

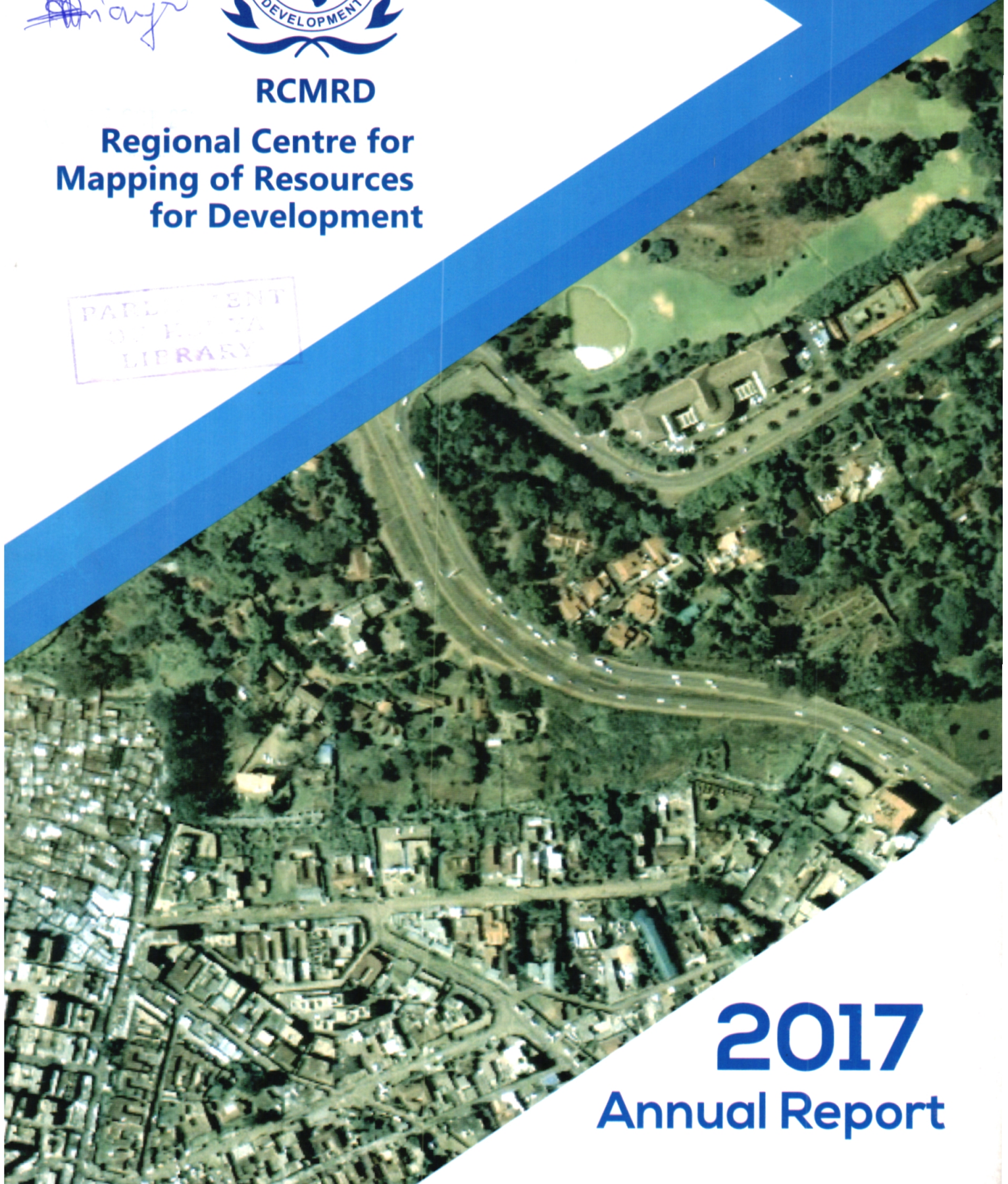
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**RCMRD**

**Regional Centre for  
Mapping of Resources  
for Development**

PARLIAMENT  
OF LESOTHO  
LIBRARY



**2017**  
**Annual Report**



## Our Vision

To be a premier Centre of excellence in the provision of geo-information for sustainable development in the member States and beyond.

## Member States



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# Letter of Transmittal from the Director General



**Dr. Emmanuel Nkurunziza**  
**Director General**

In accordance with Articles VI , Sub Article C of the Agreement establishing the Regional Centre for Mapping of Resources for Development (the "Centre"), on behalf of the management , I have the honour and privilege to submit to Members of the Governing Council and partners , the Annual Report for the Centre for the period from 1st January to 31st December 2017.

This Report describes the activities of the Centre during the year. This report shares the progress made in the implementation of a range of programmes.

It also presents a review of the performance of each of the Centre's Departments.

The listed achievements were made largely possible by the continued support by Member States and the cooperating partners. This not only underscores the unflagging commitment of member States to RCMRD's ideals, but also the confidence which our partners have in our institution.

We are more than persuaded that this spirit of commitment, confidence and cooperation will remain critical as we seek to strengthen the Centre's agenda and build a stronger foundation for promoting sustainable development in member States through generation, application and dissemination of geo-information and allied ICT technologies, products and services.

Honourable Members of the Governing Council, please accept the assurances of my highest consideration and esteem.

# Introduction

It is with great pleasure that I present the RCMRD 2017 Annual Report. The year 2017 marked the third year of the implementation of 2015-2018 Strategic Plan that was approved by our Conference of Ministers in November 2014. The Strategic Plan outlined the Centre's Vision which requires the Centre, together with its stakeholders and partners to stretch their future expectations, aspirations, and performance so as "To be a premier Centre of excellence in the provision of geo-information services to member States and beyond." The RCMRD Mission statement that expresses its fundamental purpose and business is "To promote sustainable development in member States through generation, application and dissemination of geo-information and allied ICT technologies, products and services."

I am pleased to report that, working closely with member States and our partners we have made significant progress towards fulfilling our mission. The 2017 work plan focused on building the capacity of member States institutions to generate information for planning and decision support to tackle environmental and resource issues to accelerate the social-economic development of our peoples. This annual report highlights the activities undertaken in 2017, broadly ..... under implementation of projects, customer tailored applications of geo-information training and IT courses, research as well as development, and infrastructure and staff development at RCMRD.

The Centre continued to engage member States and Partners by providing services and increasing its visibility and presence in the region. In this regard workshops, training programmes and visits were made in member States and five partnerships were established to help the Centre implement its Strategic Plan. We continued with the process of finalizing re-certification to the new ISO version 9001:2015. Quality Management System (QMS) will steer

RCMRD to achieve customer/member States satisfaction by continually improving its processes, products, and services.

In 2017, more than 1,000 nationals from member States and other African countries were trained in different geo-information training programmes. In project implementation, over twenty (20) projects were executed. The projects implemented demonstrate novel applications and the increasing role of geo-information in national development. The projects accomplished include degradation and forest monitoring, Mapping Mau and Aberdare Forests in Kenya, production of Hazards maps for Baringo, Kilifi and Kwale counties in Kenya, County Hazard Risk Assessment for Kakamega County in Kenya, Malawi Population and Housing Census mapping and establishment of a prototype of a regional forest observatory in East Africa

In the area of research, six activities were undertaken; application of Sentinel Data for Soil Moisture determination, understanding the driving Mechanisms of Land Use and Cover Change in the Sahel, Impacts and Responses, use of Sentinel data to revise and update topographic maps, monitoring Urban Sprawl for the Cities of Kigali and Hawassa in Rwanda and Ethiopia, development of the Rangeland Decision Support tool and extraction of Elevations from Topographic Maps for Nairobi County to examine the viability of generating height information directly from widely available topographic maps.

In 2017 we serviced over 400 pieces of survey and mapping instruments in six (6) member States: Malawi, Swaziland, Botswana, Uganda, Ethiopia and Kenya (Private Sector).

RCMRD values partnerships and using existing synergies between institutions to achieve its mission. In this regard we signed MoU's with different universities

and organizations : University of Nairobi, Kenyatta University, Taita Taveta University, Pwani University, Jaramogi Oginga Odinga University of Science Technology, Technical University of Mombasa, Karatina University, Jomo Kenyatta University of science and Technology, Maseno University and Dedan Kimathi University, Ardhi University, Dar es Salaam, Tanzania, University of Rwanda, INES Ruhengeri and Kigali Independent University of Rwanda, Rwanda Water and Forest Authority (RWFA), Conservation International, The Trans-African Hydro-Meteorological Observation (TAHMO) Netherlands, African Technology Policy Studies Network (ATPS) and Agriculture and Climate Risk Enterprise Limited Africa (ACRE Africa).

In line with our mission and vision; we hosted the 1st RCMRD International Conference from 27th to 29th September 2017 at our premises in Nairobi. The conference provided a platform for science and policy exchange, scientific paper and poster presentations in various services offered by the Geospatial domain. The conference theme for 2017 was

“Space Science Touches Lives”, with a focus on finding ways of translating space science into action and activities that benefit citizens. The Conference was a resounding success and thus, we plan to host it annually.

The 51st Governing Council of RCMRD was held in November 2017 in Nairobi, Kenya and it was attended by sixteen (16) Member States. The Governing Council reviewed and approved the Centre’s 2018 Work Plan and Budget. It also reviewed and approved important policy documents that are expected to improve corporate governance and institutional development of the Centre.

In conclusion, I wish to most sincerely thank RCMRD staff, our member States, development partners and clients for their support and cooperation that significantly contributed to our achievements in 2017. I also take this opportunity to appeal to them for their continued support as we tackle the challenges in the coming years and seek to achieve our aspirations to be a premier Centre of excellence in the provision of geoinformation services to Member states and beyond.

## TECHNICAL SERVICES DEPARTMENT (TSD)

During this reporting period, the Department successfully implemented various activities that were included and approved in the 2017 work plan. The Annual work Plan was derived from the 2015 - 2018 Strategic Plan. The Department provided a range of services to member States and other stakeholders during the reporting year. The services were grouped into the following categories: Project Implementation, Capacity Development, Advisory, Research and Development (R&D), Repair, Servicing and Maintenance of Mapping Equipment, and Data Dissemination.

### Project Implementation:

During the reporting year, the TSD successfully implemented over twenty (20) major projects. A summary of TSD’s

achievements under project development and implementation are presented below as summary in 12 referenced categories:

Mapping Mau and Aberdare Forests Undertaken on behalf of the European Commission/Joint Research Centre (EU/JRC), the objective of this project was to process multi-epoch remotely sensed data for the analysis of forest cover and trends of encroachments in the study area. Following additional request from the client, land use land cover mapping of the surrounding counties was also conducted. The primary source of data and information used in the exercise were Landsat images and ground truthing. The technical report, output maps as well as the database were successfully submitted to the client.

## OFESA Project:

This on-going EUC/JRC project involves establishment of a prototype of a regional forest observatory (database and website, report on the State of Forests and REDD+ activities) in East Africa, and includes the following countries: Kenya, Mozambique, Tanzania and Uganda. It is a joint venture between RCMRD and the Center for International Forestry Research (CIFOR) and Centre de cooperation international en recherche agronomique pour le développement (CIRAD). Several key tasks have already been successfully accomplished namely: Data Gathering from national stakeholders and Analysis, Conceptual Design of the System, Database Design and Development and Website Design (Content Management System and Map Viewer Tools).

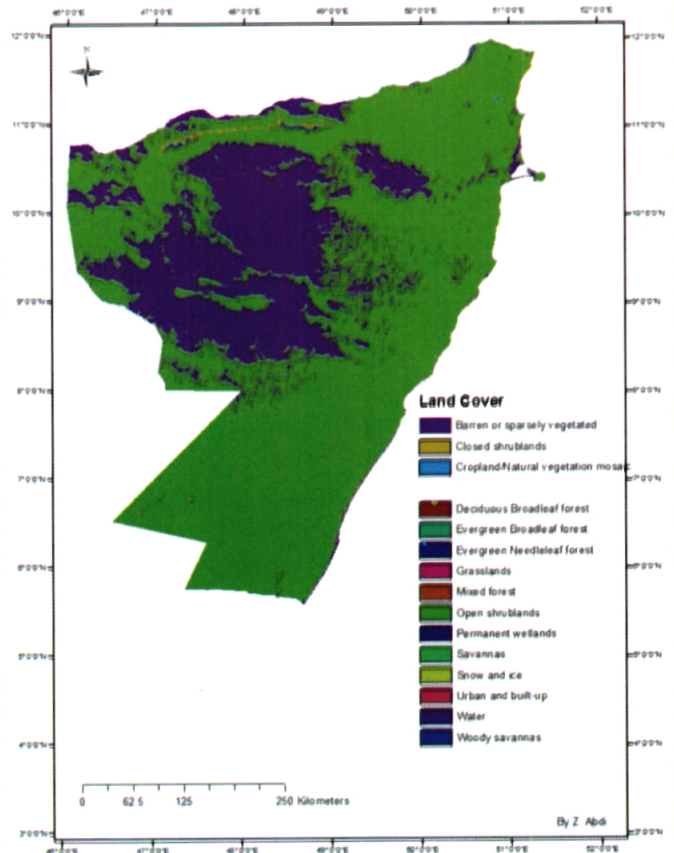


Staff from RCMRD participated in the Regional Forest Observatory in Eastern Africa (OFESA) Project Kick-off Workshop held at World Agroforestry Center (ICRAF), Nairobi, Kenya

Rangeland Mapping in Puntland Somalia: The objective of this project was to map rangeland in Puntland Somalia using multi-temporal data for the client - Care International. For that purpose Landsat images acquired in four epochs (1988, 2000, 2010 and 2017) were identified and interpreted accordingly. In addition, more than 20 local staff from the Ministry of Environment and Tourism were trained in Garowe, Puntland Somalia on interpretation of satellite images and ground truthing. Data collection was achieved through use of GPS and smartphones and applying crowdsourcing approach. From the ground truthing and multi-temporal data integration the rangeland coverage and status since 1988 was statistically analysed.



Map of Greater Puntland



Map displaying land cover in Puntland, showing evidence of gullies across the country

## SIGMA Project

SIGMA (Stimulating Innovation for Global Monitoring of Agriculture) is a project conceived as Europe's contribution to GEOGLAM and designed to enhance the current remote sensing based agricultural monitoring techniques. The aim was to develop innovative methods and indicators to monitor and assess progress towards "sustainable agriculture", keeping track of the longer term impacts of agricultural dynamics on the environment and vice versa. The main research activities include:

- Agriculture and crop land changes, globally, regionally and locally
- Changes in agricultural production levels and shifts in cultivation practices
- Environmental impacts of agriculture

The assignment given to RCMRD was on the participation of ground data collection in selected sample areas in Kenya covering the Counties of Uasin Gishu and Elgeyo Marakwet and supporting the capacity building components for the staff of Member States and beyond. The ground data were collected in 2015. The capacity building through training of 35 participants took place at RCMRD from 21-24 March, 2017. A final project workshop was held in Rome, Italy where all the stakeholders discussed on the output and outcome of the project. The Project was subsequently successfully closed.

employed. Furthermore, all the stakeholders were trained on hazard mapping, analysis and the integration of hazard and vulnerability products in planning and decision making. Recently, RCMRD was awarded a third phase of the project covering two more Counties namely: Laikipia and Marsabit with desktop activities already underway.



## Hazard Atlas Maps

The purpose of this project was to develop Hazard Atlases for several Counties in Kenya that are exposed to natural and manmade hazards. The project was contracted to RCMRD by the National Drought Management Authority (NDMA)/United Nations Development Programme (UNDP). The first phase of the project covered the 3 Counties of Turkana, Tana River and Garissa. Three additional Counties were included in the second phase namely: Baringo, Kilifi and Kwale. Both the first and second phases have been successfully accomplished. For the project implementation methodology a participatory hazard mapping approach was

## Kakamega County Hazard Risk Assessment Project

Detailed study report and maps illustrating the hazard hotspots in Kakamega County and various organizations dealing with hazards were prepared and submitted to the Humanitarian Leadership Academy (the Client). Like the other previous hazard mapping projects, participatory mapping approach was adopted including training of the government staff, NGOs and the community.

## Malawi Population and Housing Census Mapping – Technical Support and Imagery Provision

Under this project the following achievements were made during the reporting year:

- Provision of two sets of high resolution satellite imagery for the entire country at 50cm resolution.
- A well-furnished GIS laboratory was put in place where a total of 25 computers were setup, Database Server with complete functionalities including LAN Network setup, domain set up and internet access was installed. Large scale Map plotters and printers were set up and tested, approved and user guide delivered.
- Accomplished the tasks for developing standardised Dwelling Frame (DF) and thus capture DFs based on Districts covering the whole country.
- Further, the database for Enumeration Area (EA) was developed to pursue standardized segmentation/demarcation of EAs countrywide. A total of 28 districts EAs were accomplished and delivered on time.
- Total of over 25,700 EAs were delivered after being completed based on standard GIS database and Statistical guidelines. All administrative segments were consistently harmonized to comply with ground reality, especially physical features as based on 1998 and 2008 Traditional Land Management Areas (TLMA/TAs) to form updated and reliable administrative areas for the whole country.
- Software for automated Cartographic mapping was developed, installed and used for printing all the project products. Map Automation Tool installation and printing Manual was delivered as well.
- A comprehensive Census Mapping Strategy (CEMAS) report was developed and submitted to National Statistical Office (NSO).

## MESA

This project that is presently being implemented under a no cost extension achieved the following milestones:

- Production of Regional and National biannual Land Degradation (LD) Maps and Bulletins for the period 2014-2015 was accomplished.
- LDIM Model was tested using open source QGIS for LD assessment
- Manual for use of LDIM Model in QGIS environment was produced
- Installation of E-station was accomplished

## Continuously Operating Reference Station (CORS)

RCMRD continued to support the AFREF initiative through publication of two AFREF Newsletters, and maintenance of the Continuously Operating Reference Station (CORS) located at the Centre and two other sites. Training for Member States on establishment of CORS and GNSS data processing was also provided.

## Continuously Operating Reference Station (CORS) Project in Botswana

The Centre continued to support the implementation of Real Time Geodetic Network in Botswana by advising on the procurement of the necessary hardware and software and training on the use of the system. This year four CORS were installed. The system is currently active and working.

## GNSS Control Surveys

GNSS control survey service was provided to the Department of Resource Surveys and Remote Sensing Kenya, the Kenya Airports Authority, Kenya Water Institute and Egerton University. The Centre continued to operate and maintain CORS network at RCMRD (RCMN, DKUAT and EMBU) with both raw data and RTK corrections now available from our portal.

## SERVIR EASTERN AND SOUTHERN AFRICA (SERVIR&SA) PROJECT

SERVIR Project is a partnership between RCMRD, NASA and USAID whose objectives is to improve, environmental management and resilience to climate change by building capacity of institutions in the member States to integrate earth observation and geospatial technology in environment decision making. The projects that were successfully implemented under the SERVIR-ESA Project were continuation of the long term engagements stipulated under the SERVIR-ESA work pan. The Project were on the following thematic areas:

### Food Security and Agriculture

Under this thematic area seven major activities were carried out:

- Mapping of Croplands in Kenya
- GIS based Sampling Frame
- Regional Hydrological Extreme Assessment System (RHEAS)
- Rangeland Assessment and Monitoring and Surface Water Monitoring
- Intergovernmental Authority on Development region crop monitor and national crop monitors for countries in the IGAD region
- Frost Mapping and Forecasting
- Land Potential Knowledge Systems (Land PKS)

On Mapping of Croplands in Kenya a crop mask was developed for Famine Early Warning Systems Network (FEWSNET) to replace an out-dated one that had been in use for food security assessments. Technical training was conducted to build the capacity of key stakeholders in the agriculture sector with technical skills for developing croplands and computing change in overall cropland area and change in dominant crop (mostly maize) for an area. Participants were drawn from the State Department of Agriculture, (SDA), FEWSNET, Department of Resource Surveys and Remote Sensing (DRSRS), the World Food Program (WFP), Kenya Forest Service (KFS), Kenya Agricultural Livestock and Research Organization (KALRO) and

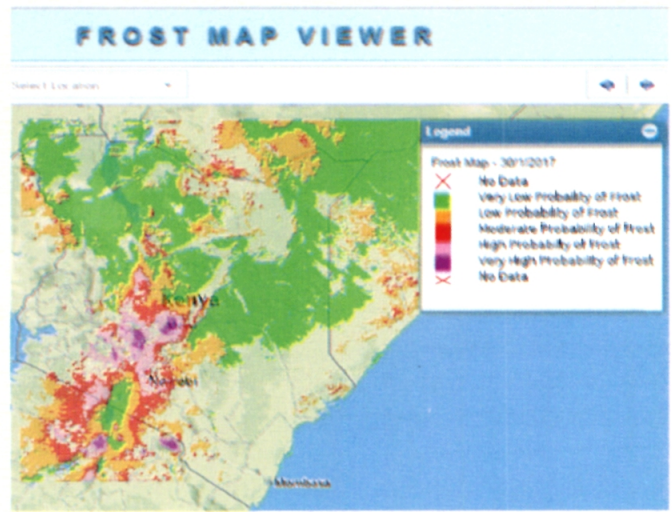
major universities. This service has grown and has developed linkages with Kenya Met Services, State department of Agriculture (SDA) and other agricultural stakeholders.

On GIS based Sampling Frame, the Government of Kenya in its implementation of a crop insurance program was previously using a tedious and expensive Unit Area Index (UAI) method. SERVIR-ESA assisted, upon a request from the State Department of Agriculture, in developing a GIS based sampling frame as a replacement. A methodology was agreed upon and the developed sampling frame was piloted in Nakuru County. The sampling frame was developed using the cropland maps, while Sentinel imagery was used for validation. State department of Agriculture (SDA) supported capacity building of its staff on the methodology which has since been expanded to other Counties in Kenya where crop insurance is being implemented. The new sampling methodology reduced the cost of the exercise for a county by 70% (from USD 10,000 to 3,000) and the time from one month to one week.

On Regional Hydrological Extreme Assessment System (RHEAS) the Jet Propulsion Lab (JPL) Team deployed the RHEAS system at RCMRD in phase 1 of SERVIR. Still in pilot phase and using data from maize growing areas of Kenya, SERVIR has been providing country specific information and getting support from NASA Science Coordination Office (SCO) in calibrating the system. Identification of regions where similar cultivars can be applied and delineation of regions for simulation was also accomplished. Once fully operational the system will give yield forecasts that can be used as further input into the crop monitor and scaled up to other member states in the region where the crop monitor is being implemented, mainly IGAD region.

On Rangeland Assessment and Monitoring and Surface Water Monitoring serving the Northern Rangelands Trust (NRT) and Laikipia Wildlife Forum (LWF) in Northern Kenya, this service is aimed at facilitating

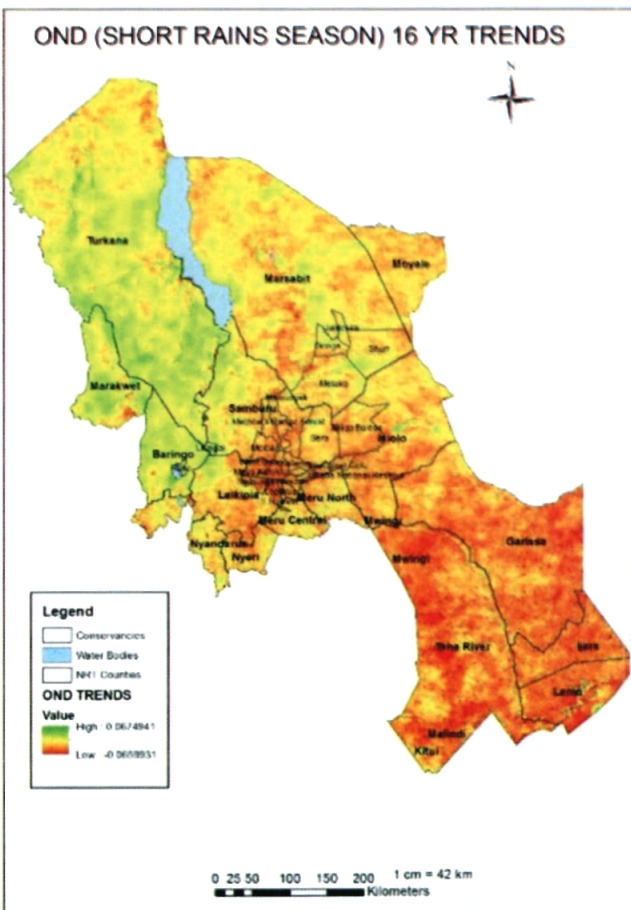
timely (10 day) assessment and monitoring of rangeland resources by developing a web based tool that will aggregate key indicators to rangeland productivity with ancillary data and allow for integration of user selected indicators to produce maps at different administrative and conservancy boundaries. The service will also develop surface water maps as an input to the web based tool using Google Earth Engine (GEE) methodologies. Definition of products for the rangelands, development of scripts to be used, workflows for scripting, web tool structure, methodologies, outputs and baselines was completed. Scripts to automate generation of the products (dekadal, monthly, seasonal) that include (10 day NDVI, monthly and seasonal NDVI, VCI and anomalies) from both a download link and from the RCMRD MODIS receiver to reduce lag times and gaps were developed. The products are now linked to other important information such as invasive species and surface water maps to aid in better interpretation of the rangeland conditions.



Estimated Frost Occurrence on 30th January 2017



Photos of Frost Occurrence in Aberdare Ranges in Kenya



Baseline Vegetation productivity map for NRT conservancies for the short rains

On the Intergovernmental Authority on Development region crop monitor and national crop monitors for countries in the IGAD region, in Kenya the crop monitor at national level was co-developed, stakeholder engagements were held with the State Department of Agriculture and University of Maryland and customizations commenced with identification of county specific priority crops. Parameters for operationalization of the system were also identified. During the regional crop monitor training, four SDA staff were trained on the use of the crop monitors for reporting and customizations. ICPAC will henceforth incorporate the regional crop monitor in a quarterly food security bulletin which will be presented at GHACOFs. The first bulletin was presented during GHACOF 47 in Zanzibar.

On Frost Mapping and Forecasting the objective of this service is to provide timely actionable information to those affected by frost. The pilot area was selected in Kericho, Kenya. A 60 hour forecast product was rolled out in this year's frost season (2016/2017). In addition, a 3-day stakeholder engagement and mapping workshop was conducted to identify and map key stakeholders, establish decision making contexts of the key institutions, ascertain data requirements, gaps and challenges in the service. The results of the workshop will help refine the service to enable better packaging of the outputs and also to enable appropriate involvement of key stakeholders to ensure users get correct and timely information on probable frost occurrences.

On Land Potential Knowledge Systems (Land PKS) following the development of the Land Potential Knowledge System (a web-based knowledge engine) by scientists from New Mexico University with data compilation and processing support by SERVIR-ESA, mobile apps, LandInfo and LandCover, were also developed to aid in data collection for the system. LandPKS is designed to provide tools for 1) collection, storage, access, and sharing of local and scientific data, information, and knowledge, and 2) selection and interpretation of management and policy-relevant information to support decision making. Together with the LandPKS

global team, SERVIR-ESA co-developed a comprehensive set of training materials for one day training which include user/training guides, assessment materials, and case studies for applications on LandPKS. The materials will be used in training targeted stakeholders who require the tools for their range monitoring, agricultural assessments, biodiversity assessments, training, research, soil assessments, etc.

## Water Resources and Hydro-Climatic Disasters

Under this thematic area five major activities were carried out:

- Ensemble Flash Framework for Flood Forecasting training
- Variable Infiltration Capacity (VIC) Model and Bias Correction of Precipitation Data Training
- Hydrological Streamflow Forecasting Training
- Stakeholder's consultations on development of Streamflow Monitoring Service
- Kenya Integrated Water, Sanitation, and Hygiene Project (KIWASH) proposal development on Runoff Projections

On Ensemble Flash Framework for Flood Forecasting a training on the application of the framework for flood forecasting was conducted at RCMRD (February 2017) in collaboration with NASA Applied Science Team (AST) from University of Oklahoma. Participants were drawn from various government institutions including Kenya Meteorological Department (KMD), Water Resources Management Authority (WRMA) among others. Following a request from KMD, a further training on the same was extended to 21 KMD and I MTR staff (August 2017) at KMD premises.

The training on Variable Infiltration Capacity (VIC) Model and Bias Correction of Precipitation Data was conducted by NASA Science Coordination Office (SCO) to 17 staff from both RCMRD and its stakeholders, at RCMRD premises (Mar 2017). The main aim of the training was to equip the participants with skills of using VIC hydrological model

and also application of the various bias correction methods to correct satellite precipitation.

Hydrological Streamflow Forecasting, a Multimodal Multiproduct Streamflow Forecasting (MMSF) framework for specific basins in Africa was implemented in collaboration with the University of Arizona. In order to transfer the skills and capacity to RCMRD, the team from the University of Arizona conducted training at RCMRD in March 2017 where both RCMRD and RCMRD stakeholders from Kenya attended. The training focused on equipping staff and stakeholders with the skills to use the framework and to allow smooth transition of the tools to RCMRD. This was also to allow smooth replication of the methodologies where applicable to other basins of interest. The Team of researchers also hosted two SERVIR staff at the University of Arizona in July 2017 for one for week hands-on training on the back-head of the MMSF. With the skills obtained, the staffs are now replicating the methodologies for the Great Ruaha Catchment in Tanzania.

Stakeholder's consultations on development of Streamflow Monitoring Service was held with the Ministry of Water and Irrigation in Tanzania in January 2017. The meeting had a total of 17 participants from the Ministry drawn from different departments and with different expertise from Civil Engineers, Hydrologists, Hydro-geologists and also GIS technicians. The discussions were geared towards refining the service on stream flow monitoring and defining roles for each institution to enable success in the implementation. The main outcome was the decision on the basin to be covered, the Great Ruaha Basin. The data requirements for the service were identified and those with the data were tasked with availing the same to SERVIR-ESA. Timelines for implementation and capacity assessment of the institutions involved in the service was agreed upon. Pursuant to the consultations held data for the Great Ruaha Catchment has been acquired from the Ministry of Water and Irrigation. The datasets captured include the catchment boundary, river

gauging stations locations, rainfall gauging station locations and time-series of the river flows and rainfall in CSV format. The data is being checked for quality and to ascertain which gauging stations will be used for setting up the model. Furthermore other hydro-climatic data required to run the specific models within the MMSF have been acquired and processing to the required format is ongoing. The geospatial datasets include temperature, wind speed, satellite rainfall (Chirps, CMORPH, Persian-CCS), and PET. A follow-up stakeholder engagement is planned to discuss decision making context in water resources management for the Great Ruaha catchment with a view to refining the streamflow outputs and stakeholder mapping to ensure appropriate flow of information during implementation and dissemination.

Proposal on Runoff Projections to support the Kenya Integrated Water, Sanitation, and Hygiene (KIWASH) for nine counties in Kenya was developed. The project implementation started in October 2017.

## Weather and Climate

Under this thematic area two major activities were carried out:

- Climate Vulnerability Mapping
- Climate Services Training

On Climate Vulnerability Mapping vulnerability maps for Rufiji and Wami-Ruvu basins in Tanzania were developed in collaborations with USAID/Tanzania Water Resources Integration Development Initiative (WARIDI). Three baseline vulnerability maps for each basin were completed for the agriculture, water resources and communities thematic areas. Additionally, 20 technical experts from 13 national agencies in Tanzania were trained on how to develop these maps, ensuring ownership of the process and building capacity for future work. In addition, baseline vulnerability maps for the Northern Rangelands with support from USAID KEA and Northern Rangeland Trust (NRT) were developed.



**SERVIR E&SA Supports Tanzania's WARIDI Project**

On Climate Services Training, in collaboration with SERVIR AST from the University of California, Santa Barbara (UCSB), RCMRD staff and external stakeholders were trained on how to use web-based climate services portals to access climate data useful in addressing various development decision making needs. 2 training workshops were held at RCMRD in February and September, 2017. During this engagement with UCSB, an Early Warning Explorer (EWX) was installed at RCMRD. Immediate outcomes of these efforts are: RCMRD staff will access climate data more easily for use in hazard mapping, vulnerability assessments, hydrological assessments/modelling and Member states (mainly hydro-met services/agencies) will complement their weather and climate data archives with the EWX datasets. A regional training targeted at hydro-met agencies

in Kenya, Rwanda, Tanzania, Ethiopia, Malawi and Zambia is planned for 2018 to demonstrate applied use of the EWX and the data. Future outcomes include enhanced work in index based crop insurance in the region which is part of the EWX training module and building long-term RCMRD capacity as a regional data provider. There are planned discussions with TAHMO and GLOBE to operationalize MOUs by ingesting weather/climate monitoring data into the EWX and blending with MODIS data at the centre, then serving users in the member states.

## Land Cover, Land Use Change and Ecosystems

Under this thematic area nine major activities were carried out:

- Rwanda 2015 Land Cover Mapping
- Capacity Building for Hub on AFOLU GHG Reporting
- Enabling Local Monitoring of Landscape Change across Eastern and Southern Africa Using Timesync tool
- Capacity building on Google Earth Engine (GEE)
- Supporting the Kenya Water Towers Climate Change Resilience Program (KWTP)
- Invasive Species Mobile App
- Malawi Wisci (Women in Science) Camp
- Silva Carbon Kick off Workshop
- SERVIR Global Land Cover and Agriculture and Food Security hub Exchange

The Rwanda 2015 Land Cover Mapping was implemented based on a request by the World Bank to have an updated land cover map of Rwanda for year 2015 based on previous activities implemented for the country in development of data for 1990, 2000 and 2010. The key activities covered in this project included: institutional capacity assessment of Rwanda Natural Resources Authority (RNRA), capacity building of stakeholders, product development and dissemination of products with the last two being completed in 2017.

Capacity Building on AFOLU GHG Reporting in order to build up on a previous project that involved developing national maps for 9 countries to support GHG reporting, utilizing the said maps for emissions estimation for the Agriculture Forestry and Land Use Sector (AFOLU) was realized. This was done by leveraging expertise from two (2) SERVIR AST researchers from Colorado State University who spent three months at RCMRD (Mar to May, 2017) to transfer this capacity to the hub. Part of this project was to build the capacity for one Member State, with Uganda being piloted. Through the Climate Change Directorate a series of workshops and training were conducted, to among other things, elucidate on calculations of AFOLU GHG

using ALU tool. By working with the country, data gaps that need to be filled in order to achieve the reporting obligations were also identified. A follow up to ensure data gaps are filled through a data collection exercise and inventory compilation for Uganda will be done in 2018. With the capacity acquired, other member countries can be assisted with the GHC accounting and reporting especially those who already have their land cover maps developed.

The activity on enabling Local Monitoring of Landscape Change across Eastern and Southern Africa Using Timesync tool is being implemented through collaborating researchers from The United States Forest Service (USFS), an agency of the U.S. Department of Agriculture, Google, Oregon State University and Silva carbon. The project seeks to leverage Landsat archive between 2000 and the current date and the Google Earth Engine to facilitate annual land cover monitoring for the ESA region: Kenya, Uganda, Tanzania, Rwanda, Uganda, Malawi and Zambia. The project will take three years. Focus for the first year was on collecting reference data for all 7 countries. This was done during the reporting year with both a regional meeting and national training conducted in Uganda.

Google Earth Engine (GEE) has been rich in its provision of huge data catalogue, supercomputing capability and in its ability to employ several algorithms for varied applications. This takes us from utilization of conventional GIS and RS software and helps save on software and infrastructure related costs. Two RCMRD members of staff

participated in a two (2) day training and another two (2) in a one week training on GEE. The skills gained were later transferred to the rest of the RCMRD staff through internal staff training. It is planned that this capacity will also be later further developed for Member States.

On the Kenya Water Towers Climate Change Resilience Program (KWTP), technical support (peer reviews) as well as provision of data on forest degradation and Land use/ Land cover change maps on key water towers (Mt. Elgon, Mau and Cherangani Hill) were services provided for KWTP. In addition, the land cover maps for Kenya, prepared under the SLEEK Project, comprising of 16 epochs and clipped to major water towers in Kenya - (1990, 1995, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014) were also provided for use in this task.

On invasive Species Mobile Application; the invasive species app was built to enable the collection of data related to presence of invasive species within the rangelands. A team of rangeland coordinators were trained on how to use this app in data collection. The In-situ data collected from the app helps in the creation and simulation of models to predict and analyze the spread of these invasive species within the regions that they affect. The data collected from some conservancies within the rangelands can be viewed on <http://mobiledata.rcmrd.org/invspec>. The Android App can be accessed through Google play store on <https://play.google.com/store/apps/details?id=com.servir.invasivespecies&hl=en>.



The Wisci (Women in Science) camp is an annual camp organized by the US State department to motivate young girls of high school age to STEM (Science, Engineering, Technology and Mathematics) careers. 2017 was NASA's first participation in Wisci. Several other partners were also invited to the two weeks Camp i.e. Google, Intel, World Learning, Girl Up, ASM (America Society for Microbiology) amongst others. Our training coverage include: role of satellite data in addressing societal problems such as: Floods, Landslides, Drought, Earthquakes and Monitoring systems as a Land Cover that informs a lot of policy decisions made by governments. We optimized the schedule excursion at Mt. Mulanje to explore the 'LULC Mapper' (mobile based app available on Google Play store) developed to collect ground truth data and Google Earth Imagery.



*The 2017 Women in Science "WiSci" STEAM Camp was held on the campus of the Malawi University of Science and Technology (MUST) July 30-August 14.*

Silva Carbon Kick off Workshop is a U.S. technical cooperation program to enhance capacity worldwide in monitoring and managing forest and terrestrial carbon. It draws on the expertise of eight U.S. technical agencies and other partners, to assist developing countries to design and implement comprehensive systems for tracking and reporting forest change and terrestrial greenhouse gas emissions. Although the potential of synthetic aperture radar (SAR) data is well recognized, the current level of experience in operational use of SAR data for LULC applications, forest mapping/monitoring and more specifically, biomass estimation is limited in SERVIR

regions. SERVIR hubs have advanced expertise on using optical remote sensing for land cover mapping, which is reflected in the multiple LULC projects executed over the years. Training SERVIR hubs and their partners on the use of SAR data and applications will further strengthen their remote sensing capabilities. Organized by the SERVIR Science Coordination Office (SCO) in collaboration with SilvaCarbon, the workshop's goal was to kick-start the development of forest mapping/monitoring and biomass estimation workflows using SAR datasets and blended SAR-optical methods, that will feed into a Methods and Guidance document (MGD). Ultimately, this MGD will become a major contribution of SERVIR to SilvaCarbon and the Global Forest Observations Initiative (GFOI) to support national REDD+ Monitoring, Reporting and Verification (MRV) systems. Through this collaboration, trainings on SAR-Assisted Forest Carbon Monitoring and use of SAR data for biomass estimation for mangroves forests have been scheduled in FY2018 to improve the skills of hub participants and key stakeholders. Hub staff will also be able to attend other capacity building activities organized by SilvaCarbon initiative within their regions.

On the China Global Land Cover Validation Workshop, through collaboration with the National Geomatics Centre for China, RCMRD participated in validation of Globe land 30 product for 2010 developed by NGCC for 10 countries (Malawi, Rwanda, Zambia, Ethiopia, Kenya, Namibia, Botswana, Tanzania, Uganda and Lesotho), it has been working on in previous activities. Through RCMRD participation NGCC has been able to refine the Global data further, while at the same time determine the level of accuracy achieved in representing the region.

## **SERVIR Global Land Cover and Agriculture and Food Security Hub Exchange**

The main purpose of the mission was for the SERVIR hubs to gain in-depth knowledge of activities implemented in each of the hubs under the themes of Land Use Land Cover and

Agriculture and Food Security. It included detailed exchange of methodologies for different projects implemented by the hubs as well as technical discussions coming out of the presentations and practical demonstrations and impending issues encountered prior to the exchange from which each hub could benefit. The mission determined action items and service planning aspect of products to be focused on.

## CROSS-CUTTING ACTIVITIES

Under this thematic area four major activities were carried out:

- User Engagement
- Partnership for Resilience and Economic Growth in Kenya (PREG)
- RCMRD Space Challenge 2017
- Grants program

On User Engagement, as part of SERVIR-ESA stakeholders mapping it was deemed necessary to undertake capacity assessments in the universities within the region. In addition, there are opportunities of leveraging on the synergies from the SERVIR Applied Science Team (AST) projects and RCMRD partners such as GLOBE, TAHMO, 4H-Kenya and GODAN. SERVIR-ESA visited thirteen universities, three (3) in Rwanda and ten (10) in Kenya. There are plans to visit more universities in the RCMRD member states. As a result of the outreach; four universities from Kenya received automatic weather stations (AWS) in July 2017 namely: Jaramogi Odinga Oginga University of Science and Technology (JOUST), Moi University, Dedan Kimathi University of Technology (DeKUT) and Pwani University. RCMRD partnered with CTA, GODAN, and CANIS on 4 - 5 October 2017 to offer an open data training for agriculture at the University of Nairobi.

SERVIR has been participating in the Partnership for Resilience and Economic Growth in Kenya (PREG) monthly meetings since June 2017. Consequently SERVIR-ESA is planning to conduct a needs assessment for the 17 PREG partners. Parallel to this, SERVIR-ESA has been exploring collaboration with The Kenya Resilient Arid Lands Partnership

for Integrated Development (Kenya RAPID) in the area of water resources such as ground water exploration.

The RCMRD Space Challenge 2017 was meant to equip students from high/secondary schools and primary schools within Kenya and beyond with the necessary skills and awareness in relation to environmental degradation, climate change and its drivers. This event is one of RCMRD's strategies for engaging the youth. This contributes to the achievement and development of the youth in Science, Technology, Engineering and Math (STEM) and is expected to have these young people grow up with interest in sciences and greater awareness of needs to promote sustainable development. The inception workshop was held at RCMRD in April 2017. Students were given two months to prepare for the Space Challenge and submitted a Space Challenge Report on 30th June 2017. The RCMRD Space Challenge 2017 Awards Ceremony was held on 7th July 2017 at RCMRD.



*Students who participated in the RCMRD Space Challenge 2017*



The SERVIR-ESA's phase II grants program opened its request for Applications (RFA) on 23rd June 2017. The solicitation process will comprise of two-stage process; Concept paper (stage one) and Full proposal (stage two). SERVIR-ESA plans to award grants to organizations in Ethiopia, Kenya, Rwanda, Tanzania, Uganda and Zambia to produce Earth observation and GIS applications within four (4) thematic/technical areas: Agriculture and Food Security, Land Use land Cover and Ecosystems, Water Resources and Hydro-climatic Disasters, and Weather and Climate. The Grants Program overall objective is to expand RCMRD/SERVIR-ESA's network of organizations in the region and to generate innovative ideas for applying Earth observation data and geospatial methods/tools for development decision-making in the Eastern and Southern Africa Region. The expected number of grants to be awarded is 8-10 awards with each individual grant award to range between USD\$25,000 – USD\$30,000. The implementation period of the grants awarded is expected to be no more than 9 months. The estimated start date for grants awarded in this phase is 1st April 2018.

## Geospatial Information Technology (GIT)

Under this thematic area nine major activities were carried out:

- Development of RCMRD Websites and RCMRD Open Data Site
- Setting up Discussion Forum
- Deployed Early Warning Explorer platform
- Member States Story Map
- Uploading Frost and Invasive Species Mobile Applications (apps) on Google Play Store
- Setting up the Survey Monkey
- Installation of Ensemble Framework for Flash Flood Forecasting software
- Setting up the Regional Hydrological Extremes Assessment System (RHEAS) software

The website for RCMRD was redesigned afresh to ensure its look and feel was appealing as well as making sure the content is structured in an informative and educative manner. The features availed in the new website were

meant to ensure the website is relevant to the RCMRD communication strategy. Some of the interesting things in the website are success stories, projects being implemented, training opportunities, members states focal points and access to all the sub-sites RCMRD has put up for publishing and sharing datasets. Its link is [www.rcmrd.org](http://www.rcmrd.org). Further, the RCMRD International Conference website was developed to create awareness and promote the conference which took place on the 27-29th September 2017 at RCMRD. The website can be accessed on this link <http://ric2017.rcmrd.org>.

The RCMRD Open Data Site serves as a community public platform upon which RCMRD extends and enhances access to the products and services generated by the various projects. All the shared data available has been made free to access, analyse, visualize and promoting its reuse. By opening up data, institutions can help drive the creation of innovative services that deliver social and commercial value. Thus, people will be more informed, at the same time contribute to better decision-making by allowing the site users to participate and engage with the data by downloading it, develop web maps, story maps, and access datasets via API etc. The open data site is accessible on this link <http://opendata.rcmrd.org>. Other portals that are useful and have been updated include: the Apps Portal (<http://apps.rcmrd.org>) for accessing all the applications in one dashboard, Geoportal (<http://geoportal.rcmrd.org>) useful for downloading data and maps and a Metadata Catalogue (<http://metacatalog.rcmrd.org:8080/geonetwork/srv/eng/home>)

The Discussion Forum was setup as a need to interact with users at a more technical level based on various activities that RCMRD engages and bridge information flow gap between University students, implementing agencies/institutions and RCMRD Scientist. Its link is <http://discussion.rcmrd.org>.

On the Early Warning Explorer, RCMRD with support of the Applied Science Team from University of California Santa Barbara, USA, deployed an Early Warning Explorer platform

that can be used to access and download Climate Data Sets e.g. Chirps rainfall data. Its link is <http://apps.rcmrd.org/ewx-viewer>.

Member States Story Map is a story map showing casing a unique feature in each of our Member State was designed and shared in our social media pages. Its link is <http://maps.rcmrd.org/arcgisportal/apps/MapTour/index.html?appid>

The Frost and Invasive Species Mobile applications were designed and uploaded in Google Play Store: Invasive Species Mapper (Collects data related to presence of invasive species within the rangelands) and Frost Mapper (Collects information about frost occurrence and locations of frost presence and absence). The link for accessing these apps is <https://play.google.com/store/search?q=RCMRD&hl=en>

On the Survey Monkey the tool has greatly enhanced how RCMRD captures, analyzes, reports and centralizes all customer feedback data, questionnaire or surveys that are collected during training, workshops, user engagement activities etc. The tool was used as a registration form to applicants who applied to participate in the RCMRD International Conference thereafter this information was presented as a map showing the geographical coverage of all the applicants and which thematic areas are they were interested in. Its link is <http://surveymonkey.com>

Ensemble Framework for Flash Flood Forecasting; the beta version of the EF5 software was installed on RCMRD cloud by the University of Oklahoma AST team in collaboration with the GIT team. CREST model outputs are pushed to cloud storage and are available for download and validation. Efforts to develop a user facing front end are on-going in addition to the CREST model calibration work.

The Regional Hydrological Extremes Assessment System (RHEAS) software was setup on the RCMRD cloud and scheduled to carry out weekly and monthly VIC hydrological model simulations. The GIT

team has assisted in testing and debugging the software components, and configuring regional parameters for VIC and DSSAT models including the cultivars for Kenya and Tanzania. The RHEAS framework outputs and crop yield forecasts can be accessible via this link <http://tethys.servirglobal.net/apps/rheas-viewer/>

## TRAINING AND CAPACITY BUILDING

The Department implemented various training and capacity building activities in 2017 designed to address the needs of diverse stakeholders. Most of these trainings implemented by the Department were part of project activities. Other trainings were implemented based on user demand from members States and different stakeholders. A total of 740 participants were trained in the reporting year. The main training events during the reporting year are listed below:

- Geospatial database development and management using ArcGIS, 2 weeks
- Training on Timesync Tool, 1 week
- Use Satellite Imagery for Geospatial Information Management Databases Development and Topographic Mapping, 4 weeks
- Application of the Ensemble Framework for Flash Flood Forecasting for Flood and Drought Monitoring, 1 week
- Enabling Local Monitoring of Landscape Change across Eastern and Southern Africa, 1 week
- VIC Modelling and Bias Correction of satellite Precipitation, 1 week
- Python Programming (Internal Staff), 1 week
- GHG Inventory Compilation Using Agriculture Land Use Tool, week
- Hydrological Stream Flow Forecasting, 1 week
- Climate Change Vulnerability Index Mapping for Wami-Ruvu, 1 week
- RTK and GNSS, 1 week
- Geospatial Data Management for Climate Change Vulnerability Mapping, 2 weeks
- Training On Use Invasive Species App To Collect Data, 1 week
- Hazard Atlas Mapping, 2 weeks

- Climate Change Vulnerability Index Mapping for Wami-Ruvu, 2 weeks
- Application of RS, GIS in Urban Planning and Management, 4 weeks
- Map updating using High Resolution imagery, 2 weeks
- Climate Change Vulnerability Mapping, 1 week
- Mapping Crop Land and Change Detection, 1 week
- Agriculture Forestry and Land Use (AFOLU) Sector GHG Reporting 1 week
- GIS and RS using QGIS, 1 week
- Relational Database Management Systems (RDBMS), SQL Server & Web Mapping, 2 weeks
- GIS, RS and GPS in Natural Resource Management, 4 weeks
- Sentinel Data Processing and Analysis, 1 week
- GIS and Remote Sensing in Hazard, Vulnerability & Risk Mapping, 2 weeks
- ICPAC Crop Monitor Regional Training, 1 week
- Application of the Ensemble Framework for Flash Flood Forecasting for Flood and Drought Monitoring, 1 week
- Remote Sensing and Digital Image Processing, 2 weeks
- Digital Cartography, 1 week
- Applied Climate Services Training Workshop, 1 week
- African Geodetic Reference Frame (AFREF) and GNSS Data Processing, 1 week
- Introduction to Lidar and Radar, 1 week
- Advanced GIS and Geo Statistics, 1 week
- Service and calibration of surveying and mapping equipment, 1 week



ICPAC Crop Monitor Regional Training workshop

## Advisory Services

The Department also provided advisory services to our member States as follow:

- Provided technical support to Surveys and Mapping Division, Tanzania on the implementation of Topographic Map Revision using freely available satellite images, Google Earth and other free web services including BingTM and ArcBrutile.
- Advise to Vital Signs and Conservation International on integration of land degradation issues into ecosystem conservation
- Specifications for GNSS Base/Rover systems, network Rover systems provided to member States
- Within the framework of the SIGMA project, RCMRD hosted a regional training workshop on "Application of Geoinformation for Agricultural Monitoring and Statistical Analysis" to disseminate research findings to stakeholders. Discussions held allowed demonstration and application of different tools employed in agricultural monitoring and statistical analysis. Crowd sourcing and open GIS approaches were also elaborated. The 35 participants from all Member States gained relevant knowledge useful for their everyday activities.
- MESA Land Degradation Peer Review was conducted and a report on usability and sustainability of the service produced, developed MESA products were presented at the 2nd MESA Forum in Dakar, Senegal in April 2017.



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- Two days project products results workshop was held in Lilongwe for NSO Malawi project involving over 70 stakeholders. All project products were displayed, commented upon and some of products were shared. Total of nine (9) supportive manuals and guidelines on how the NSO Malawi project was carried out were prepared and delivered as listed below

- o Administrative Boundary Harmonization Manual
- o Creating and updating Metadata files
- o Dwelling Frame Capture Manual
- o Enumeration Areas (EA) segmentation/ Demarcation Manual
- o GIS database design and development for census mapping
- o Guide to hand held GPS use and set up for data collection
- o Images, DFs and EAs metadata for the projects data
- o Complete scrip code for Map printing Automation Tool

## Research and Development

During the reporting year there were research activities undertaken in the framework of the projects being implemented. The main research areas were as follows:

### i) TIGER-2 Project

A research project on the “Application of Sentinel Data for Soil Moisture” was conducted in collaboration with EURAC and Locate IT. Two training workshops were carried out in Bolzano, Italy and in Nairobi. The study objective was to evaluate the application of Sentinel SAR and optical imagery for analyzing soil moisture in different agro-ecological and climatic zones in Kenya with project implemented in five counties in Kenya namely; Uasin Gishu, Elgeyo Marakwet, Kajiado, Machakos and Narok.

### ii) Driving Mechanisms of Land Use and Cover Change in the Sahel: Impacts and Responses (DIMECLUES) Project

The project aims to study the responses and impacts of land use and land cover (LULC) in the Sahel under climate and anthropic forcing using satellite data, reanalysis data and ground survey. It is led by the Institute of Remote Sensing and Digital Earth, Chinese Academic of Sciences (RADI-CAS), Tsinghua University and the Institute of Geographic Sciences and Natural Resources Research, Chinese Academic of Sciences (IGSNRR-CAS), and three African regional centres including RCMRD, AGRHYMET and OSS.

### iii) Map Revision and Updating Project

This on-going project studies the use of Sentinel data to revise and update topographic maps: Case of Nakuru, Kenya and Babati, Tanzania. Achievements made include: 1:50,000 scale map updating (spatial database design and capture), methodology development and Geo-database completed. Project report and manuals were submitted to Director; Surveys and Mapping Division, Tanzania. Cartographic design and production of manual for offset printing (photolitho) is still under development. Example on attribute field completion/ typonomy on place/area names is to be finalized jointly with Ministry team and Land office Babati in 2017 before cartographic compilation and mass production of the

updated base map.

#### iv) Monitoring Urban Sprawl

The objective of this on-going research is to examine urban sprawl for the Cities of Kigali and Hawassa in Rwanda and Ethiopia respectively. Already the Centre has acquired relevant remotely sensed data for the study area with image analysis nearing completion. This will be followed by ground truthing to be accomplished within the coming few months.

#### v) Development of the Rangeland Decision Support tool

The main objective of the Rangeland Assessment and Monitoring Service developed by SERVIR was to facilitate near real time assessment and monitoring of rangeland resources in Kenya. This would be achieved by developing a web based tool that aggregates key indicators to produce maps at different administrative and conservancy boundaries. The service also allowed development of surface water maps as an input to the web based tool using Google Earth Engine (GEE) methodologies

#### vi) Extraction of Elevations from Topographic Maps

The objective of this pilot study carried out in Nairobi County was to examine the viability of generating height information directly from widely available topographic maps. The exercise involved geo-referencing of the topo maps, digitization of the spot heights and further GIS analysis to derive the digital elevation model (DEM). The overlay analysis resulted in a perfect fit for the physical features such as the water features. Our conclusion was that indeed the spot heights can be used to recreate the land surfaces in areas where the DEM are not readily available. The study further recommended for a comprehensive ground validation by employing geodetic technics. This would involve the collection of sample elevation points from the study area and analysis undertaken to ascertain the variance that would end up quantify the errors if any.

## Data archiving, retrieval and dissemination

The Department undertook satellite data archiving, data retrieval and dissemination through sales and free data supply. The Department provided commercial image supply and data sale to various clients. Another service was provision of free data to institutions towards supporting their research programmes; the data was from Landsat, MODIS and MSG. Some of the data dissemination and supply services undertaken during the reporting year are summarized as follows:

- Disseminated over 9,091 satellite images to clients, research institutions, clients (both internal and external) and students. This figure is inclusive of 3,467 satellite images that were delivered for the Malawi Population and Housing Census Mapping (NSO) project.
- Supplied Sentinel 2 data to the project "Establishment of Regional Forest Observatory in the Region of East Africa (OFESA)".
- Dissemination of 30m Global Land Cover Dataset to over 100 RIC 2017 participants.



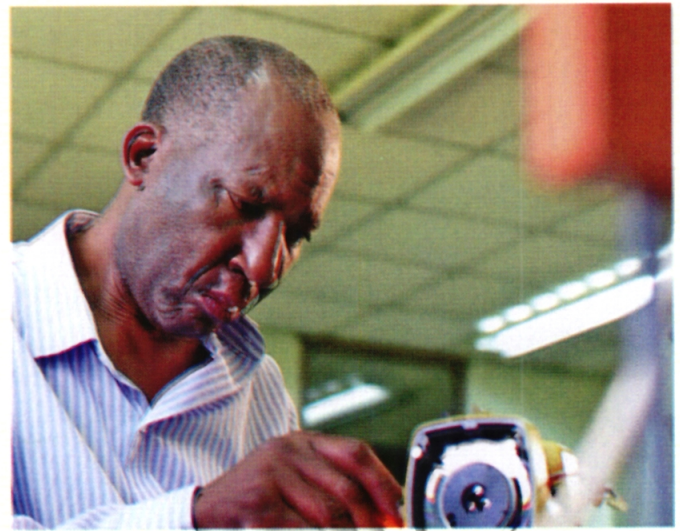
Satellite image of Malawi

## Engineering Section

The section continued to render services in repair, servicing and calibration of surveying instruments to government and private practitioners in the member States. During the reporting period the section rendered services to six (6) Member States with details outlined in the table below:

Country	Number of Instruments repaired
Malawi	27
Swaziland	17
Botswana	23
Uganda	31
Ethiopia	84
Kenya (Private Sector)	230

The Engineering Section also erected an indoor GPS receiver repeater radio that allows GPS tracking inside the workshop.



*RCMRD Engineer, Moses Ambuga, calibrating and servicing mapping and survey equipment*

## COMMON SERVICES DEPARTMENT

During the year under review, the Department undertook the following activities:

### Business Development and marketing unit and information services

For the reporting year 2017, the unit addressed activities based on Result Area 3 and 4 of the Centre Level Strategic Result Areas in Strategic Plan for 2015-2018. Result Area 3 addresses improvement of and dissemination of information while Result Area 4 seeks to establish and operationalize institutional partnerships and strategic alliances, advisory services and policy advocacy Institutional capacity, marketing and resource mobilization for geo-information generation, application. Primary stakeholders and audiences were identified for targeted engagement. While secondary audiences were identified as Research and Development Organizations; Non-mapping (traditional) related stakeholders who would benefit from RCMRD products; Private Sector; and General Public.

The strategy that was adopted for the year was based on key messages towards Raising

Awareness on RCMRD's regional activities and communicate these amongst relevant audiences; To Impart knowledge on areas of possible collaboration; and Build Business Synergy and capacities internal and external to RCMRD as well as enhancing Resource Mobilization role with emphasis of impacting positively on RCMRD bottom lines. For 2017 the section focused on:

- Sustaining, building and strengthening relationships with bilateral and multi-lateral stakeholders as well as Member States by entering 4 partnership agreements and MoU's and re-establishing contacts with partners
- Facilitated more than 25 outreach activities and developed materials/media that communicated RCMRD's role in National Development of Member States and Africa.
- Interventions towards Networking, Collaboration, Partnerships & Consultancies – To promote RCMRD were continuously carried out
- Development of case materials for exhibition at events where RCMRD member states were present
- Participation at 2 non geo-information related events on Agriculture and Planning

with Committee on Data for Science and Technology on Agriculture - Africa Working Group Meeting at KALRO (Agriculture) HQ in Nairobi as well as the African Ministerial Committee on Meteorology session in Addis Ababa where we made case for RCMRD to be accredited.

### Information services

- Purchase of Information materials - About 2500 information materials were acquired including books, journals/ magazines, newspapers etc.
- Processing of information materials - The library processed more than 3000 information materials in to the Library database
- Dissemination of information - more than 6000 information materials were disseminated to library users in the year 2017 in both print and non-print media.

### Marketing, Outreach and Promotion

The unit was instrumental in developing marketing and promotion in support of communication roles addressing (e-) marketing, and direct communication focusing on societal benefit areas in reporting year 2017. Key messages we focused on were Raising Awareness; to impart knowledge; Enable internal and external Advocacy; and Build Synergy internal and external to RCMRD addressed by the strategies below

- RCMRD Branding - Impacting on RCMRD as a brand and standardizing branding on all media
- Advocacy - to build on staff resources and abilities to respond to Member State needs
- RCMRD website was improved
- Social media platform was enhanced
- A minimum of two potential clientele visits were made in every month for the reporting year
- Customer feedback assessments were carried out for visitors to RCMRD

## Information Technology Support Services

The IT Support Services has in this year made great strides in applying innovation, automation of routine services and adoption of new technologies towards improvement of the ICT infrastructure. The Section is mandated to provide support services in the management of the Centre's ICT infrastructure, hence enabling the other departments and sections carry out their work effectively. The main services are: network administration, internet, e-mail data management and information security, maintenance and servicing of computers, printers and other peripherals as well as website management and updating. The section also proposes and provides avenues for new and upcoming trends in ICT for adoption to enable the Centre deliver geo-information products and services. During the reporting year the section implemented the following activities

- Implementation of the automated printing / scanning / photocopying solution (MYQ) that has greatly streamlined the process improving efficiency, accountability and ease of service delivery for staff within RCMRD. This initiative has been projected to deliver a cost reduction of over 15,000 USD per annum in the coming year moving forward.
- Data Policy Implementation - sensitization of RCMRD staff on Data Policy conducted alongside other members of the data policy implementation committee. Proposed additional storage to be used during the implementation of the data policy was procured and configured.
- Procured 40 TB Storage upgrade for our Servers in line with accommodating the data policy implementation project.
- To ensure that preventive maintenance contracts are obtained for the equipment needing external preventive maintenance the section signed preventive / Maintenance contracts for the following set of equipment; the MYQ print/scan/photocopy solution, 1 new Plotter in the Data Office procured this year, the Alcatel PABX system and the telephone extensions and the Air Conditional (ACs).



- Asset Management System roll-out: Configuration and setup complete with the discovery of all network attached devices captured. Optimization and inventory collection is on-going.
- 7 computers were procured and setup in the various training labs and one Computer for the Library and are fully operational.
- Preparation of ITTC, RS and GIS training labs for the trainings as well as overall support to other sections.
- We also reconfigured the RCMRD Firewall (Watchguard Firebox) policies to provide better performance for Internet Access. All updates and administration of the firewall have been handled internally by ITS which is a great cost cutting measure for RCMRD.
- The wireless internet (Wi-Fi) service range was also increased to cover a larger area of the RCMRD premises.
- Set up the power regulator / stabilizer in the Server Room to regulate and stabilize power supply for the Server Equipment. Set up center wide Wireless Network for internet service provision within the RCMRD premises.

## Monitoring and Evaluation (M&E)

The effective and efficient implementation of the strategic plan requires a continuous participatory monitoring and evaluation. M&E system form a critical part of the Centre's performance management in terms of tracking progress of strategic plan implementation to enable learning and improvement. During the year under review the following activities were implemented:

- The M&E Committee supported the evaluation of 2016 work plan and mid-year evaluation for the 2017 work plan. Evaluation reports with findings and recommendations were presented to the management for learning and improve strategic plan implementation.
- Institution capacity assessment tool was developed to collect baseline data on integrating Earth Observation Information in decision making. In addition, post training evaluation was improved by collecting data online as compared to paper questionnaire.

This has enhanced data collection, analysis and reporting for post training evaluation and other activities that require evaluation feedback.

- Capacity Assessment was conducted to collect baseline data for six Institutions in Tanzania and nine in Rwanda. This activity was to support SERVIR-ESA improve the capacity of these institutions to integrate geospatial technologies in decision making.
- Data was collected for key indicators in the M&E Plan to track project performance in four Intermediate Result areas. In addition, Theory of Change (ToC) was developed for each service to track and measure impact of SERVIR project.
- Customer feedback data was collected and analyzed for clients and institutions that visit the Centre. Data collection and analysis was conducted for post training evaluation and RCMRD International Conference. Support was also provided in development of ISO documents and project proposals.
- To strengthen M & E system in project management, M & E Specialist provided technical assistance on development of the proposals that were submitted to various clients.

## Information Technology Training Centre (ITTC)

During the year, ITTC implemented the corporate training programmes and the Diploma programmes as follows:

- The unit conducted two intakes for Diploma and Certificate courses in the year. In January 2017 fifty seven (57) students were admitted (35 Diploma and 22 Certificate). In May 2017 149 students were admitted; 70 in Diploma in Land Surveying, 32 Diploma in Cartography and GIS, 20 in Diploma in Photogrammetry and 27 in Certificate in Land Survey. In total there were 232 students pursuing Diploma and Certificate courses at RCMRD.
- The unit conducted Corporate tailor made and short term courses in area of Data Analysis, ICDL, GIS, Auto CAD, Web design, Digital Skills for Managers, IT Security and Cyber Crime, Graphic Design and Programming. A total of 103 participants have been trained in this category.

# ADMINISTRATION AND HUMAN RESOURCE

## Administration

The Administration and Human Resource Section continued facilitating implementation of planned activities by providing the following support services:

### Physical Infrastructure

The following activities were undertaken in order to improve the facilities and infrastructure of the Centre:

- Construction of drainage system in the ITTC and canteen block.
- Converting Gym to classrooms and increased washroom capacity for ITTC classes.
- Construction of tank slab and increased water reserve capacity by 10,000 litres through installation of water tank.
- Construction of 231 metres perimeter wall to secure RCMRD undeveloped land.
- Tiling of canteen.
- Repair of walkways in the front of block and between blocks A, B and D.
- General maintenance of buildings and grounds.

### Transport Services

The main transport services that were provided were as follows:

- Provision of transport to staff, guests, course/workshop participants and dignitaries.
- Maintenance and servicing of vehicles.
- Valuation of vehicles for insurance purposes.
- Procurement of one vehicle.
- Undertaking of 12 field trips.

### Protocol Services

The following activities were undertaken with regard to Protocol services:

- Clearing of shipments including motor vehicle.
- Acquisition of Airport passes.
- Processing of VAT and duty exemptions.
- Processing diplomatic documents including international staff's work permits.
- Processing of Visas for staff and course participants.

## Security Services

During the reporting period under Security services, the following activities were undertaken:

- Servicing of fire-fighting equipment twice during the year.
- Issuing security advisories.
- Providing security to staff and Centre's premises.
- Security preparedness for staff and the Centre during General Elections period.
- Servicing of electric fence.

### Human Resource Management

The following activities were undertaken in Human Resource:

### Organization Review

Following the introduction of the Scheme of Service due to the Organizational Review, three Professional Staff were promoted by Appointments, Promotions and Remuneration Committee while eight General Service staff were promoted by Appointments and Promotions Committee. A Procurement Assistant was correctly placed in her grade after attaining the minimum Bachelor of Commerce degree for the grade. A Survey Assistant will be placed in the right grade before the end of the year once he graduates with a Bachelor of Geography & Environmental Studies. Two members of staff have enrolled for courses that will lead to acquiring the minimum qualifications for their cadres.

### Recruitment

The recruitment of Senior Remote Sensing Technician was conducted in July, 2017 and an internal candidate who was serving as Data Standardisation, Archiving and Dissemination Technician was successful and appointed to the position in August 2017. The position of Data Standardisation, Archiving and Dissemination Technician he vacated was filled in October, 2017. In

In addition to this, the recruitment process for a Land Information Assistant in the Land Information Section of the Directorate of Technical Services commenced with an applications received by the end of December, 2017.

There was recruitment of 12 short term staff to undertake a USDA project on Reference Data. Contracts for Four one (41) part-time Lecturers for programmes under the Information Technology Training Centre were processed during the year.

## Resignations

One staff member a Technical Expert from SERVIR Eastern & Southern Africa Project departed from the Centre in September, 2017 to pursue other interests after serving for two years ten months.

## Performance Management

The Centre continued implementing the Performance Management System for the Centre's staff. Eight six (86) work plans were completed and submitted, whereas Eighty five (85) staff members completed their Mid-Year Performance evaluation which was undertaken at the end of June, 2017. End of the year performance appraisals were carried out between November and December, 2017 for the same officers.

## Staff Training

A Project Management Training programme was conducted in July, 2017 and was attended by thirty (30) members of staff from the Technical Services Directorate and other sections, including the SERVIR Project that are involved in Project Management. The objective of the training was to impart skills in identifying, negotiating, budgeting for and executing project activities to ensure that projects are effectively and efficiently implemented.



*RCMRD staff participating in the Project Management Training*

Several Technical staff attended various training programmes. One IT Technician and 1 SERVIR GIT Technician attended Google training; 1 Instrument Technician attended training at LEICA, Switzerland on Instrument Calibration; A SERVIR Technician participated in training in USA; 1 IT Technician attending Microsoft Server Administration Course; 1 Remote Sensing Technician and a 4 SERVIR staff attended Land Use Land Cover & Agriculture Mapping training workshop in Thailand.

A number of staff continued to pursue self-sponsored training in local colleges and universities on part time basis to acquire more knowledge and improve their professional skills. The Librarian's training for an MSc in Information Science was ongoing. An IT Lecturer was undertaking an MSc in IT training. Five Remote Sensing staff were undertaking MSc in GIS sponsored by the SERVIR project.

## Policy Development

Two policies were developed with the finalization targeted for the end of the year. These are the Recruitment and Deployment Policy and Staff Development Policy. A policy on Proportional representation for member States in the recruitment of Professional staff was developed and approved by the Governing Council in November, 2017.

Management Information Systems

A number of systems had been proposed to be developed during the financial year

2017. With input from the Information Technology Administration Section a Vehicle Management System was developed and was awaiting user training, data population and implementation. Specifications for a HRMIS system were developed and proposals received for the same and the close of the year their procurement process was at an advanced stage. In addition preparations for the development of a Physical Infrastructure Management System were also being finalised. In conjunction with IT Administration Section the Division was exploring the possibility of introducing new generation digital Diplomatic passports for the Centre.

## Finance Section

### Investment

The Finance Section continued to take advantage of the favourable interest rates in the market and continued in investing the surplus cash in secure fixed deposits. The interest revenue generated in the period January – November 2017 amounted to USD.148, 612. The RCMRD master plan was done during the year which has provided alternative investment options through lease of office space and conferencing facilities. The proposal includes construction of RCMRD complex in the phase one using the Centre's resources. This will in turn free up currently occupied space which shall be used as a training Centre and facilitate in generation of more income.

### Procedures & Documentation

In a bid to improve the procurement process, the Finance Section advertised for tender of prequalifying suppliers to be engaged by RCMRD in the 2017-2018 financial years in order to establish a long term relationship thus improving efficiency.

### Asset Management

The section continuously maintained the assets of the Centre in a fixed assets register. Assets that were fully depreciated and those that were not in a usable state were

disposed off during the year with the help of the Internal Tender Committee. Asset verification was done during the year where old assets that had not been previously tagged were tagged. New acquisitions were also tagged. The fixed assets register was updated with information collected during the assets verification exercise.

### Maintenance of the books of accounts

The Section continued to maintain proper books of accounts. The liability owed to the members of staff of USD 170,270 as a result of accumulated leave days was written off. This liability was reduced by USD 97,280 after adjustments were done as provided for in the staff rules and regulations. Members of staff have been urged to follow the staff rules and regulations and avoid such non-compliance.

### Issuance of Invoices and Statements to the member States

The Finance Section ensured timely issuance of invoices and statements to the Member States. These were issued every quarter. This was a means of reminding the member States of the need to honour their membership contributions in order to enable the Centre offer services to them.

### External audit of the Financial Statements

The Finance Section has provided to the external Auditors all the records, information and explanations necessary in the preparation and auditing of the Financial Statements for the year ended 31st December 2016. The management comments for year 2015 were also provided by the accounts section. The External Auditor confirmed that the financial statements gave a true and fair view of the financial position of the Centre as at 31st December 2016.

The External Auditor recommended that the Member States contributions should be reviewed so as to help boost the revenues

generated by the Centre. The external Auditor further reported that the fixed assets had been well managed and tagged. He further recommended that the fixed assets register, should be fully updated so as to ensure that assets were easily located and the process of verification was easy and smooth.

The external Auditor reported that the valuation of assets, which was last done in the year 2012, needed to be done to avoid non-compliance. It was reported that this exercise would be done in the month of November to avoid non-compliance.

The Centre had high value assets in form of lands that were not fully utilized. It was recommended that it was important to urgently develop the assets which would then offer a solution in generation of more revenue for the Centre

On the provident fund, it was reported that over the years the fund was being managed by an off-shore company which in the year 2017 had terminated its services and remitted the funds accumulated by staff as their savings to the Centre. The management of the Centre appointed a Committee that was tasked to look into possibilities of transferring the funds to a reputable fund management company that would manage the funds for the employees. The Committee's work was still on-going

## MANAGEMENT

The 2017 Work Plan rolled out measures to position the Centre strategically to play a central role in the promotion of sustainable development in member States through the use of geo-information. The Work Plan dealt with the provision of capacity building and project services required by member States and clients as well as provision of advisory services and forming networks of partners dealing with geo-information research for sustainable development. RCMRD management facilitated all the departments to perform their activities.

## Strategic Partnerships

Over the years, the Centre has continued to establish beneficial partnerships and collaboration with relevant institutions within and outside the region in research, development and application of geo-information for sustainable development. In this regard the Management engaged with Member States institutions and development partners in pursuit of areas of collaboration. In 2017 the Centre entered into partnerships with several organizations to undertake various activities. Some of these were:

- MoUs with universities in Kenya: University of Nairobi, Kenyatta University, Taita Taveta University, Pwani University, Jaramogi Oginga Odinga University of Science Technology, Technical University of Mombasa, Karatina University, Jomo Kenyatta University of science and Technology, Maseno University and Dedan Kimathi University,
- MoU with Ardhi University, Dar es Salaam, Tanzania
- MOUs with Universities in Rwanda: University of Rwanda, INES Ruhengeri and Kigali Independent University of Rwanda,
- MoU with Rwanda Water and Forest Authority (RWFA)
- MoU with Conservation International
- MoU with The Trans-African Hydro-Meteorological Observation (TAHMO) Netherlands
- MoU with African Technology Policy Studies Network (ATPS)
- MoU Agriculture and Climate Risk Enterprise Limited Africa (ACRE Africa)
- Working on accreditation to the Green Climate Fund (GCF)

Some tangible activities are already being realized from these partnerships for example work with ATPS and Rwanda Water and Forest Authority (RWFA) on water for growth.

## Visits to member States by the RCMRD Management

The RCMRD Director General led senior staff to visit several member States. The purpose of the visits was to familiarize management with the activities of government institutions and expose the institutions to RCMRD services as well as identifying areas of mutual benefit to the member States and RCMRD.

### Ethiopia

The Director General met with the Director General, Ethiopia Mapping Agency (EMA), Sultan Mohammed Alya in Addis Ababa, Ethiopia in June 2017. During the meeting they discussed areas possible areas of cooperation and provision of service to Ethiopia Mapping Agency and other Government Ministries by RCMRD. The visit brought closer working relations and cooperation between The Federal Republic of Ethiopia and RCMRD. During his visit he also paid a courtesy call to Ag. Executive Secretary UNECA, Dr. Hamdok, Deputy Chairperson of the African Union H.E Kwesi Quartey and Dr. Marc Nolting, Head of Programme Strengthening Capacities for Land Governance in Africa, GIZ.

### Uganda

The Director General and the Management team travelled to Republic of Uganda in September 2017, for a meeting with officials from Ministry of Lands Housing and Urban Development. The purpose of the visit is to familiarize RCMRD management with the activities of the Ministry of Lands and Housing, expose Ministry of Lands and Housing to RCMRD services, discuss possible areas of cooperation and provision of service to the Ministry of Lands and Housing by RCMRD and support in the establishment of the National Spatial Data Infrastructure (NSDI) and Modern Geodetic Network. He met with the Minister of lands, housing and Urban Development Hon. Betty Amongi, Executive Director of NEMA as well as Executive Director of National Planning Authority among others.

### Kenya

The Director General made a courtesy call to Dr Ibrahim Mohamed, Principal Secretary, Ministry of Mining, and Republic of Kenya as part of his familiarization with our partners and to further enhance our collaboration. The purpose of his visit was also to discuss areas of common interest and benefit to both organizations. Present during the meeting was the Director, Department of Remote Sensing and Resource Surveys, Dr. Patrick Warugute.

The Director General also met the Principal Secretary, Ministry of Land and Physical Development, Republic of Kenya, Dr. Nicholas Muraguri, in Nairobi Kenya in September 2016. The meeting discussed areas of cooperation with the RCMRD on application of earth observation in areas beyond the Land Ministry, including the Ministry of Health that he is most familiar with.

### Malawi and Zambia

The Director General visited Malawi and Zambia following request by the World Bank Group to provide technical advice on the on-going National Land Titling Programme (NLTP) for Zambia and implementation of recently enacted land Bills in Malawi. In Malawi, he met with the Surveyor General and the Principal Secretary, Ministry of Lands, Housing and Urban Development, Mr. Msosa and his Deputy.

In Zambia, he met the Minister for Finance and minister of Lands, Natural Resources and Environmental Protection, the Ag. Permanent Secretary, Ministry of Lands, Natural Resources and Environmental Protection and the Surveyor General

### Rwanda

The Director General visited Rwanda for a meeting with Chairpersons of RCMRD Conference of Ministers, Governing Council and Technical Committee.



*Ms. Fatina Mukarubibi, the Permanent Secretary of the Ministry of Environment paid a courtesy call on RCMRD*

### **Visit by Hon. Dr. Chris Baryomunsi, State Minister for Housing and Hon. Isaac Musumba, State Minister for Urban Planning, Republic of Uganda**

Hon. Dr. Chris Baryomunsi, State Minister for Housing and Hon. Isaac Musumba, State Ministers of Urban Planning, Republic of Uganda visited RCMRD in May 2017 and witnessed the different activities taking place. They assured RCMRD staff of continued support by the Council of Ministers to enable the Centre continues to register progress in executing its mandate.

Their visit was preceded by a visit from Mrs. Dorcas W. Okalany, the Permanent Secretary, Ministry of Lands Housing and Urban Development, Republic of Uganda and a member of the RCMRD Governing Council.



*Visit by Hon. Dr. Chris Baryomunsi, State Minister for Housing and Hon. Isaac Musumba, State Minister for Urban Planning, Republic of Uganda*

### **Visit by Principal Secretary, Local Government and Chieftainship, Kingdom of Lesotho, May 2017**

Mrs. Nthomeng Mapitso Panyane, The Principal Secretary, Ministry of Local Government and Chieftainship, Kingdom of Lesotho, also visited RCMRD. She led a delegation from the Kingdom of Lesotho on a familiarization visit to RCMRD but also sought to pay a courtesy call on Dr. Nkurunziza who assumed the mantle of Director General in February this year.



*Representatives from the Kingdom of Lesotho Call on RCMRD*

### **ISO Quality Management System Certification**

The Centre was awarded the ISO 9001:2008 Quality Management System (QMS) certification in July 2014. The Quality Management System ISO 9001:2008 expired in April 2017 and RCMRD is in the process of finalizing re-certification to the new ISO version 9001:2015. This version gives additional emphasis on identification of potential opportunities, profitability and risks. The process is almost complete with first external audit already done by Kenya Bureau of Standards (KEBS). Implementation of this standard is a crucial activity as it ensures all RCMRD staff follows set and approved procedures as they deliver their mandate. It also ensures proper management and efficiency in use of RCMRD resources as well as effective management of documented information.

QMS will steer the RCMRD in achieving member States and customer satisfaction by continually improving its processes, products

and services to ensure they meet customers' requirement.

## Implementation of the Communication and Resource Mobilization Strategies

The Management continued implementing the Centre's communication strategy for effective out-reach to its stakeholders in order to enhance its corporate visibility and image. This has strengthened its relations with member States, existing clients and partners, as well as new ones. We have published 2 e-Newsletters and distributed them widely.

In order to better implement the resource mobilization strategy, we improved the strategy and supportive mechanisms were put in place.

## Strengthening of institutional internal audit, planning, monitoring and evaluation and quality assurance systems

Management also embarked on establishment and operationalization of effective and efficient institutional internal audit, planning, monitoring and evaluation and quality assurance systems through strengthening of the internal financial and assets audit processes and procedures. In this regard a Monitoring and Evaluation Committee is functional and the M & E tool that was developed is being used. Internal Audits were carried out in four sections at the Centre.

## 51st Governing Council Meeting

The 51st Governing Council (GC) Meeting was held at the Regional Centre for Mapping of Resources for Development, Nairobi, Kenya from 16th - 17th November 2017. The Governing Council meets annually to review and approve RCMRD's Annual Work Plan and budget and is composed of Permanent/Principal secretaries from member States responsible for the activities of RCMRD. The 51st Governing Council discussed the 2017

Annual Work Plan and Budget and approved the same for implementation.

Sixteen member States attended the meeting. The member States were: Botswana, Burundi, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Namibia, Rwanda, South Sudan, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. UNECA sent apologies.



*Member States Representatives during the 51st Governing Council Meeting at RCMRD*



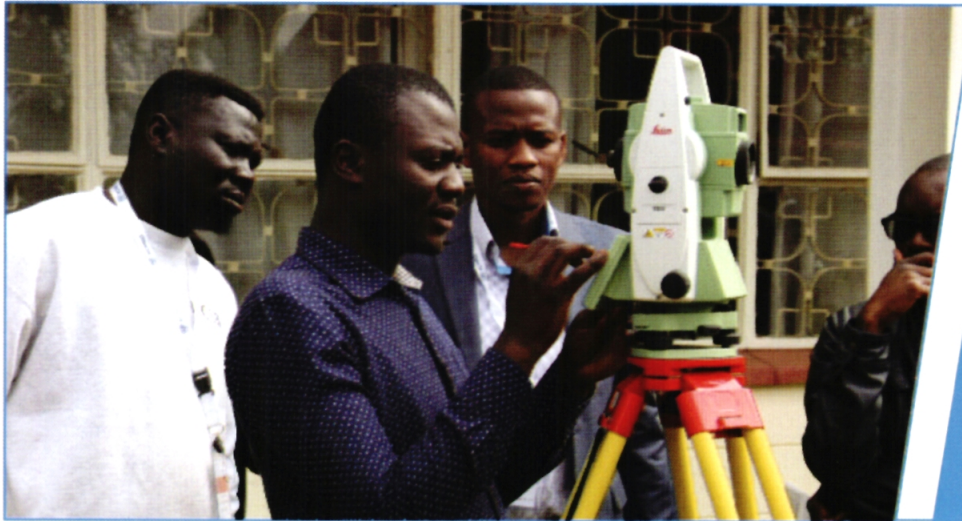
*RCMRD's DG, Governing Council Chairman and the PS Lands at the 51st Governing Council opening ceremony*

## DISTINGUISHED VISITORS TO THE CENTRE

During the year under review, the Centre received over ten distinguished visitors. These included:

Mr. Gregory Simpkins	United States House Sub-committee on Africa, Global Health and Human Rights and International Organizations Staff Director,	April 2017
Hon. Dr. C. Baryomunsi	State Minister of Housing, Republic of Uganda,	May 2017
Hon. Isaac Musumba	State Ministers of Urban Planning, Republic of Uganda,	May 2017
Nthomeng Panyane	Ministry of Local Government & Chieftainship Kingdom of Lesotho,	May 2017
Mating Mahooana	Ministry of Local Government and Chieftainship, Kingdom of Lesotho,	May 2017
Li Zhigany	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Wang Xinogu	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Ma Libo	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Xie Weiting	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Jian Jie	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Fan Yi	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Zhang Jumburi	National Administration of Surveying, mapping and Geoinformation, China	May 2017
Olori Ata	EGNOS Africa Joint Programme Office,	August 2017
Eric Ntagengeana	EAC Secretariat,	August 2017
Pelonomi Bomatlotse	Department of Mine, Botswana	August 2017
Stanley Bornwell	Department of Mine, Botswana	August 2017
HE Mrs. Agrina Mussa	Malawi High Commissioner	September 2017
Mrs. Glory Mbabazi	2nd Counsellor, High Commissioner of Rwanda	September 2017

# PICTORIAL



AFREF and GNSS data processing training was held at RCMRD last year



Staff of RCMRD visited Thomas Barnardo House (Kenya Children's Home (KCH)) in commemoration of the International Day of Charity



RCMRD was at the inaugural AMCOMET Africa Hydromet Forum at the African Union Commission Headquarters in Addis Ababa

# PICTORIAL



RCMRD has been involved in activities with National Statistics Organisations (NSO) in member States. Abdoulaye Adam and Naman Keita Consultants at AfDB visited RCMRD to explore further collaboration with RCMRD for development of a master sampling frame for Kenya National Bureau of Statistics



Moi Forces Academy Nairobi participated in the 2017 RCMRD Space Challenge.



SERVIR Vulnerability Impacts and Assessments (VIA) team at RCMRD trained technical experts in Tanzania on technologies being applied in East Africa to assess climate change vulnerability for key development sectors



**RCMRD**

The Director General,  
Regional Centre for Mapping of Resources for Development  
Kasarani Road, Off Thika Road  
P.O. Box 632-00618,  
Ruaraka, Nairobi, Kenya  
Tel: +254 20 2680722/2680748  
Fax: +254 20 2680747  
Email: [rcmrd@rcmrd.org](mailto:rcmrd@rcmrd.org)  
Website: <http://www.rcmrd.org>