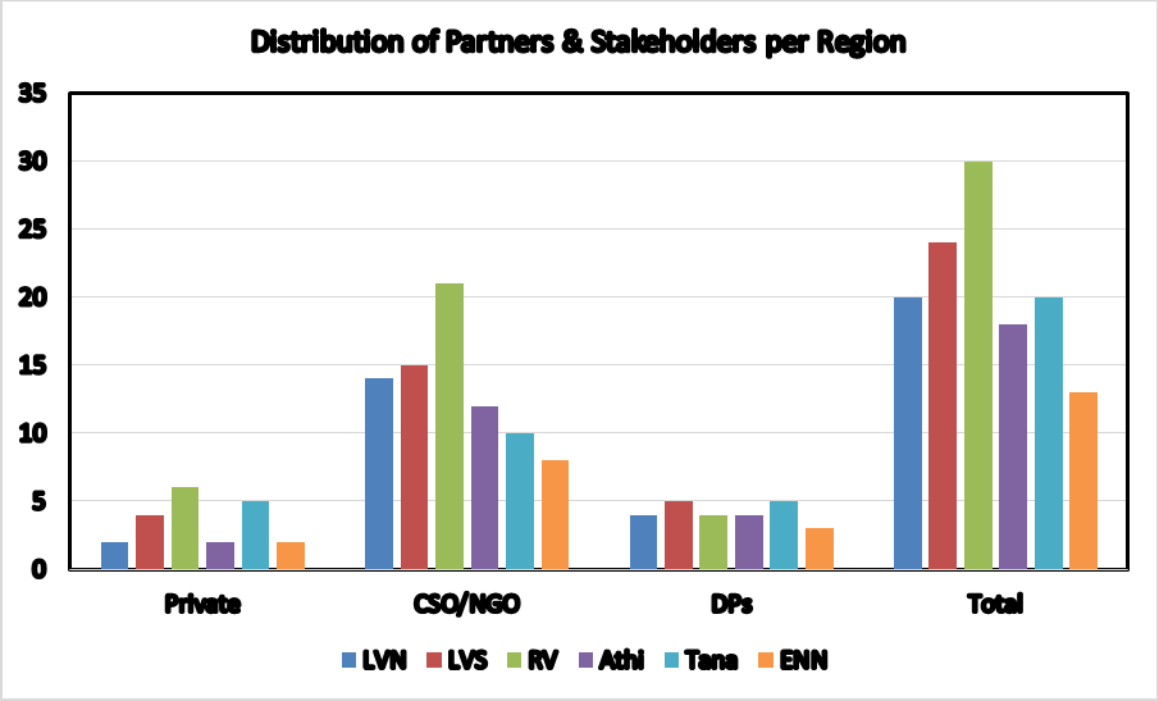
Region	Status of Participation of Partners & Stakeholders in Water Resource Management up to June 2017				
	Private	CSO/NGO	DPs	Total	
LVN	2	14	4	20	
LVS	4	15	5	24	
RV	6	21	4	30	
Athi	2	12	4	18	
Tana	5	10	5	20	
ENN	2	8	3	13	
Total	21	80	25	126	

DPs – Development partners; CSO – Civil Society organizations

The partners that WRA collaborated with in all the river basins were 126 in number. There were 21 private, 80 civil society organisations (CSOs/NGOs) and 25 development partners. WRA grew to 126 partners from 117 partners in previous FY 2016/2017. The category of the civil society and the Non-Governmental Organizations had the highest percentages compared to the private and the development partners. Most of the private partners are flower and multinational tea companies.

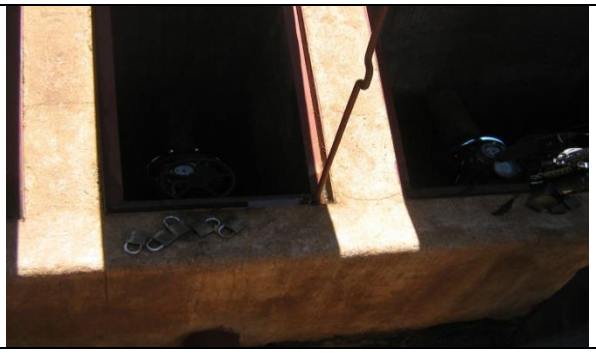
Mr. Mohamed Shurie, CEO WRA with the Governor of Trans Nzoia County Mr. Patrick Khaemba

Figure 3: 40 Distribution of Partners & Stakeholders per Region



The distribution of partners supporting WRA shows that all the regions had more than 12No. of partners. The least of partners were from the private category.

Water Resources Authority manages the water resources in the basins through the establishment of WRUAs. Ngushishi WRUA in Ewaso Ngiro North Catchment Area regulates the water in Ngushishi River in is one of the 670No WRUAs that WRA had established by June FY 2016/2017. The implementation of Sub Catchment Management Plans (SCMP) by these WRUAs demonstrated best practices that have excellent impacts in the management of the water resources. Some of the major achievements by Ngushishi WRUA included: regulation of water resources, water use efficiency practices (3NO common intakes), catchment conservation and wetland pegging among others.

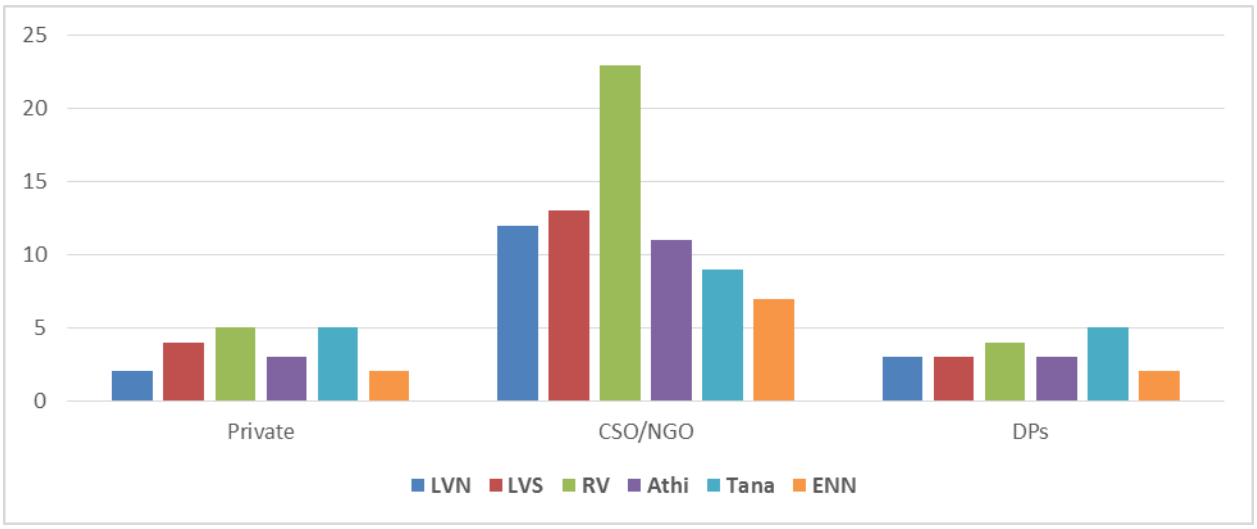


Common intake and lockable chambers for compliance

Ngushishi WRUA is one of the community based organizations that participated in the 1st Annual Kenya Water Week 2016 (KEWAWK) which was held from the 20th to the 25th of November 2016 at the KICC. Ngushishi WRUA won the best price in category of governance in the MapiaAward. The theme was "From Aid to Trade: Enhancing Business Partnerships & Innovation for Sustainable Water and Sanitation Provision in Africa.

The community members have benefited a lot from the WRUA activities that included: solving 88% of water conflict cases, shared water equitably and ensured the Ngusishi River continued to flow even during the dry spells. The WRUA created employment along the catchment that included by employing scouts for monitoring on illegal abstractions, planting of tree seedlings, meter readings and recording, and for checking and repairing leakages.

Figure 3: 41 Participatory data acquisition and information sharing



The partners that WRA collaborated with in all the river basins totals to 117 in number out of which 18 private, 56 civil society organisations (CSOs/NGOs) and 23 development partners. The organization had 20No more partners than the previous FY 2014/2015. The RVSC had the highest number of partners and ENNCA had the least. Most of the private partners are flower and multinational tea companies. The concerted efforts by WRA and partners strived to diligently address the organizational strategic objectives.

4 Progress (Trend analysis) and Achievements

4.1 Permitting trend

Permitting, which includes authorization and permit issuance, has been steadily increasing with more water users registering their abstractions with WRA. When WRA took over the management of water use in 2006, there were less than 2000 authorizations and fewer than 100 permits nationally (Figure 4.1). Currently there are over 10,000 authorizations and 4000 permits. This increase is over a period of 11 years with the improvement being more remarkable in the last three years. In the first five years of operations the improvement in authorizations was minimal, reaching a 2000 mark in 2010, while permits increased to about 250 over the same period. Increase could be attributed to innovation of the Permit Database made reporting easier, as well as users appreciated the essence of having permits in order to abstract water.

During the three year period from June 2011 to June 2013 there was a significant increase in permitting, with authorizations increasing from about 3700 to about 5500, while permits increased from 300 to about 1700. This was the period where most water abstracters understood and accepted the need to regulate water abstraction and therefore readily complied. Permit database innovation also took place then. There has been remarkable improvement in the last three years with about 7800 authorizations and 3100 permits in 2014; 10,387 authorizations and 4046 permits in 2015; 11844 authorizations and 4411 permits in 2016; 15059 authorizations and 5767 permits in 2017. During this period, WRA enhanced enforcement through disconnections and prosecution of non-compliant abstractors. This improvement needs to be sustained so that eventually all abstractors become compliant and update their permits regularly. To realize this, goodwill from water users and support from policy makers are essential.

Figure 4: 1 Progress in permits and authorisations since 2006

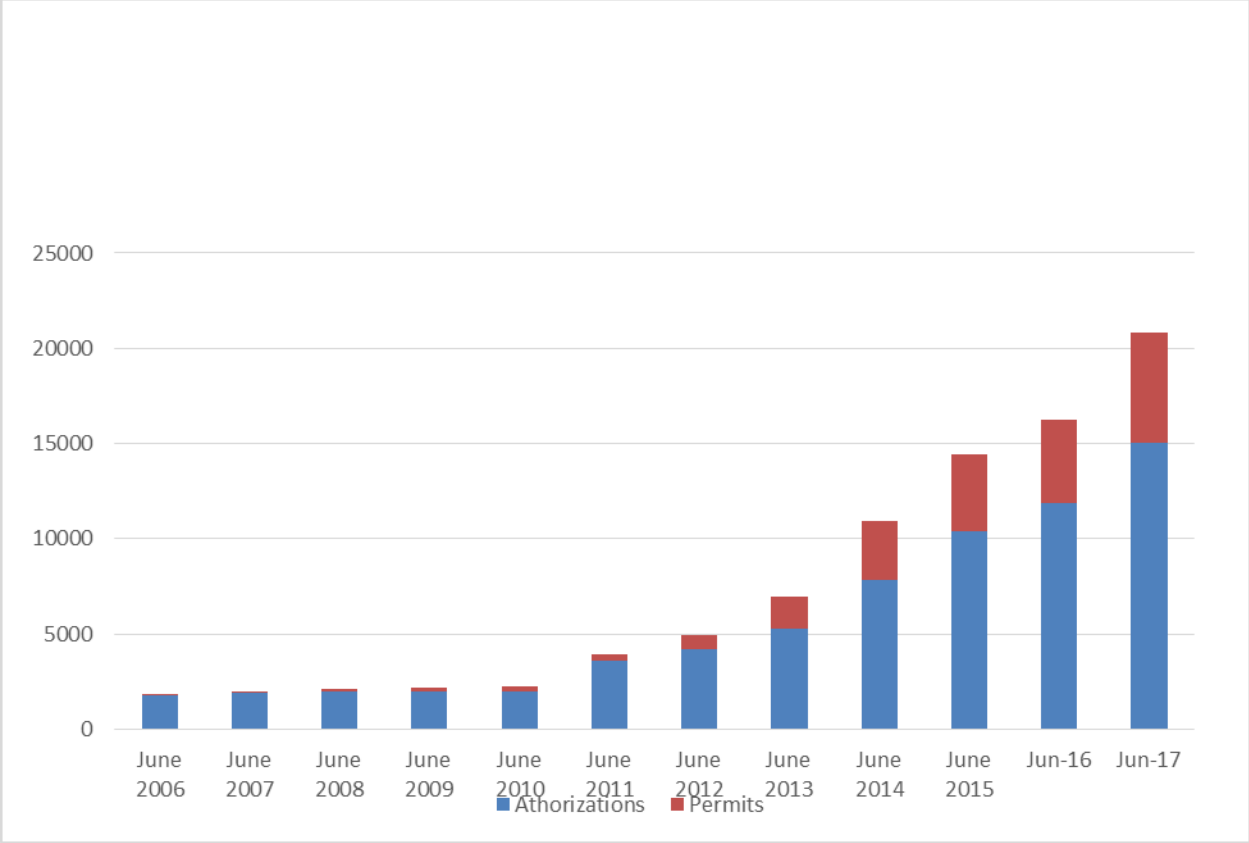


Figure 4: 2 Trend of WRUA formation 2009- 2016

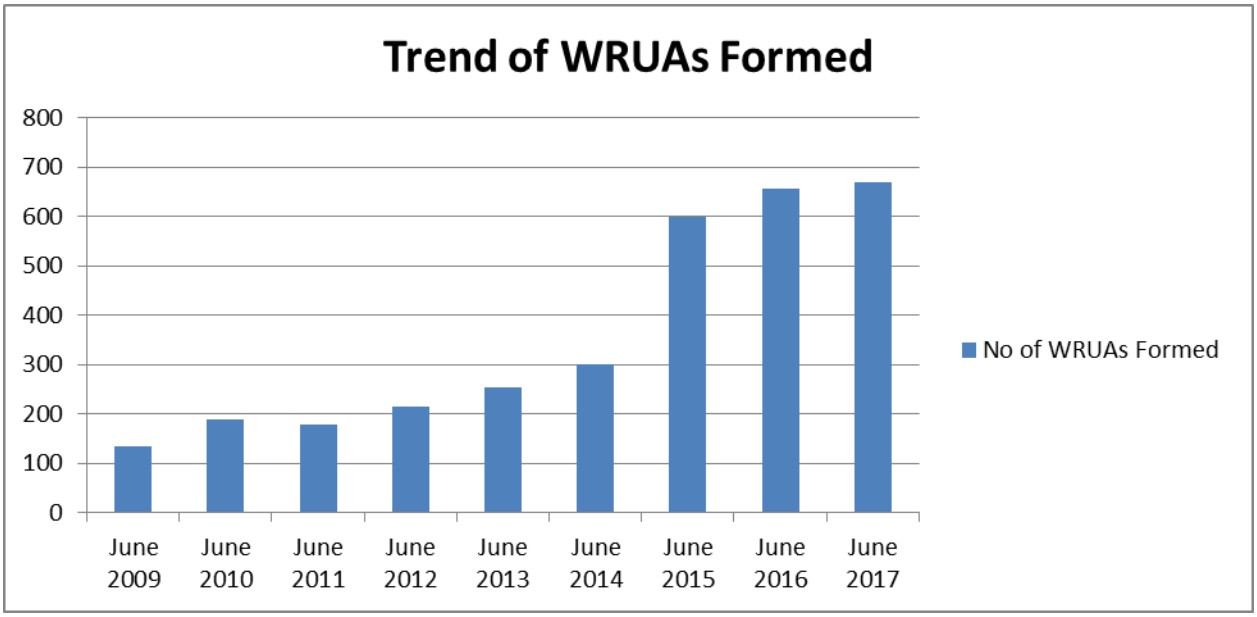
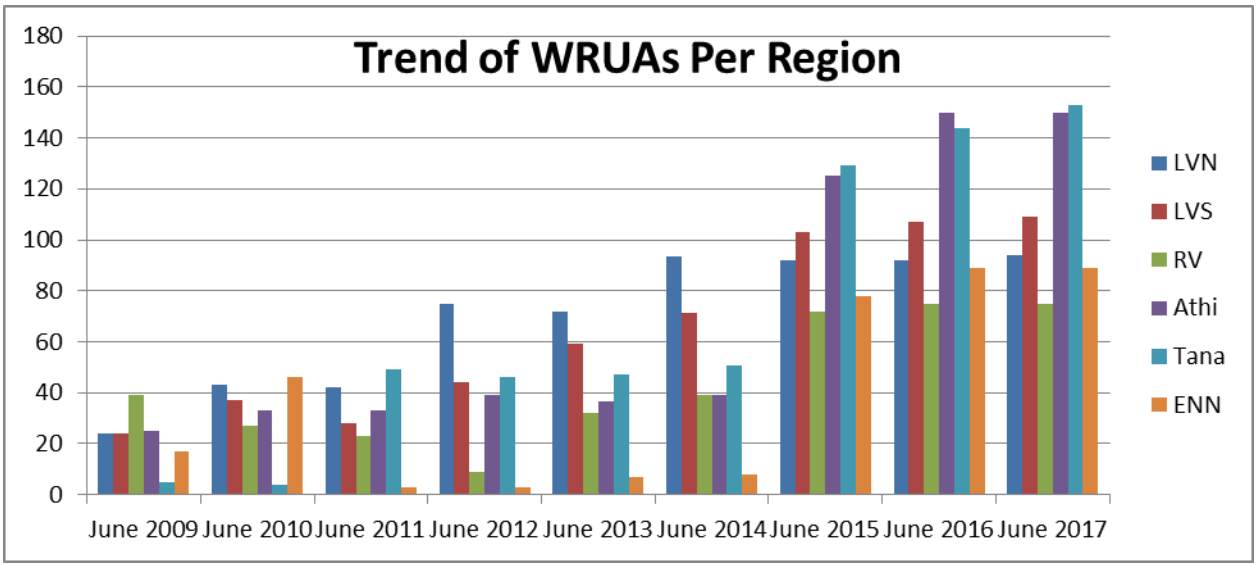


Figure 4: 3 Trend of WRUA formation 2009- 2016



There has been steady growth in WRUA formation over the years this is an indication that the public is becoming more aware on cooperative management of water resources hence voluntarily being part of the WRUAs to ensure their catchment areas are protected and water use conflict reduced.

Figure 4: 4 Trend of SCMP Developed nationally

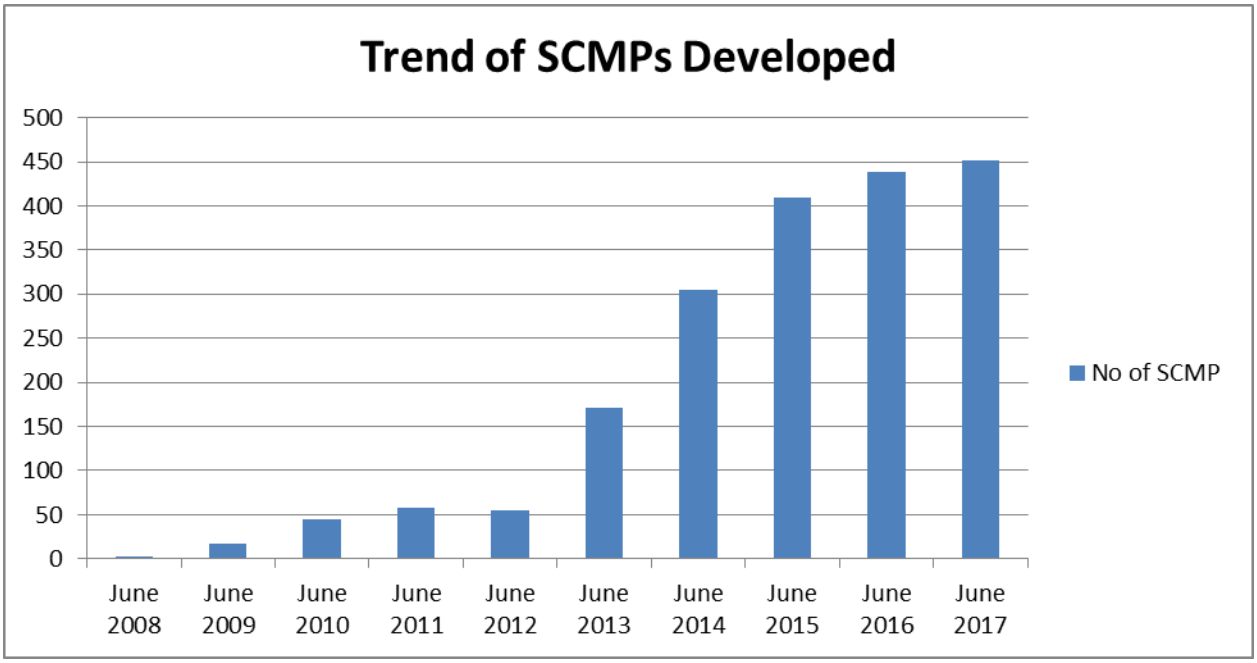
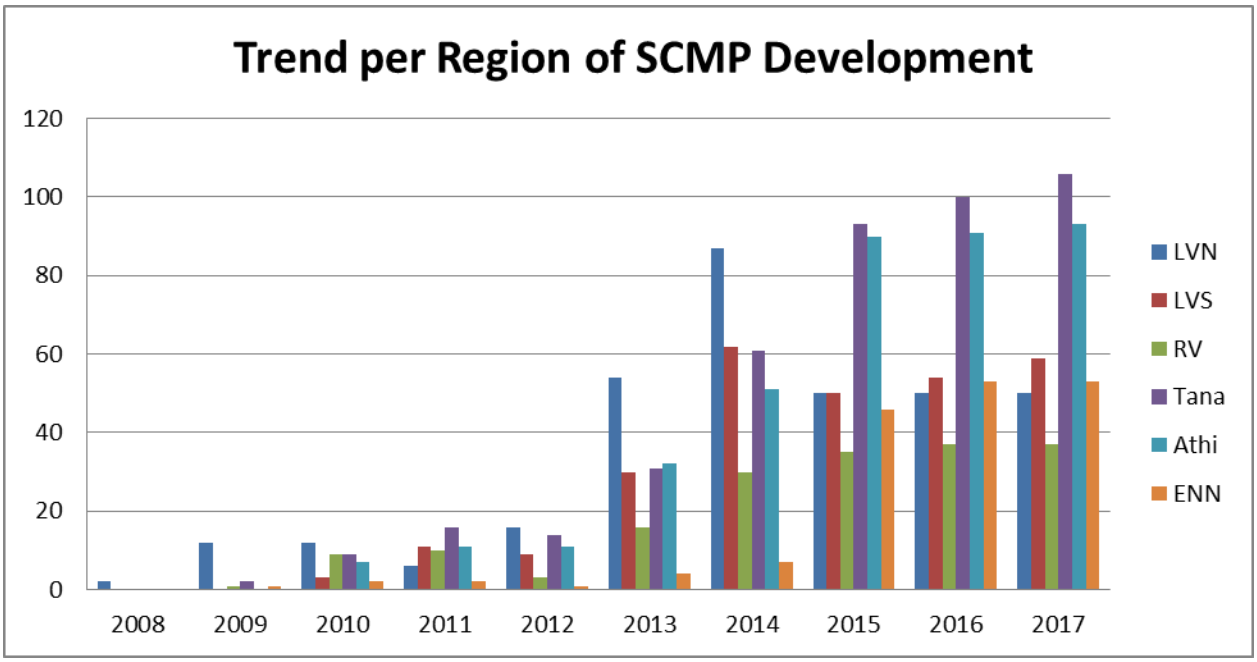


Figure 4: 5 Trend per Region of SCMP Development



The upward trend of SCMP development is a milestone in the catchment management this illustrates that many sub catchment have laid down plans with visions on the activities to be undertaken and stakeholders to be engaged in the respective sub catchment areas in Kenya.

More efforts will be put in place to ensure the SCMPs are implemented in the various sub catchment.

EDCP Trend

Compliance to EDCP and permit conditions gives an indication of how effective the point source pollution control management is. Figure xx give the trend of this indicator at the national level from June 2009 to June 2017.

Figure 4: 6 National EDCP & Permit condition compliance from June 2009 to June 2017

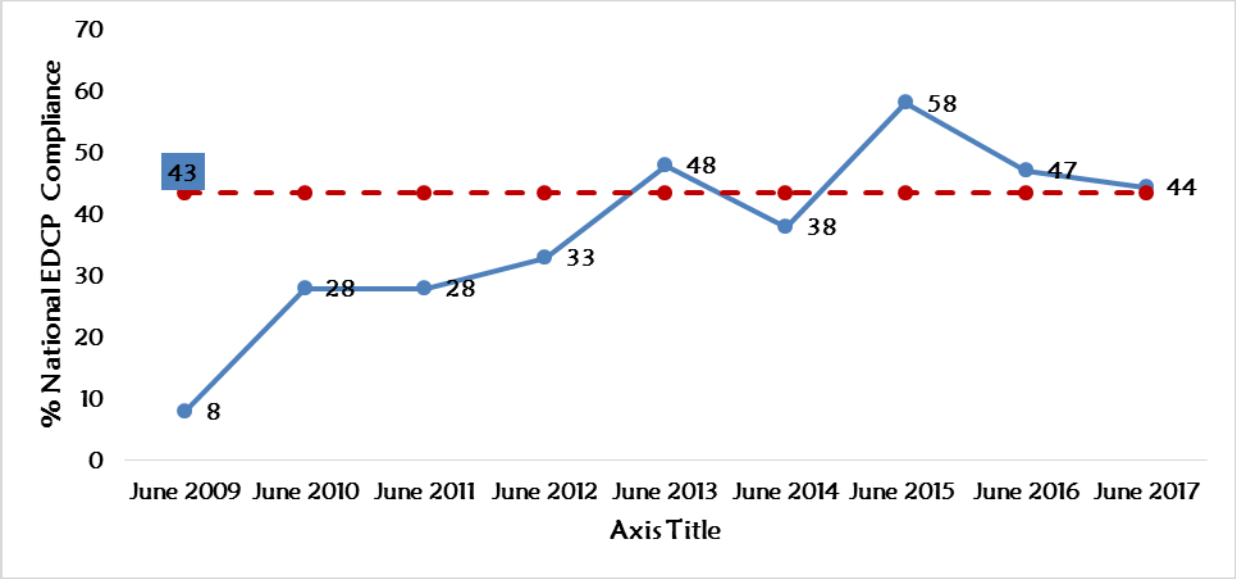


Figure. Shows the overall national EDCP & Permit condition compliance over the last 8 years for each region; From June 2009 to June 2017

Generally a steady increase in the percentage compliance was registered in the years 2009 to 2013. This increase was from 8 to 48 %. But from 2013 to 2017 there has been inconsistencies where sharp increase and decrease in EDCP compliance were reported as shown in Figure. The highest compliance 58% was recorded in 2015 while the least compliance was registered in 2009 at 8%. The average for the last 9 years was 44%.

Figure 4: 7 Regional EDCP & Permit condition compliance from June 2009 to June 2013

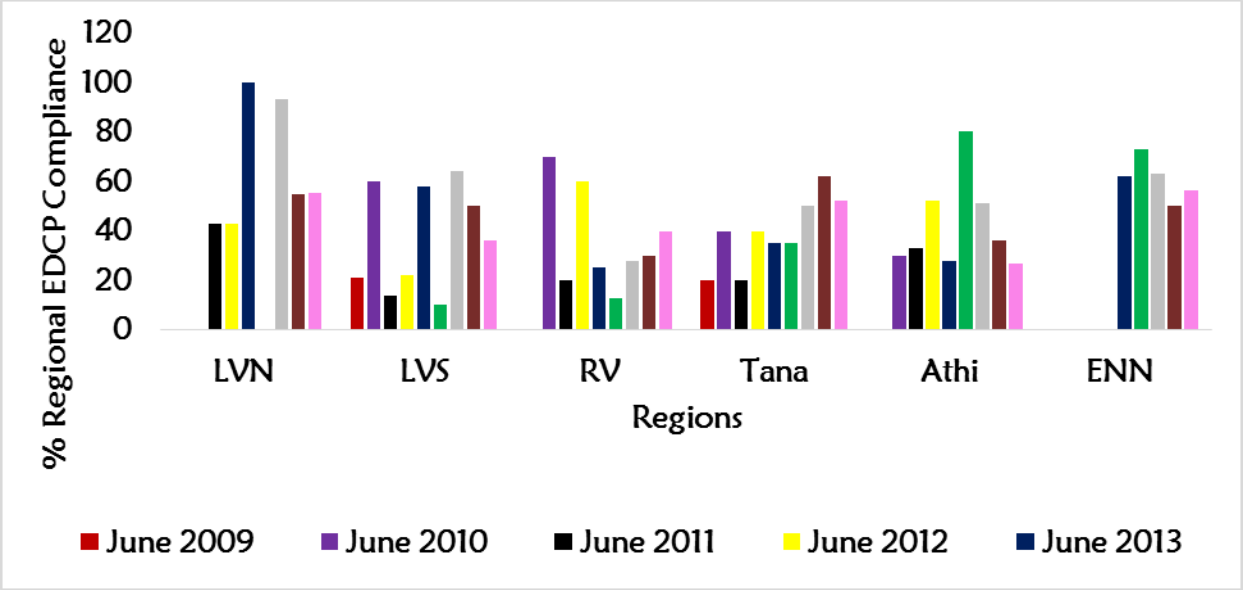
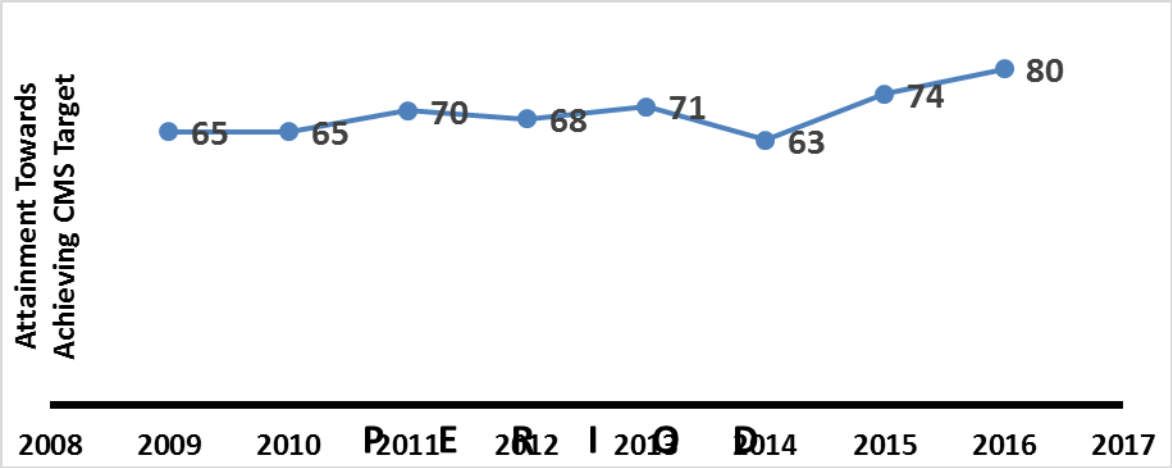


Figure. Shows the regional EDCP & Permit condition compliance over the last 8 years for each region; From June 2009 to June 2017

Analysis for the regions compliance across the years showed that there was inconsistencies in the performance of this indicator. Also from this graph, it can be seen there are data gaps. It is only LVS and Tana regions had monitoring in all the 8 years of this trend analysis. But we can conclude that in general in this indicator more effort is required.

National trend

Figure 4: 8 Achievement CMS Target Station



Ground Water trend

Surface water monitoring over time is based on the functional regular gauging stations against the identified CMS target. The figure below reflect the trends of monitoring over a period of nine years nationally. The performance has been fluctuating but has shown a steady rise over the last 4 years.

The fluctuation can be attributed to challenges in monitoring which are brought about by losses of stations through vandalisms and flash floods. So this is being countered through upgrading stations using more durable materials and sensors that provides better quality and consistent data.

Figure 4: 9 CMS Monitoring Station

	Monitoring stations by June 2017							
Regions	CMS Tar	OTHER STATIONS	Stations with water level records	Stations with updated rating curves	Number of monitoring boreholes	Number of operational boreholes	% operational	Boreholes with Water Rest data
LVN	28	9	37	6	19	19	100%	14
LVS	38	26	58	4	28	28	100%	14
RV	41	0	28	5	51	47	92.10%	36
Athi	31	0	29	23	40	23	39	16
Tana	47	27	74	29	41	16	53	21
ENN	38	0	35	0	16	9	75%	7
TOTAL	223	62	261	67	187	140	73.30%	108

Regions	Stations with water level records [2016/17]
LVN	37
LVS	58
RV	28
Athi	29
Tana	74
ENN	35
	_Monitoring_chart_SW_2016/17

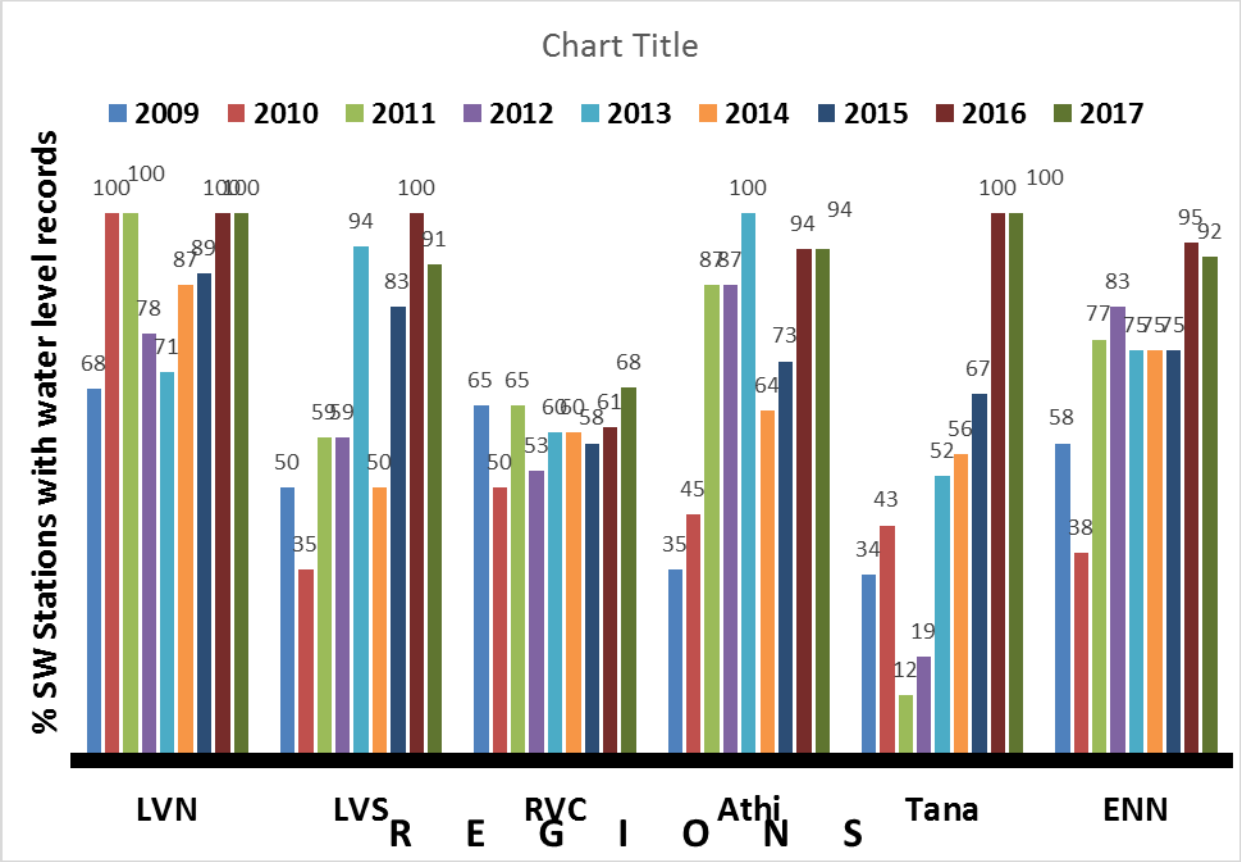
Regions	Boreholes with Water Rest data [2016/17]
LVN	14
LVS	14
RV	36
Tana	21
Athi	16
ENN	7
	_Monitoring_chart_GW_2016/17

Regions	No of SW Operational Stations [2016/17]
LVN	37
LVS	58
RV	28

SW Regional Trends						
YEARS	LVN	LVS	RVC	Athi	Tana	ENN
2009	68	50	65	35	34	58

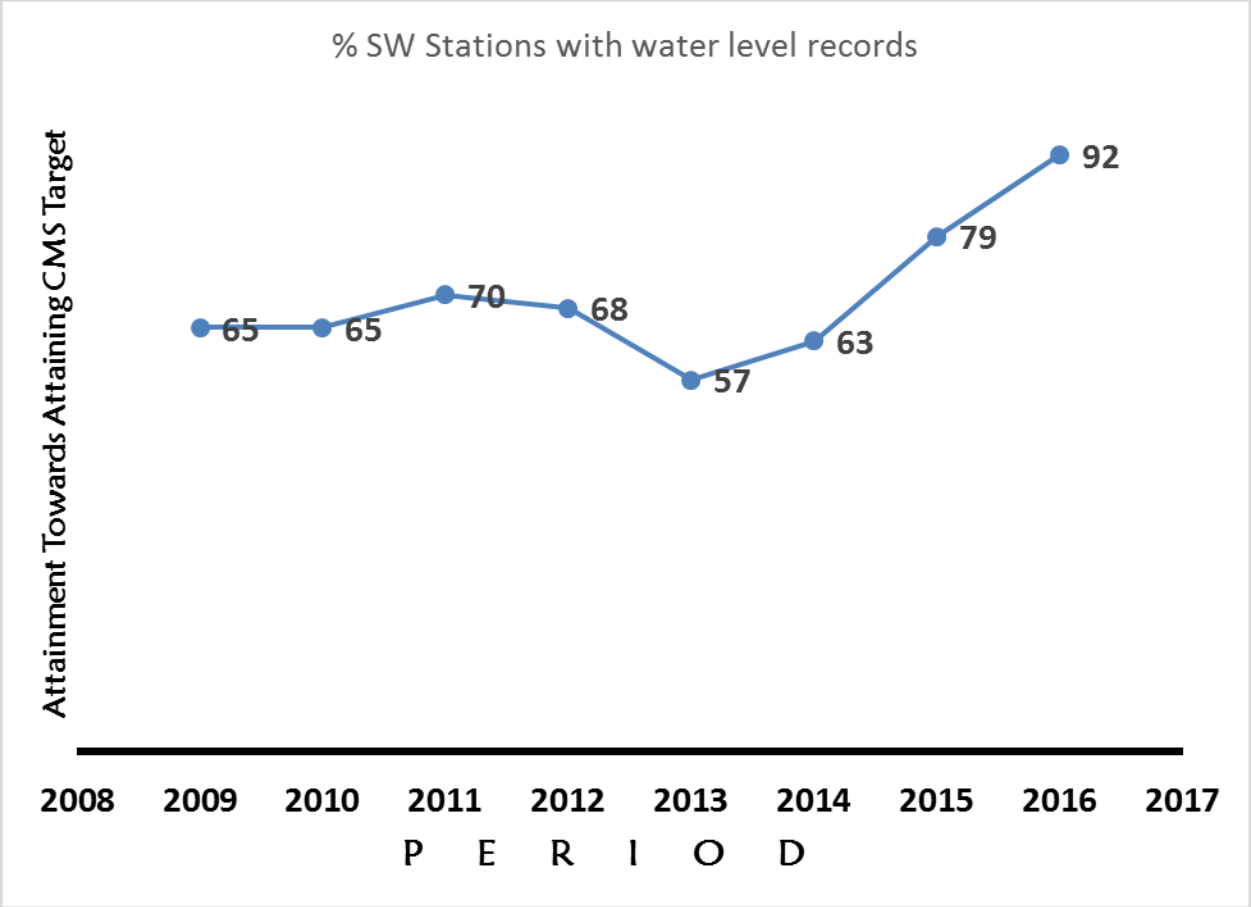
The figure below reflects the trend of monitoring over a period of nine years in all the regions. Again the performance fluctuated with a steady increase over the last four years. Overall LVN has performed better than other regions over time.

Figure 4: 10 Surface water trends per regions from June 2009- June 2017



SW trend per regions

Figure 4: 11 Percentage Surface water stations with water level records



From Left, Manual Rainfall Station Versus, Right, a Modern Rain Recorder.

Figure 4: 12 GW Stations with water level records

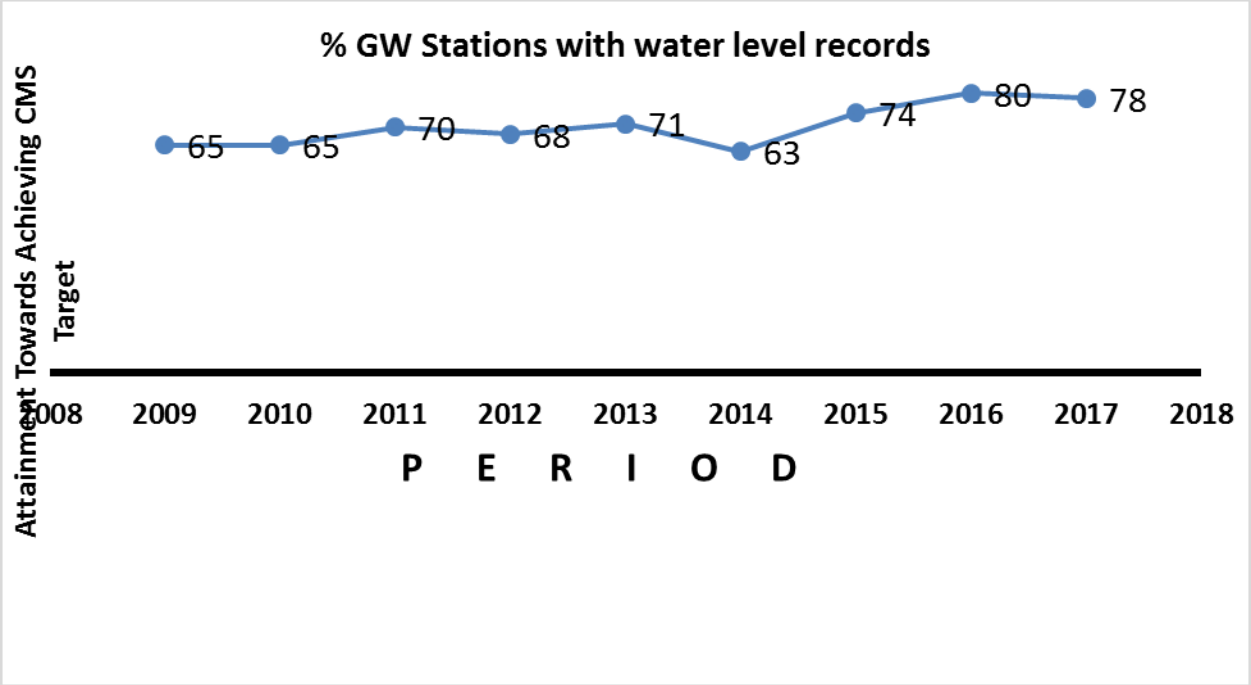


Figure 4: 13 Water quality Monitoring Stations trend

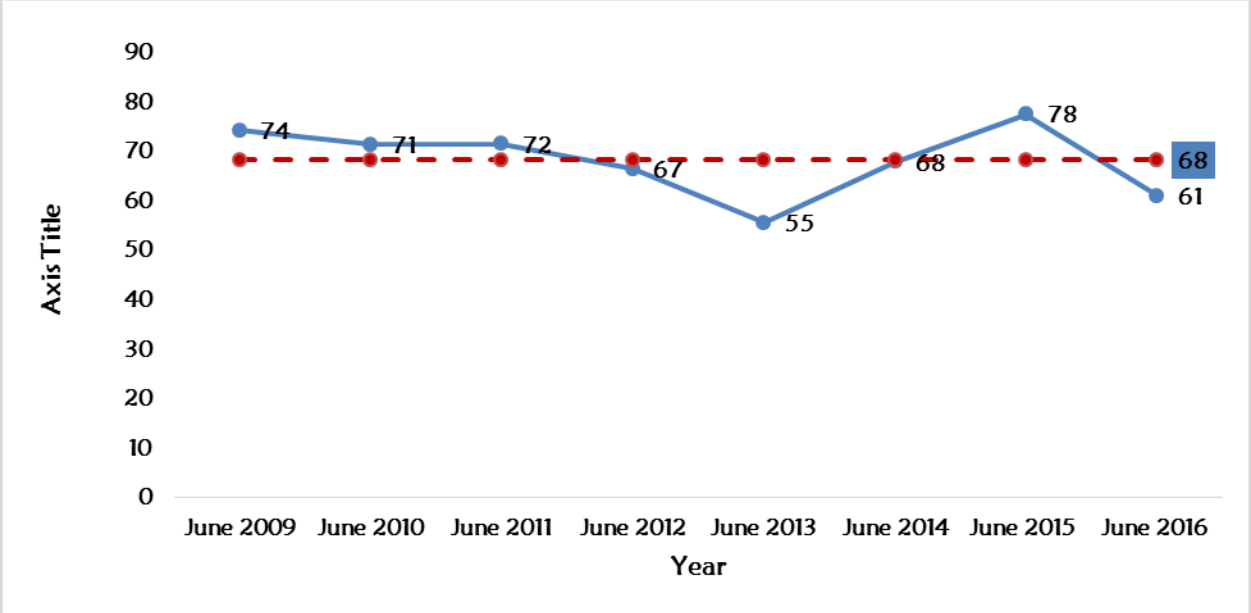


Figure. Shows the Overall Percentage of Target Surface water quality monitoring station monitored over the last 8 years for each region; From June 2009 to June 2017.

There has been inconsistency in the overall performance in the percentage of the surface water quality stations monitored. The average for the 8 years analyzed is 68 % and it was only in 2013 that this value was below 60% while the best performing year was 2015 at 78%. Athi and Tana regions had the highest and least average at 77% and 54% for the last eight years of monitoring (Figure).

Figure 4: 14 Surface Water Quality Monitoring Station

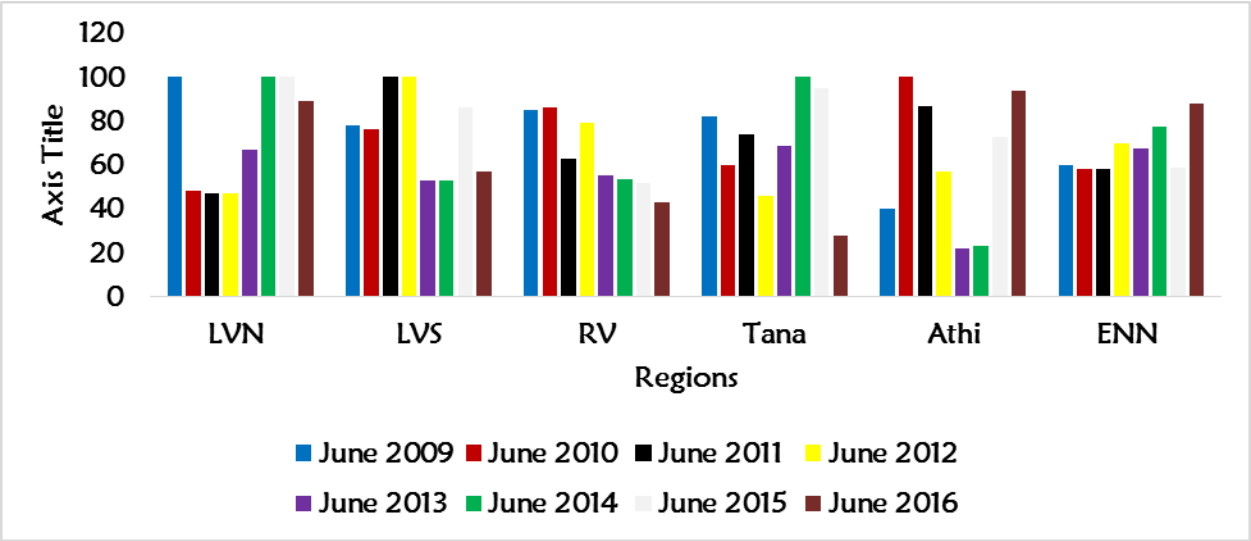


Figure. Shows the Percentage of Target Surface water quality monitoring station monitored over the last 8 years for each region; From June 2009 to June 2017

Similarly to surface water, groundwater quality monitoring stations has also shown inconsistencies in the percentage of the monitored stations across the years and the regions. The average for the 8 years analyzed is 67 % and it was only in 2016 that this value was below 50% while the best performing year was 2013 (79%). Nationally, the has been a decreasing trend; initially gradual decline (June 2009 to June 2012), and more rapid one as from June 2013 to June 2017 although there was erratic increase and decrease. Therefore, this means control of non-point pollution is not progressing well and deliberate more effort is required to change this trend.

Figure 4: 15 Overall % of Ground water quality stations monitored

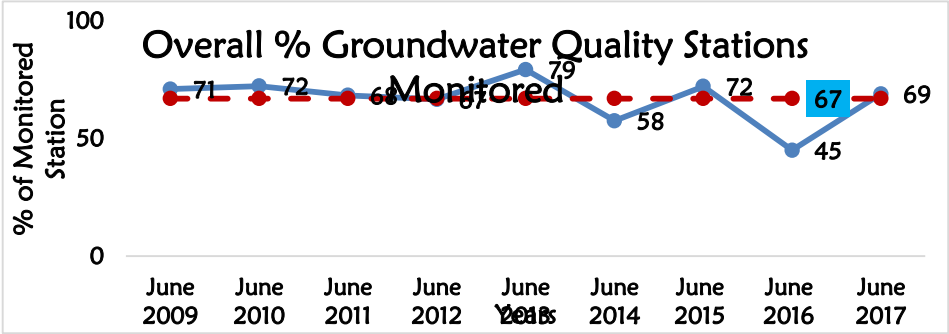


Figure. Shows the overall Percentage of Target Groundwater quality monitoring station monitored over the last 8 years; From June 2009 to June 2017

Figure 4: 16 Percentage of Ground water quality stations monitored

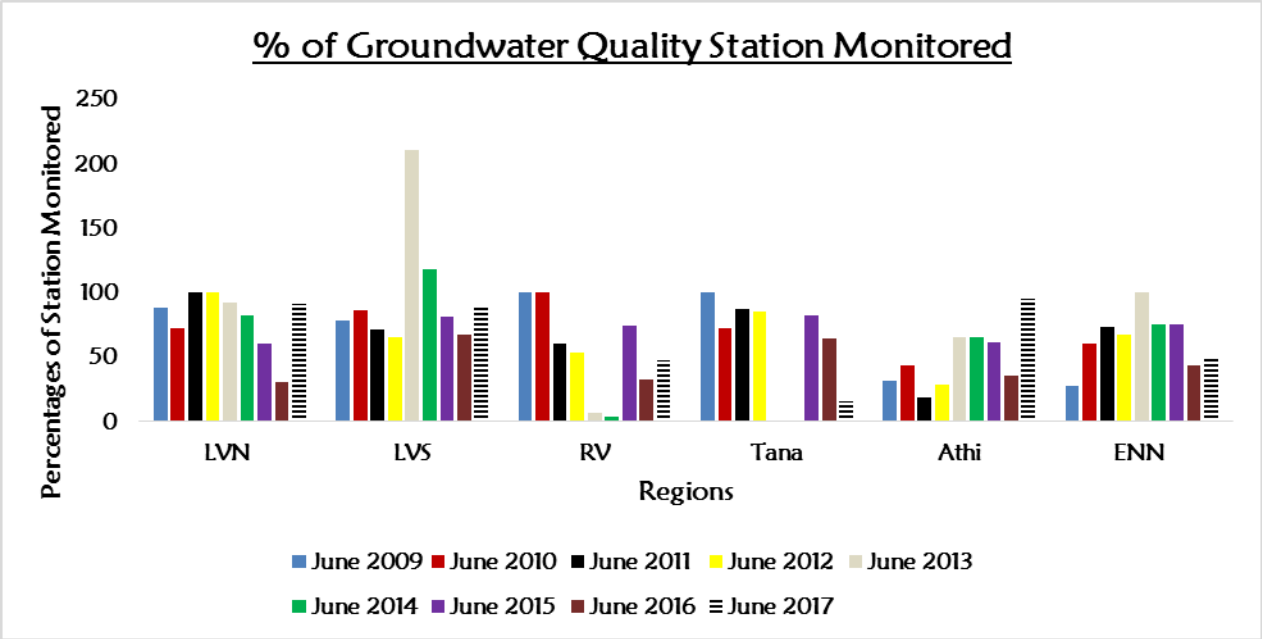
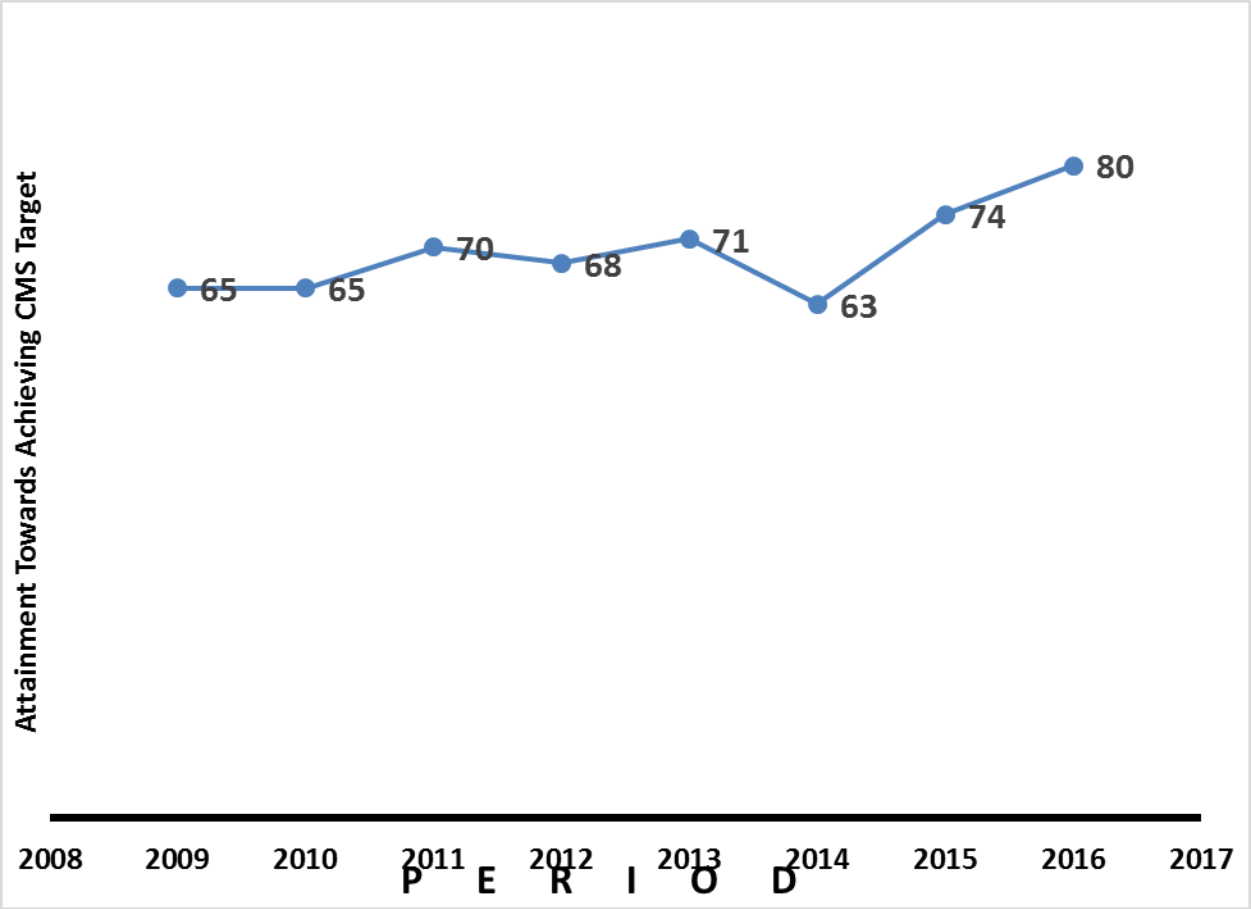


Figure. Shows the Percentage of Target Groundwater quality monitoring station monitored over the last 8 years for each region; From June 2009 to June 2017.

From the graph above, all the regions showed decreasing trend with exception of ENN and Athi regions. This explains overall general decline in performance of this indicator (Figure).

Figure 4: 17



Over the last eleven years the Authority has recorded an improvement in funds it realized. The most significant improvement was recorded in revenue collection which has steadily grown from an initial collection of Kshs. 42.4 million realized in FY 2005/06 to that of over Kshs.720 million in FY 2016/17.

Government grants releases have also increased over time from an initial allocation of Kshs.17 million in FY 2005/06 to an allocation for FY 2016/17 of Kshs.805 million.

Funds received from external sources (donor funds) increased in the first seven years' period from an allocation of Kshs.151.9 million in FY 2005/06 to Kshs.822.4 million in FY 2012/13. However, the funding has since declined drastically, such that in FY 2016/17 only Kshs.62.6 million was released to the Authority by development partners.

The funds released to the Authority over the last five years are as summarized and shown in Table below.

Table 4: 1 Funds Received

Type/Source	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17
	Kshs. "000"	Kshs. "000"	Kshs. "000"	Kshs. "000"	Kshs. "000"
Internally G. Funds (Revenue/AIA)	605.512	764.533	815.152	851.296	721.990
Government Grants	307.783	511.271	528.434	291.667	803.877
External Resources (Donor funds)	822.382	456.350	146.017	141.255	62.573
Total	1,735.676	1,732.154	1,489.603	1,284.217	1,588.440

Expenditure on Programmes

Expenditure on operational activities generally increased over the period under review. It steadily rose from an amount Kshs.66.7 million recorded in FY 2005/06 to over Kshs.1, 225.6 billion reported in FY 2016/17.

Development expenditure, for both government supported programmes and donor funded projects, increased over the first seven years' period from an expenditure of Kshs.128.4 million in FY 2005/06 to Kshs.954 million in FY 2012/13. Since then development expenditure has declined drastically, such that in FY 2016/17 only Kshs.139.2 million was utilized on development programmes.

The summary expenditure per programmes for the last five years is as shown in Table 1.3 below.

Table 4: 2 Summary of Expenditure per year

Type/Vote	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17
	Kshs. "000"	Kshs. "000"	Kshs. "000"	Kshs. "000"	Kshs. "000"
Operations (Recurrent expend.)	832.137	1,364.286	1,412,075	1,309.305	1,225.634
Development expend	954.026	658.222	336.675	233.560	139.174
Total	1,786.163	2,022.508	1,748.750	1,542.865	1,364.809

Funding Gaps

Generally the funding of water resources management has been inadequate over the year as compared to the approved budget resulting in huge financing gap as summarized table 1 below. A number of water resources management functions which have been retained in the Ministry, have continued to receive higher allocations/funding compared to the Authority's allocation which has also contributed to low funding to the authority.

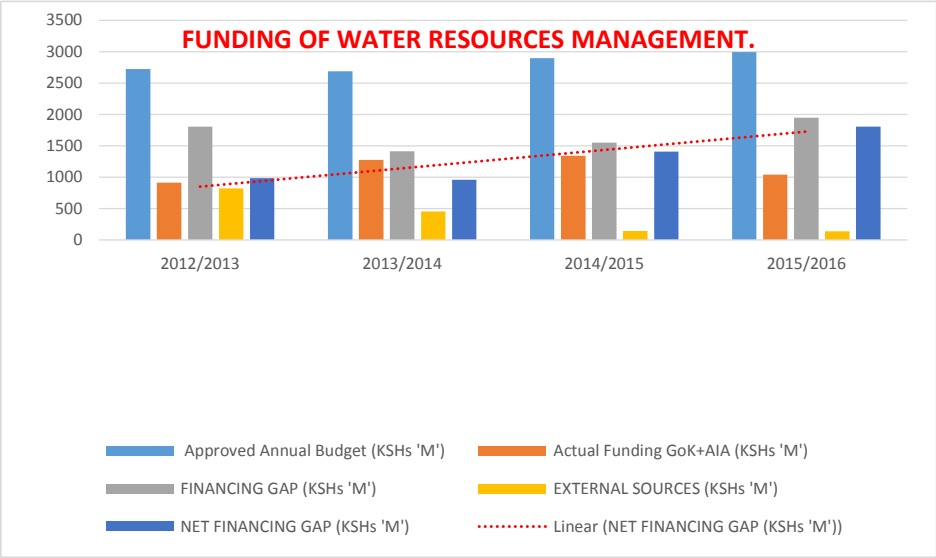
The trend line in figure 1 below represents the net funding gap as seen from table 1 below there has been an average financing gap of Kshs.1.4b over the years.

Table 4: 3 WRA GoK + AIA Financing Gap Analysis

YEAR	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Approved Annual Budget (KSHs 'M')	2,722	2,690	2,896	2,992	3,328
Actual Funding GoK+AIA (KSHs 'M')	913.3	1,275.8	1,343.6	1,043	1,625.9

FINANCING GAP (KSHs 'M')	1,808.7	1,414.2	1,552.4	1,949	1,702.1
EXTERNAL SOURCES (KSHs M')	822.4	456.3	146	141.3	62.6
NET FINANCING GAP (KSHs M')	986.3	957.9	1,406.4	1,807.7	1,639.5

Figure 4: 18 Funding Trend for Water Resources Management Authority



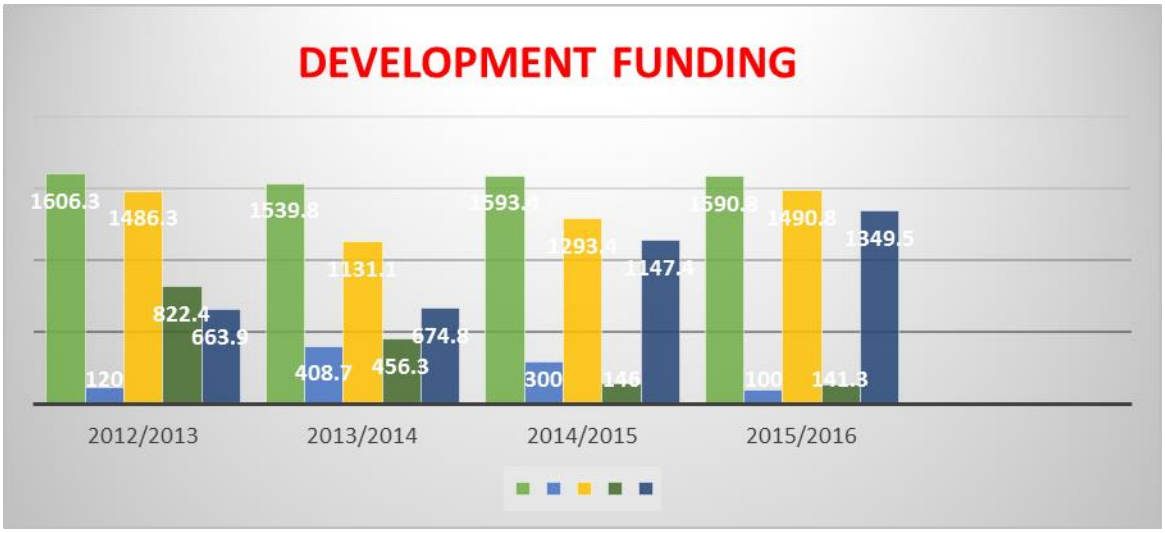
Funding of Development Programmes

Funding for development programmes of the water resources management shows a steady rise implying a steady decline in donor support/financing over the period thus a direct relationship between the budget and net financing gap under this programme.

Table 4: 4 Development Financing Gap Analysis

YEAR	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Approved Annual Budget (Kshs 'M')	1,606.3	1,539.8	1,593.4	1,590.8	1,899.0
Actual Funding (Kshs 'M')	120.0	408.7	300.0	100.0	496.9
Financing Gap (Kshs 'M')	1,486.3	1,131.1	1,293.4	1,490.8	1,402.1
External Sources (Kshs 'M')	822.4	456.3	146.0	141.3	62.6
Net Financing Gap (Kshs 'M')	663.9	674.8	1,147.4	1,349.5	1,339.5

Table 4: 5 Development Funding Trend



Funding of Recurrent Activities (Operations)

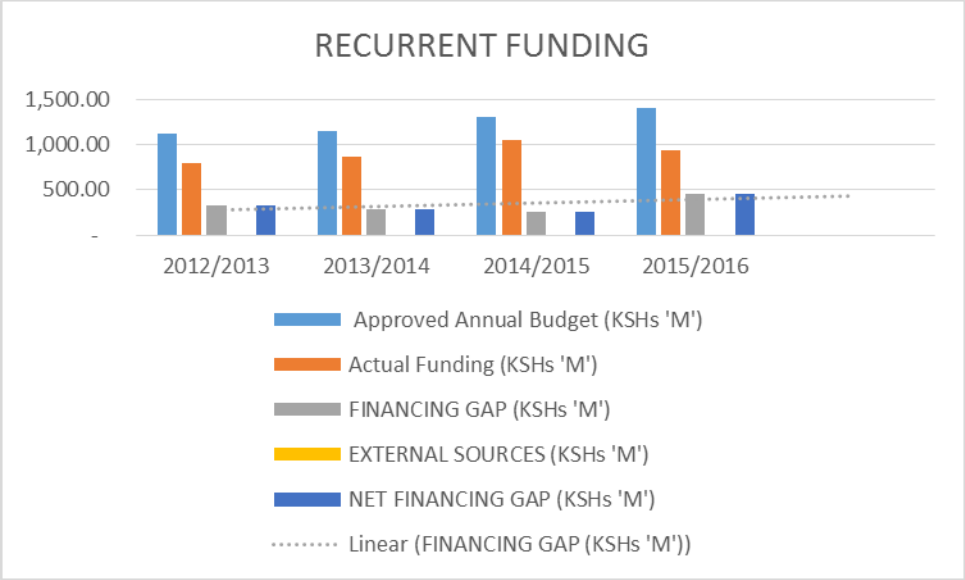
The approved recurrent budgets over the years has increased steadily though with a small percentage while actual funds released for operations has also improved over the period

in line with the available funding. The financing gap has relatively been the same over the same period

Table 4: 6 Recurrent Funding

YEAR	2012/2013	2013/2014	2014/2015	2016/2017
Approved Annual Budget (KSHs 'M')	1,116	1,151	1,303	1,428
Actual Funding (KSHs 'M')	793	867	1,044	1,129
Financing Gap (Kshs 'M')	323	284	259	299

Table 4: 7 Recurrent Funding Trend



Despite the fact that the sector has already enough resources labelled as water resources fund we still have deficit. So there is an urgent need for water resources funds to be allocated as per the functions in future

Due to increased mandate of the Authority in the new act we propose a higher budget of approximately Kshs.5 billion to enable the Authority implement its mandate effectively,

an approximate of Kshs.3 billion been recurrent budget and 2 billion been development budget, this will address the Authority's financing gap.

Performance Contact Performance

Financial Year	PC Score	Rating	Remarks
FY 2013/14	3.2059	Fair	Insufficient development funding
FY 2014/15	2.9436	Very Good	Increase in donor funded projects
FY 2015/16	-	-	No evaluation was done
FY 2016/17	2.7414	Very Good	Increase in GOK development funding

6. Lessons Learnt

1. For us to succeed in Water Resources Regulation communities and key continuous training of users

2. Partnerships are good because they help focused interventions, joint planning and pooling resources together to avoid wastage for common vision goal strategy and interventions

3. Even though functions spread in county and national the two governments cannot succeed without each other thus there us need for harmonizing plans

4. Due to limited water resources endowment in the country investment in water storage is becoming increasingly important

5. Awareness among communities and residents in water catchment areas on environmental conservation is low and needs to be enhanced so that it can help people to have self interest initiatives towards conserving environment especially around water resources at all levels policy makers, development partners and communities.

6. Effective water allocation in the basin will only be possible if the entire basin is covered. This can't be done at a go and is only possible in smaller sub basins. Water Allocation Plans will be drawn to entire basin for effective implementation of WAP

7. For effective regulations WRA must work with other agencies especially the police and courts

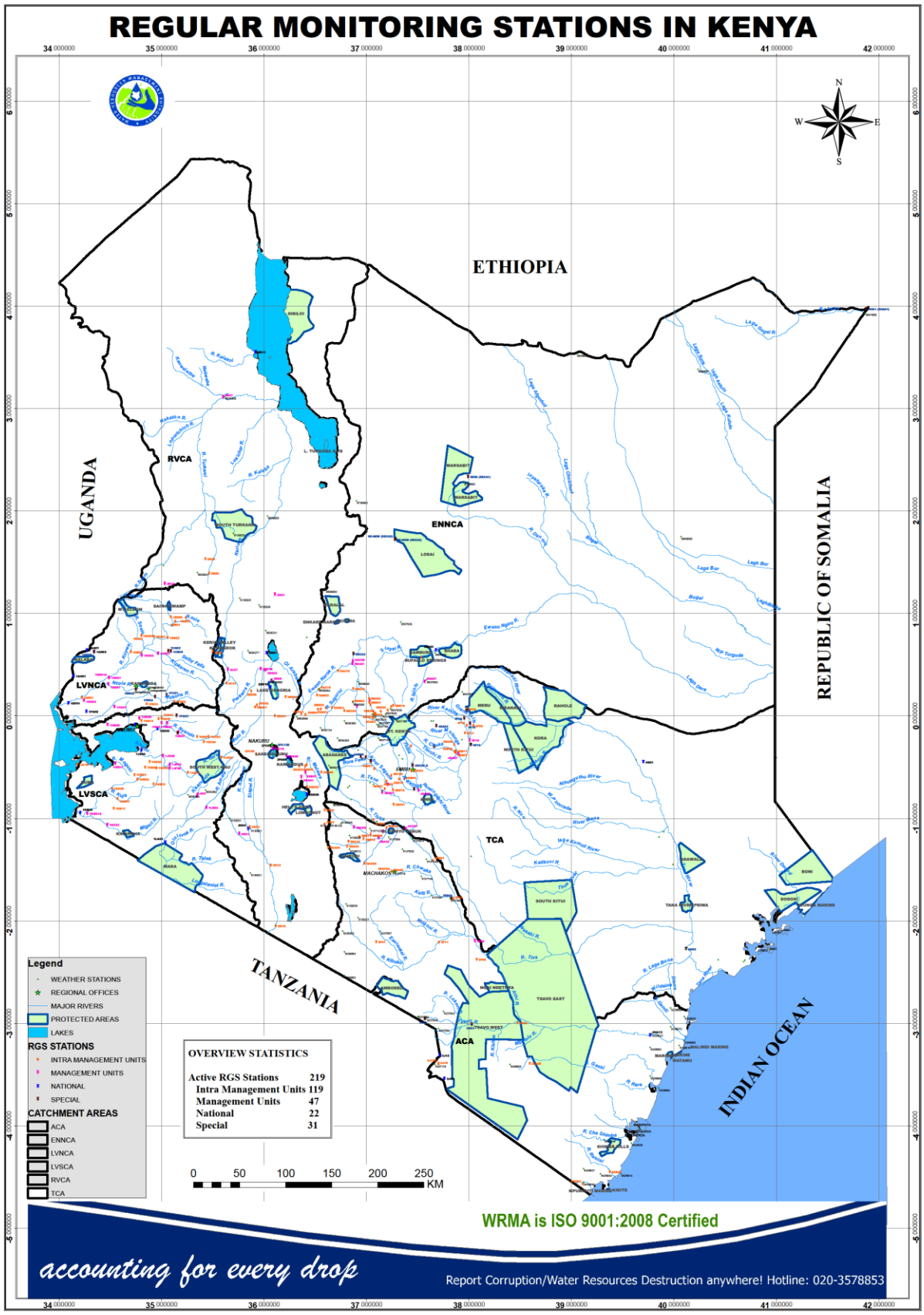
7. Conclusions and Recommendations

- From the analysis the water use through permit application has been increasing this is attributed to the economy growth towards realization of Vision 2030 flagship projects The demand for irrigation water is predicted that it will become more going into the future this despite water resources remaining the same . in some cases the water resources us in the decline and this calls for interventions to reverse the decline and increase storage per capita
- The challenges of investment and financing to water resources sector has continued to be low there is great need for more support from exchequer and other development partners for the sector
- The sector supports water resources in particular Irrigation sub sector has given substantial support for food security.
- Storage development is important for augmenting current available water resources with a view to manage the ever increasing demand
- More attention needs to be given to water pollution which is increasingly becoming a threat to the available water resources more attention should be on pollution control and involve pollutant producers in this regard private sector players should be engaged more in pollution control
- Encroachment into the wetlands, swamps , sand dunes , riparian lands has been on the increase in the past this is a serious threat to the water sources and there is need for collaborative efforts in enforcing the laws .

Annexes

The data coverage table above shows the entire river gauging station whose flows have been calculated and their respective location. The table also displays the percentage data coverage for the entire duration of the station existence. This table is useful to our customers both internal and external for use by researchers, designer's contractors, University students and for preparation of the year book.

Analysis of data coverage (see Annexes 3 and 4) shows that LVN has an average value of about **57.86%** followed by Tana with **51.28%** while LVS has **50.95%** data coverage. Ewaso Ngiro North, ACA and RVCA have a data coverage of **48.53%**, **44.33**% and **40.47%** respectively. The region with most gaps in the data is RVCA with about **59%** data missing. On average the data coverage is **49%;** this means that the gaps constitute **51%.**


REGULAR MONITORING STATIONS IN KENYA
ETHIOPIA
UGANDA
TANZANIA
REPUBLIC OF SOMALIA
INDIAN OCEAN
RVCA
ENNCA
LVNCA
LVSCA
TCA
ACA
Legend
WEATHER STATIONS
REGIONAL OFFICES
MAJOR RIVERS
PROTECTED AREAS
LAKES
RGS STATIONS
INTRA MANAGEMENT UNITS
MANAGEMENT UNITS
NATIONAL
SPECIAL
CATCHMENT AREAS
ACA
ENNCA
LVNCA
LVSCA
RVCA
TCA
OVERVIEW STATISTICS
Active RGS Stations 219
Intra Management Units 119
Management Units 47
National 22
Special 31
0 50 100 150 200 250 KM
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accounting for every drop
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Human Resources

WRA has a staff compliment of 743 Employees as listed below according to the cadres and the numbers in each cadre.

S/NO	CADRE	TOTAL NUMBER
1.	Chief Executive Officer	1
2.	Engineer/Water Conservation Officers	20
3.	Hydrologist/Surface Water Officers	53
4.	Geologist/Ground Water Officers	34
5.	Community Development Officer	36
6.	Water Quality and Pollution Control Officer	33
7.	Laboratory Technician	19
8.	Water Rights Officer	57
9.	Water Resources Data Officer	15
10.	Commercial Officer	31
11.	Finance Officers	3
12.	Accountant	43
13.	Internal Auditor	4
14.	Human Resources Officer	16
15.	ICT Officer	29
16.	Planning Officer	6
17.	Legal Officer	1
18.	Corporate Communication Officer	5

S/NO	CADRE	TOTAL NUMBER
19.	Administrative Officer	51
20.	Records Management Officer	31
21.	Secretary	38
22.	Store Keeper	20
23.	Clerical Officer	67
24.	Driver	59
25.	Office Assistant	49
26.	Procurement Officers	22
	Total	743

1. STRUCTURE OF WRA OPERATIONS

WRA is managed through the Headquarters (Nairobi) and six regional offices namely: Athi Catchment Area (Machakos), Tana Catchment Area (Embu), EwasoNg'iro North Catchment Area (Nanyuki), Lake Victoria North Catchment Area (Kakamega), Lake Victoria South Catchment Area (Kisumu), and finally Rift Valley Catchment Area (Nakuru).

WRA works closely with county governments in the management of water resources through its Regions and Sub Regional Offices countrywide. The Water Act 2016 provides for a decentralized and participatory approach based on basin areas, assisted by Basin Water Resources Committees (BWRCs) and Water Resource User Associations (WRUAs).

Table 0:1: WRA Regional and Sub Regional Offices

S/No	NAME	LOCATION
1.	HEADQUARTERS	NHIF BUILDING, 9TH FLOOR, WING B, NGONG

S/No	NAME	LOCATION
		ROAD
	Central Water Testing Laboratories	Nairobi, Industrial Area, Dunga Road
		Athi Catchment Area
2.	ATHI Regional Office	Machakos
3.	Middle Athi Sub Regional Office	Kibwezi
4.	Upper Athi Sub Regional Office	Kiambu
5.	Coastal Athi Sub Regional Office	Mombasa
6.	NoltureshLumi Sub Regional Office	Loitokitok
7.	Nairobi Sub Regional Office	Nairobi – Industrial Area, Dunga Road
7.	Malindi Satellite Office	Malindi Satellite Office
Tana Catchment Area		
1.	TCA Regional Office	Embu
2.	Thiba Sub Regional Office	Kerugoya
3.	Upper Tana Sub Regional Office	Murang'a
4.	Kathita/Mutonga Sub Regional Office	Meru
5.	Tiva/Tyaa Sub Regional Office	Kitui
6.	Lower Tana Sub Regional Office	Garissa
8.	Lamu Satellite Office	Lamu Satellite Office
EwasoNg'iro North Catchment Area		
1.	ENNCA Regional Office	Nanyuki
2.	Upper Ewaso Ng'iro Sub Regional Office	Nanyuki

S/No	NAME	LOCATION
3.	Middle EwasoNg'iro Sub Regional Office	Isiolo
4.	Engare-NarokMelgis Sub Regional Office	Rumuruti
5.	North EwasoLaggas Sub Regional Office	Marsabit
6.	EwasoDaua Sub Regional Office	Mandera sub Region
Rift Valley Catchment Area		
1.	RVCA Regional Office	Nakuru
2.	Naivasha-Nakuru Sub Regional Office	Naivasha
3.	Lakes Baringo-Bogoria Sub Regional Office	Kabarnet
4.	Upper Turkwel Catchment Area Sub Regional Office	Kapenguria
5.	South Rift Sub Regional Office	Narok
6.	Lower Turkwel Sub Regional Office	Lodwar
Lake Victoria North Catchment Area		
1.	LVNCA Regional Office	Kakamega
2.	Kipkaren – Upper Yala Sub Regional Office	Eldoret
3.	Elgon Cheranganyi Sub Regional Office	Kitale
4.	Lower Nzoia-Yala Sub Regional Office	Siaya
Lake Victoria South Catchment Area		
1.	LVSCA Regional Office	Kisumu

S/No	NAME	LOCATION
2.	Northern Shoreline Nyando Sub Region	Kisumu
3.	Mara Sondu Sub Region	Kericho
4.	Southern Shoreline – GuchaMigori Sub Region	Kisii

WRA current structure and Assets

Administration

In the operationalization of WRA, assets which included furniture, equipment, office space, land, vehicles were sourced from various development partners and some were inherited from Ministry of Water and Irrigation.

The development partners also supported WRA in acquiring certain assets through various projects under World Bank, SIDA and GIZ. These assets have over the years depreciated in value and some have become obsolete. To date WRA has constructed 4 regional offices and 14 Sub-Regional offices and as it transitions to WRA it is envisioned to construct headquarter office, 2 regional offices and 12 Sub-Regional offices. The WRA offices are occupying MWI land and are in the process of acquiring title deeds for the various parcels of land. Head quarter office is located in Nairobi and is on rental space.

WRA inherited a total of 767 Regular (River) Gauging Stations and more than 1000 climatic stations in various states of operation. During development of the first series of CMS, WRA undertook a rationalization of the surface water monitoring network to prioritize the stations to be rehabilitated, operated and maintained based on catchment classification and available resources. This resulted in 223 stations categorized as National, Management unit, Intra-management unit and special stations.

WRA has continuously improved its data monitoring network in order to avail more reliable data to planners, designers, users, investors and regulators. This is done through increased investments into water resources monitoring, infrastructural rehabilitation and upgrading of existing network.

WRA has started installing telemetric hydro-met monitoring stations for real time data collection to reduce the lapses in decision making due to lack of timely data sourcing and modelling. This will also assist in timely querying of inaccurate data. This is being achieved through installation of automatic equipment that is using GSM technology on transmission. Real time data is crucial for operating the early warning systems for water related disasters like floods and droughts. This is a function which WRA has fully embraced and piloted in three sub-catchments. This will be taken to the next level in the coming years.

The summary of the assets are as follows:

- Furniture and equipment at a value of Ksh 114,000,000
- Land and offices at a cost of Ksh 587,750,000
- WRA vehicles 65 at a cost of
- ICT equipment at a value of Ksh 19,915,000
- 223 Catchment Management Strategy 75% operational
- Weather monitoring network comprising of 270 rainfall, 65 Evaporation and 32 climatic stations.
- 32 Telemetric and 52 Automated Regular Stations
- 252 Surface Water Quality Monitoring Stations 76% operational
- 72 Ground Water Boreholes.
- LVNCA has an extra 22No miscellaneous stations whose purpose is to monitor sediment load for Kuywa River Sub-catchment.

A detailed schedule with description of all the assets held by WRA and some still under the MWI proposed to be transferred to WRA is attached to this report as Annex IV.