LASER PULSE East Africa Water Security Stakeholder Meeting

Introduction to the Project

Margaret W. Gitau, Ph.D.

Purdue University

May 6th 2021

Data-Driven Decision Support for Improved Water Security in East Africa

RESEARCH TEAM

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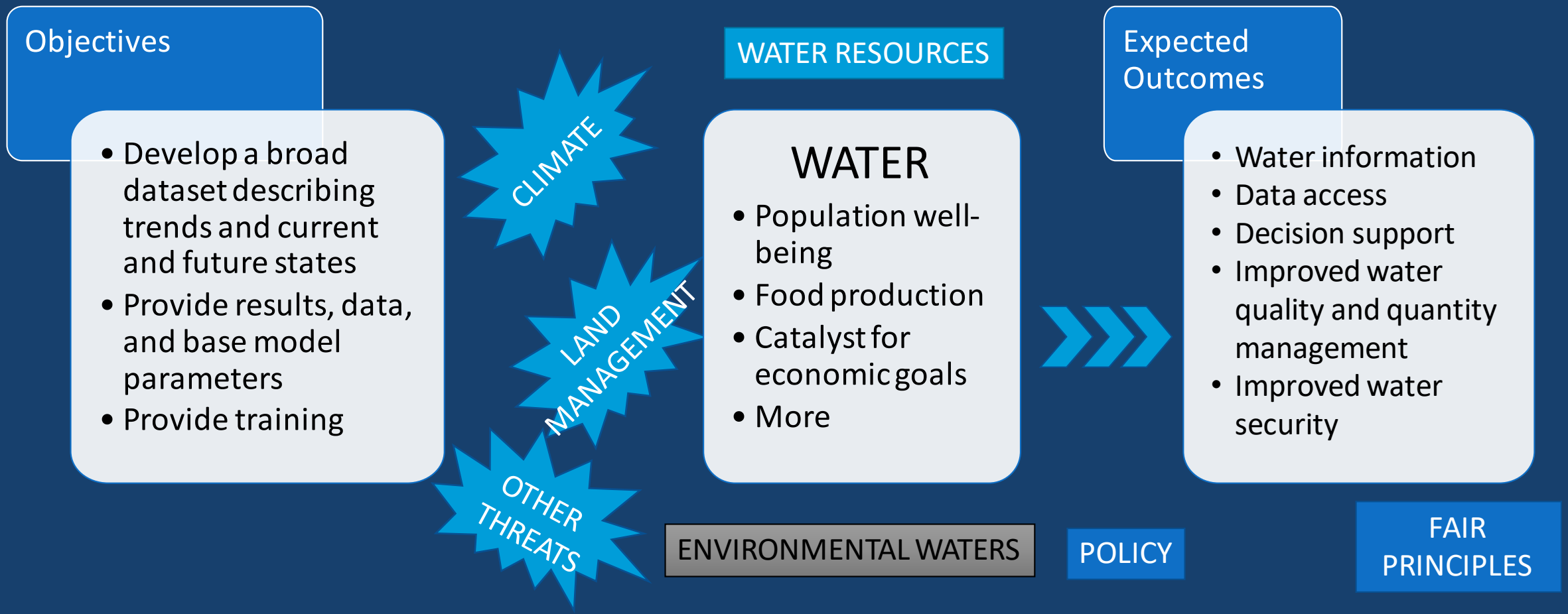
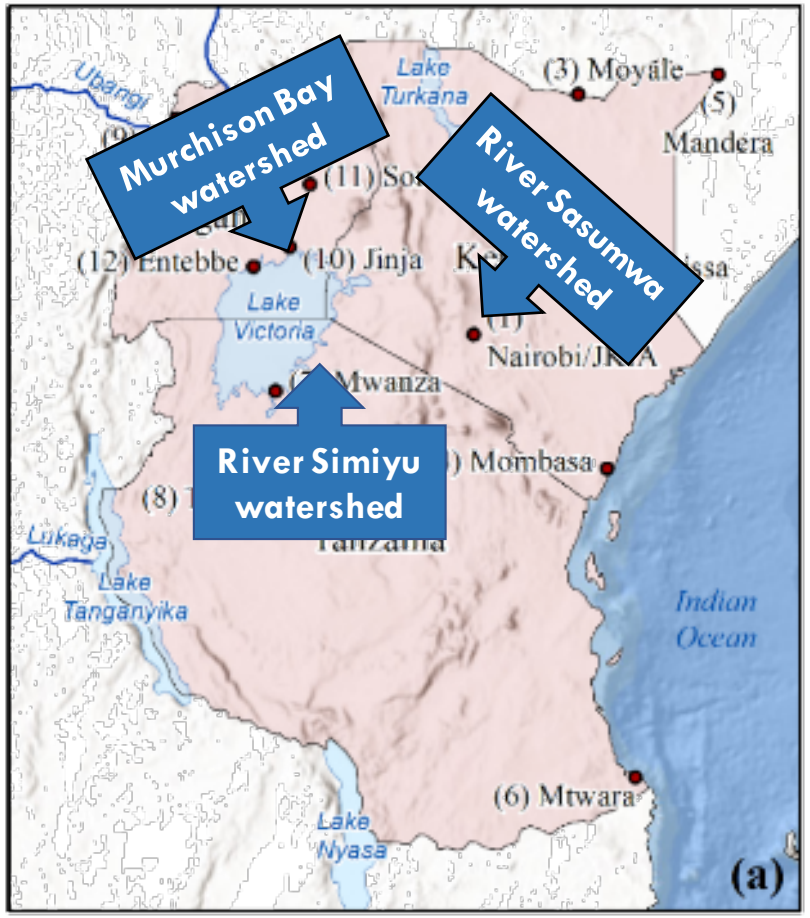
Project Goals



LASER PULSE

Delivering practical, research-driven solutions to global development challenges

Data-Driven Decision Support for Improved Water Security in East Africa



Question: What are the current, and potential future states of water resources in the study areas?

- Analysis of existing climate data
- Modelling using SWAT

Research methods

Research Translation Products

- Accessible datasets
- Actionable water information
- Quick reference report
- Training manuals

- Partner websites
- Social & Professional media
- Stakeholder meetings
- Training workshops

Products Dissemination

Data use in decision making leads to Improved Water Security

aidenvironment | Global Water Partnership Southern Africa / Tanzania Water Partnership | Resource Plan Ltd

Research Translation Partners

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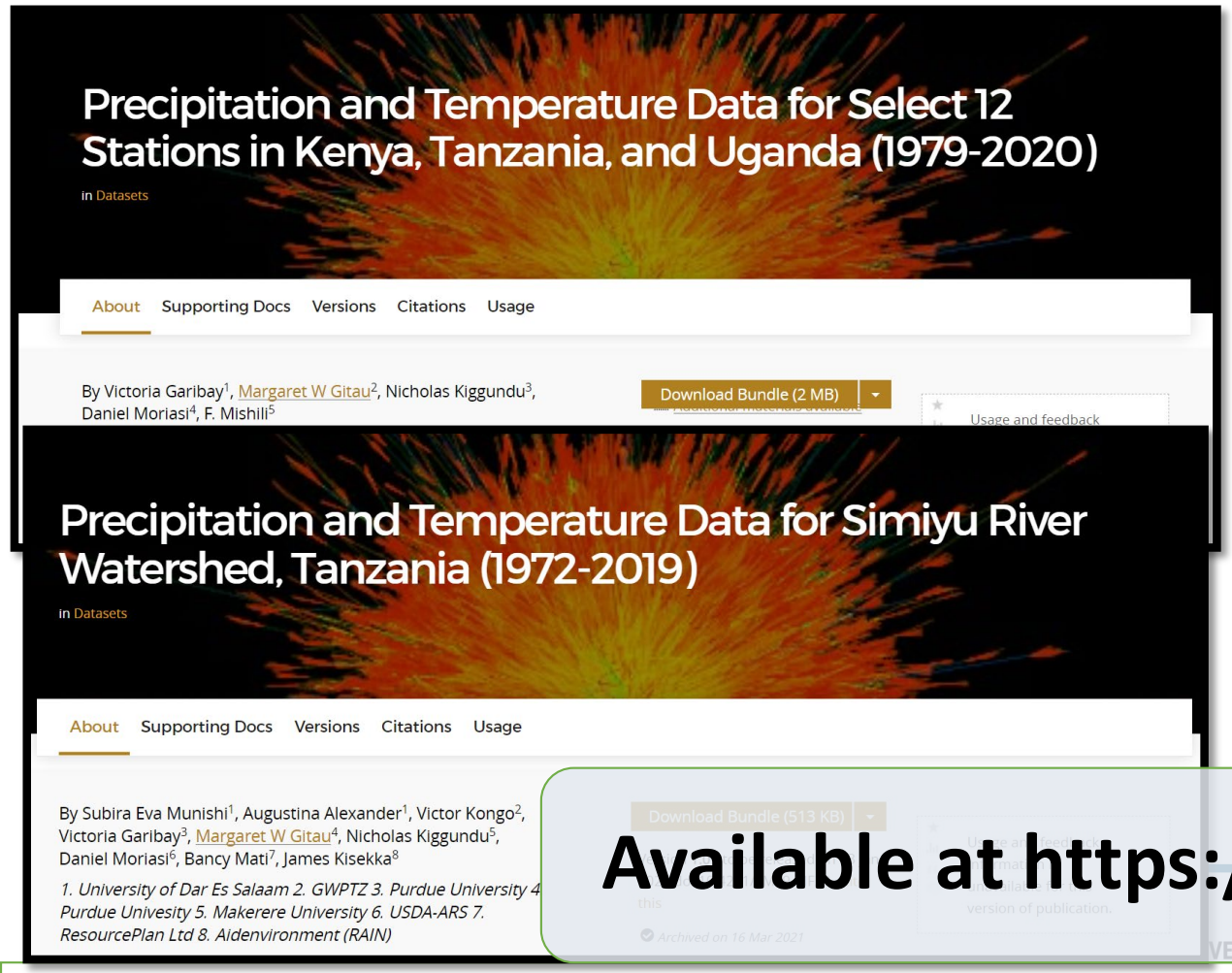
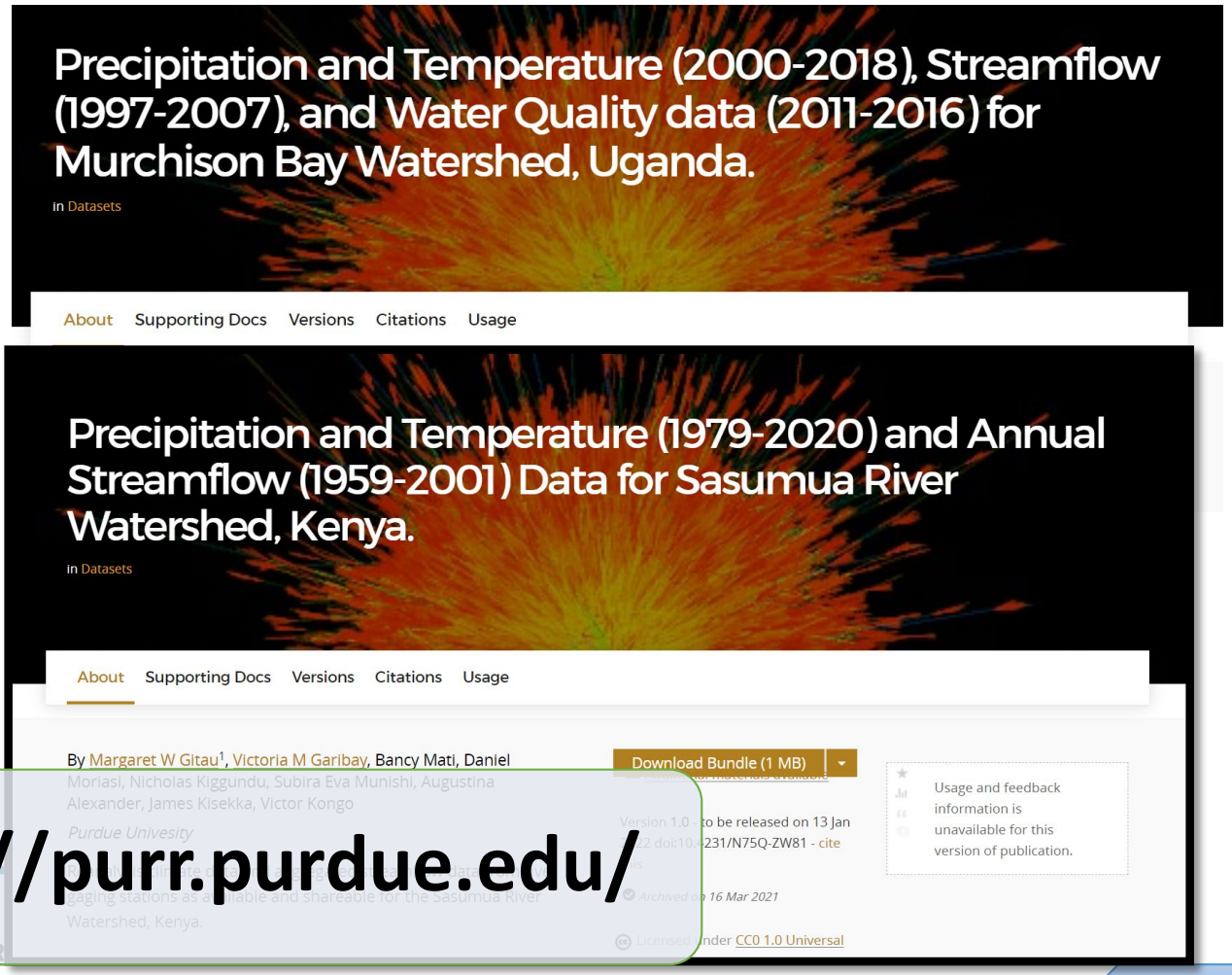
Data Products

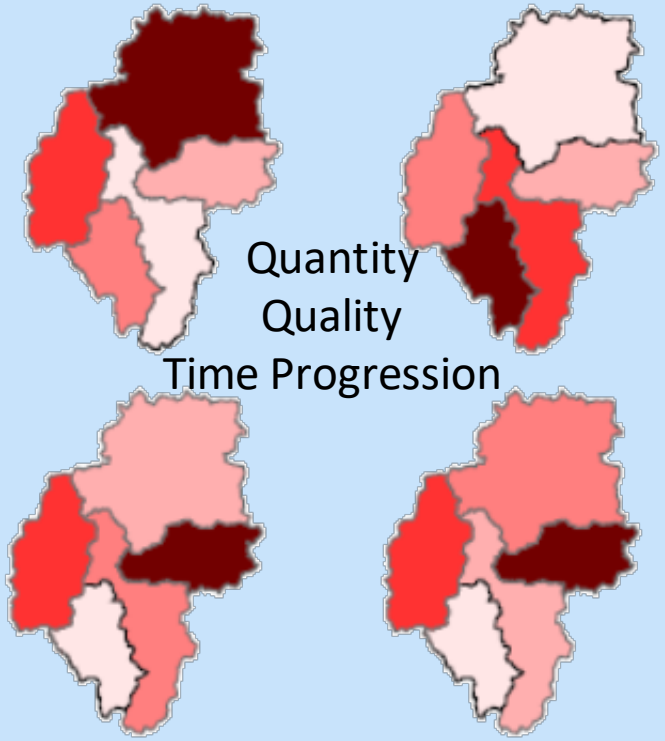




Available at https://purr.purdue.edu/

Example Outputs

Watershed Status



Monthly Nash-Sutcliffe Coefficients

Gage	Calib.	Global	Regr.
Elm Spr.	0.90	0.81	0.75
	0.77	0.66	0.79
Savoy	0.64	0.69	0.38


Training
Model
Patterns
Future
Climate
Gender
Quality
Policy
Mainstreaming
Data
Budgets
Rainfall
Current
Water
Quantity
Briefs
Products
Parameters

Meeting Objectives

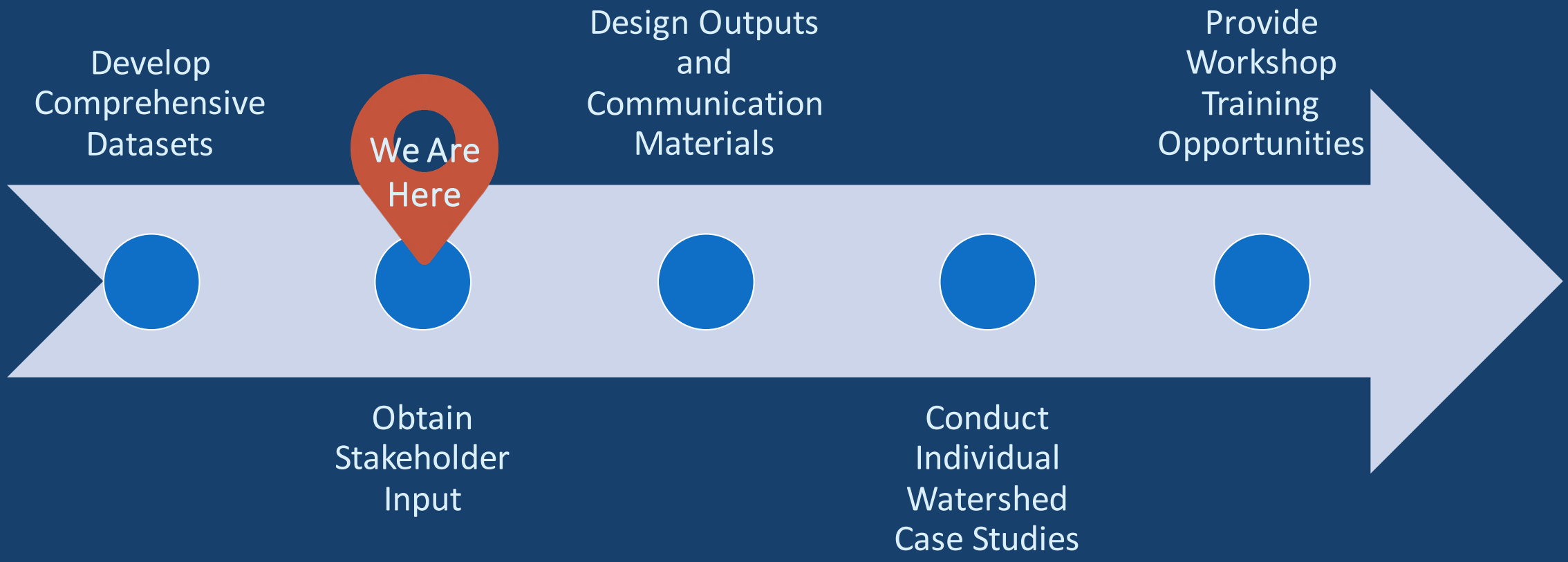
Understand experiences with data, lessons learnt, gaps

Learn about water and data policies at different levels, impacts

Understand stakeholder engagement in water resources monitoring, value addition

* Speakers
* Open Discussion
* Breakout Sessions

Project Progress



Thank you for your participation!

Contact Us

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OVERVIEW OF WATER RESOURCES & MANAGEMENT IN EAST AFRICA

INTRODUCTORY NOTES

Presented by: **Prof. Bancy M. Mati**

At the (Virtual) Webinar on:

LASER PULSE East Africa Water Security Stakeholder Meeting

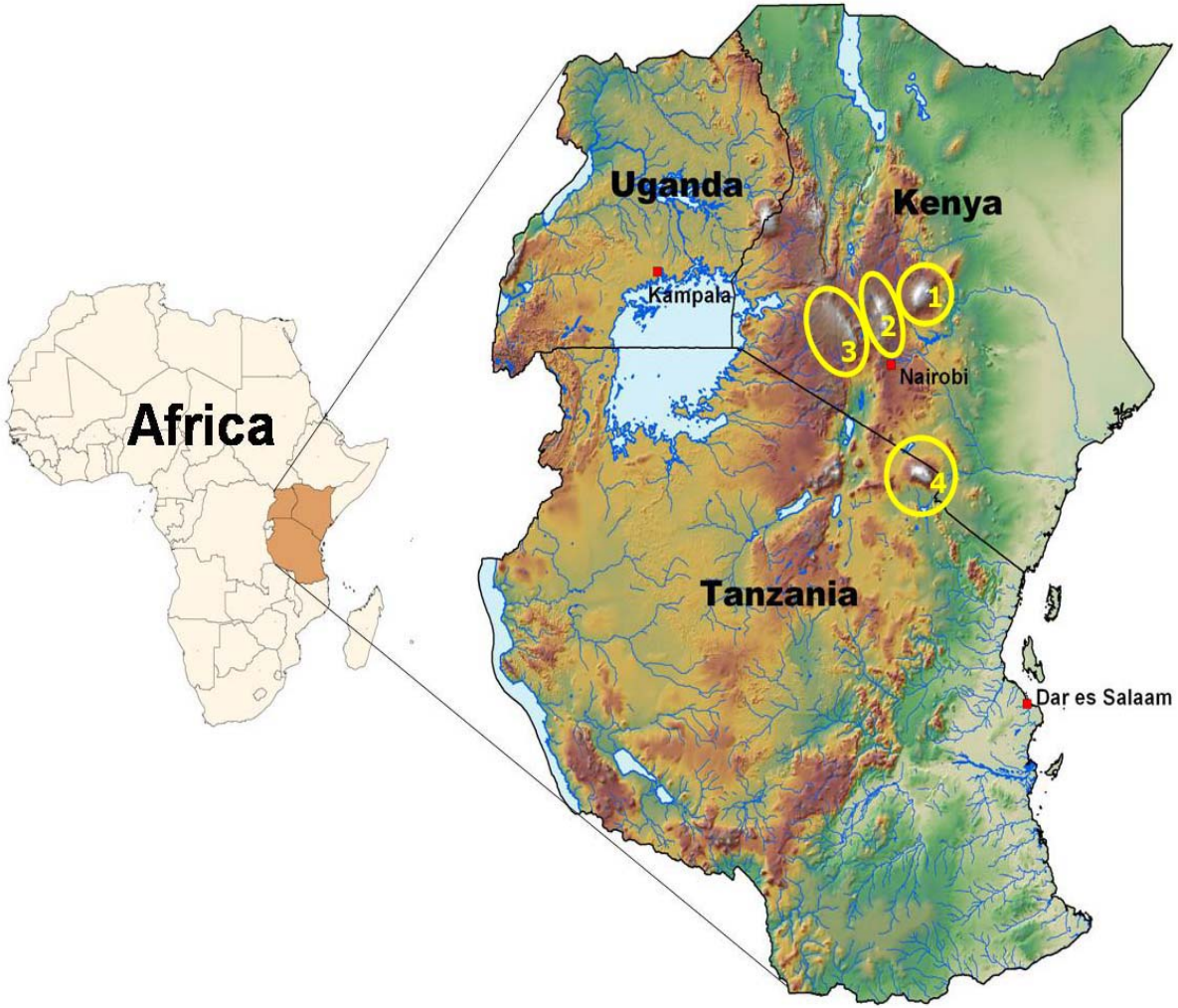
Thursday, 6th May 2021 at 11.00 (EAT)

East Africa is Endowed with Vast Water Resources

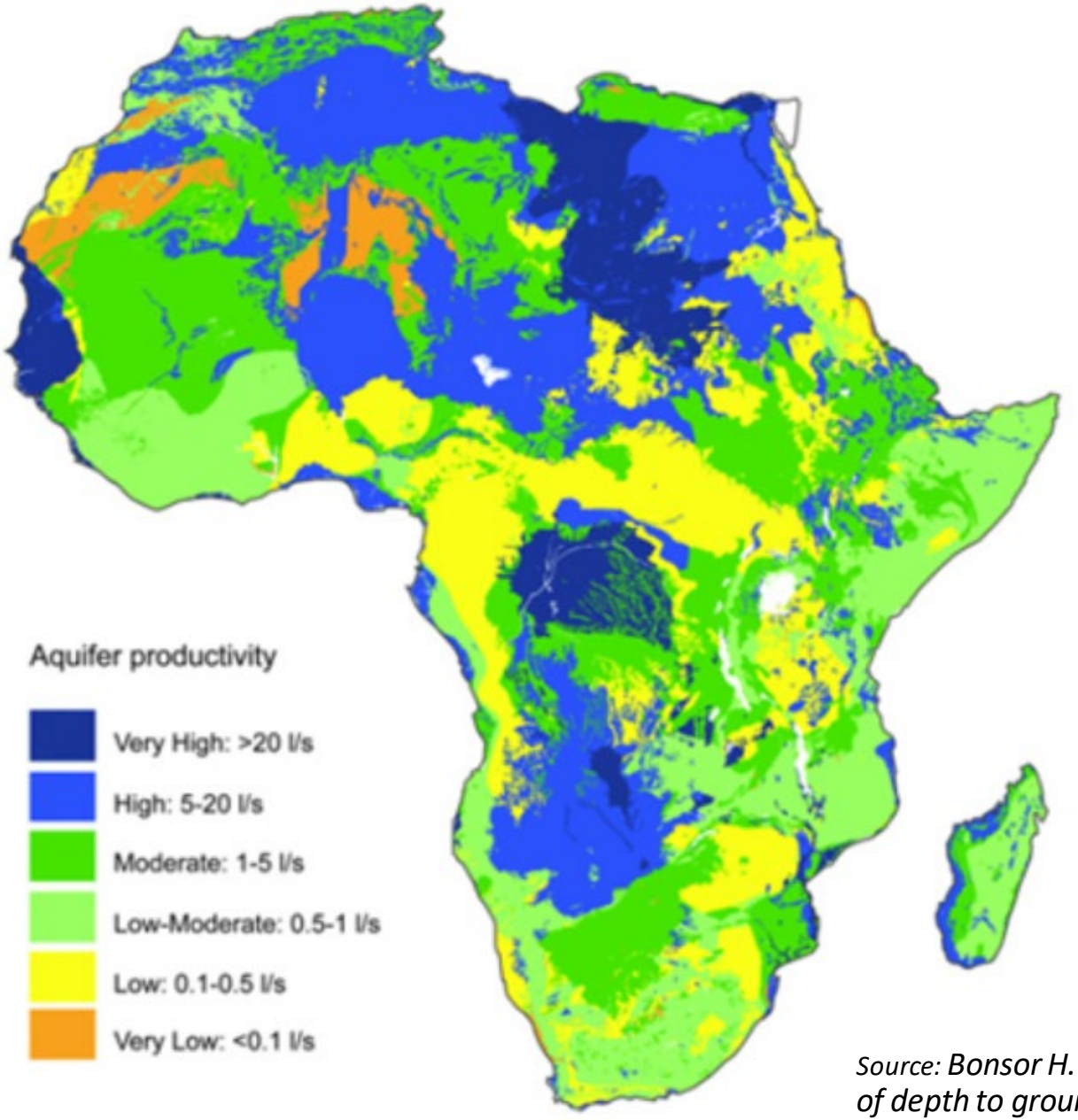
(compared to the rest of Africa)

Freshwater Resources in East Africa

- The EAC has a total renewable water resources of 187 km^3/yr *(Africa has 4,000 km^3/yr)*
- The EAC region boasts several water towers such as Mt. Kilimanjaro, Mt. Kenya, Aberdares, Mt. Elgon, the Ruwenzoris, Njombe mountains etc.
- There are many rivers (including the Nile), lakes, including Lake Victoria the largest shared water resource in the region.
- There are also ground water resources, ample rainfall, riverine and lacustrine swamps
- However, distribution of water resources is unequal with large areas being drylands



Groundwater Resources

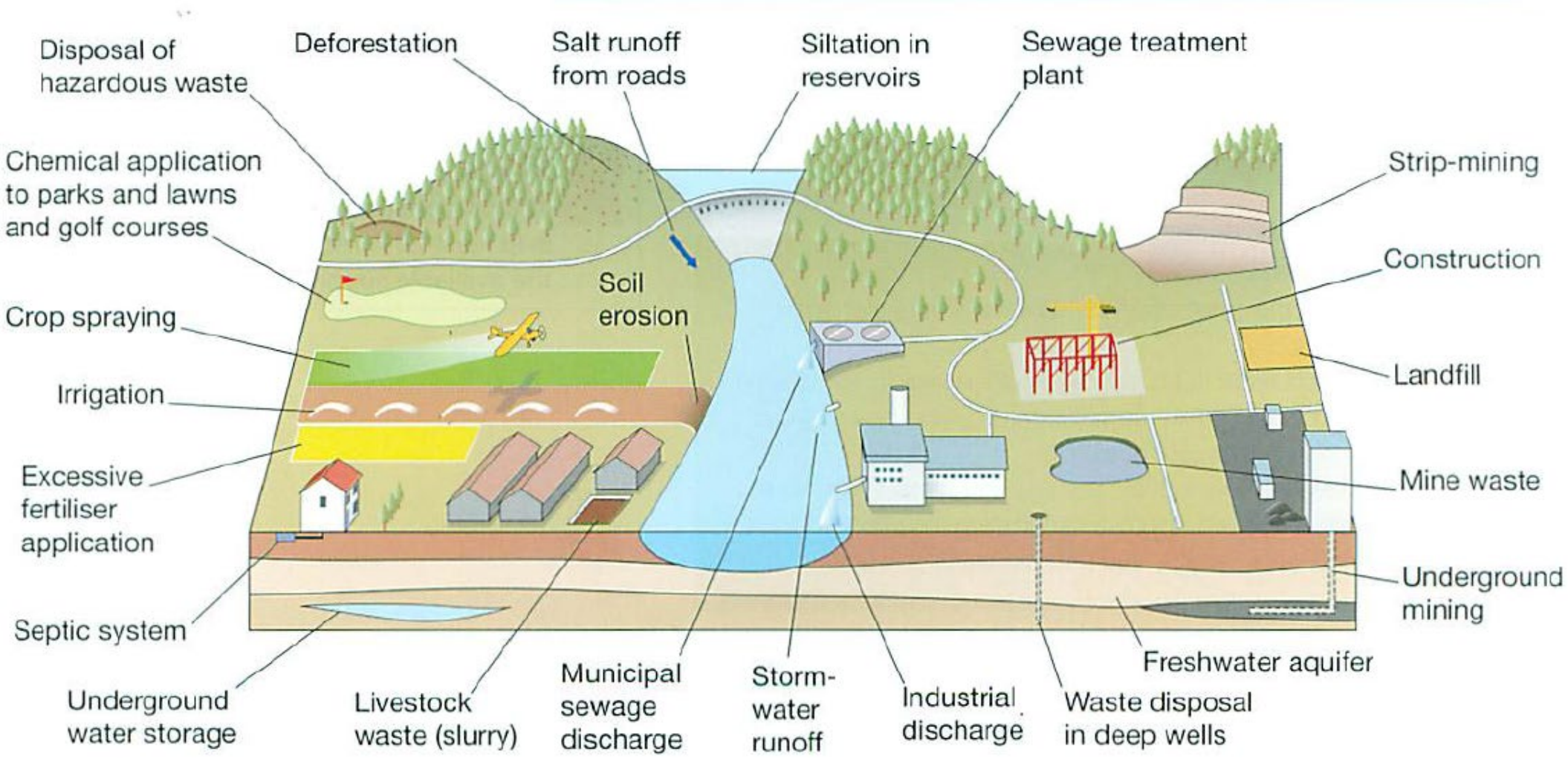


Source: Bonsor H.C. and MacDonald A.M. 2011. An initial estimate of depth to groundwater across Africa .

Abundant Freshwater & Saltwater Ecosystems

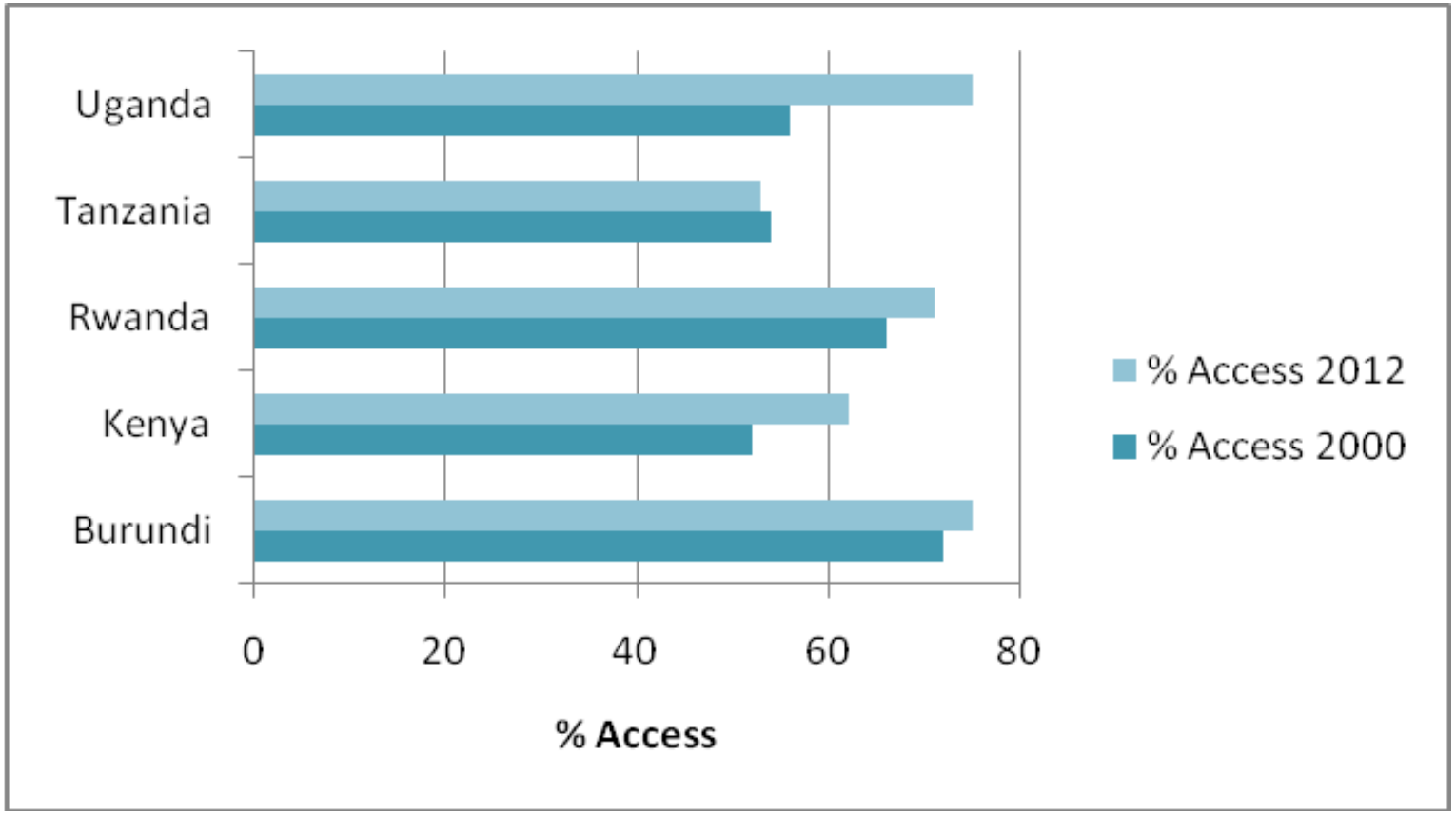
- The EAC countries have fresh water lakes, wetlands, mountains, forests, woodland, rolling plains and grassland
- Several wetlands e.g. Yala, Nyando, Sondu-Miriu, Lake Kanyaboli, Lake Sare , Lake Namboyo the Saiwa Swamp, Kimandi River wetland.
- A wide range of aquatic biodiversity e.g. Lake Vitoria contains over 500 fish species
- Saltwater ecosystems e.g. mangrove swamps, flamingos in Rift Valley lakes;
- Large numbers of phytoplankton communities support the fisheries in the lakes etc

Declining Water Quality from increasing Users and Uses



Poorly Developed Access to Safe Drinking Water

- Access to safe water in EAC is still a major challenge due to poor infrastructure development.
- Less than 75% of population in rural areas have access to safe drinking water.

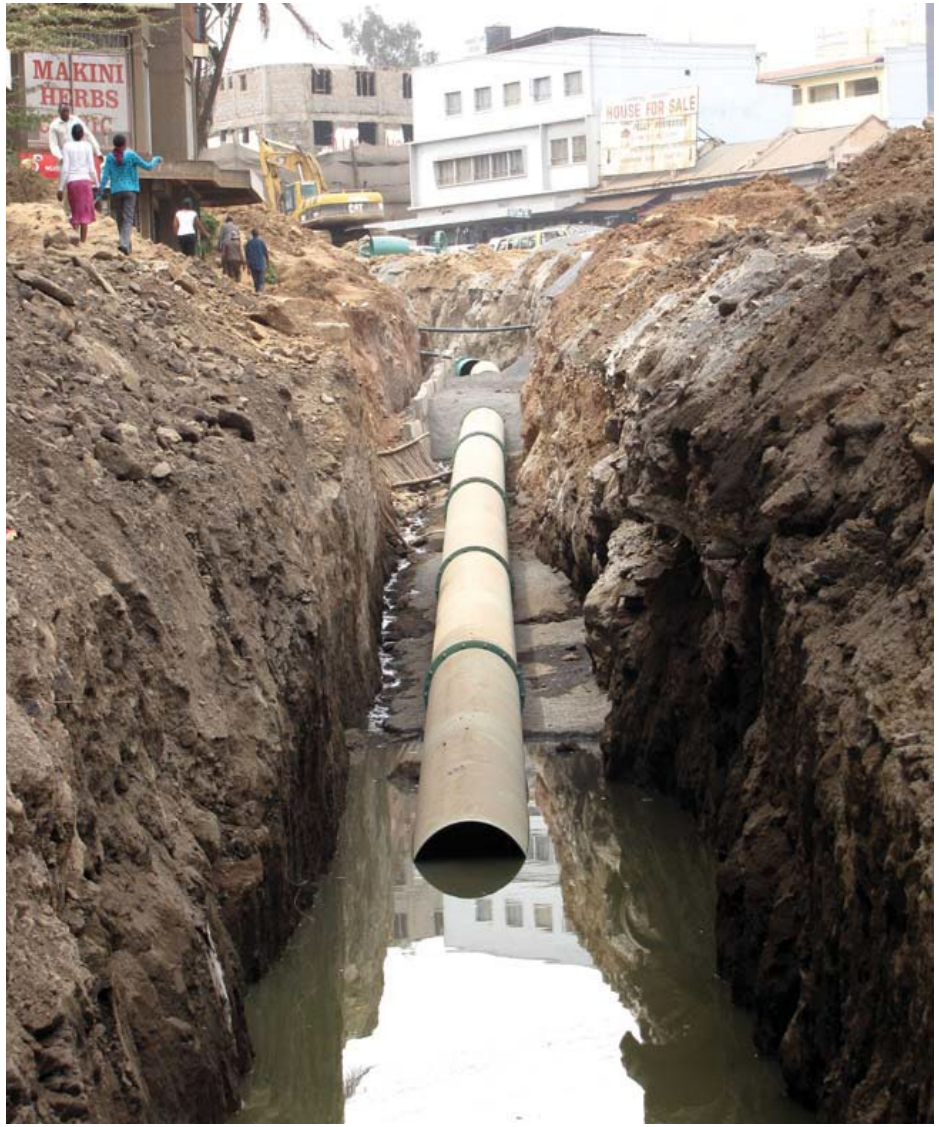


Data source: https://www.climatelinks.org/resources/vulnerability-impacts-and-adaptation-assessment-east-africa-region-water-aquatic

Water supply infrastructure – improved but not still…

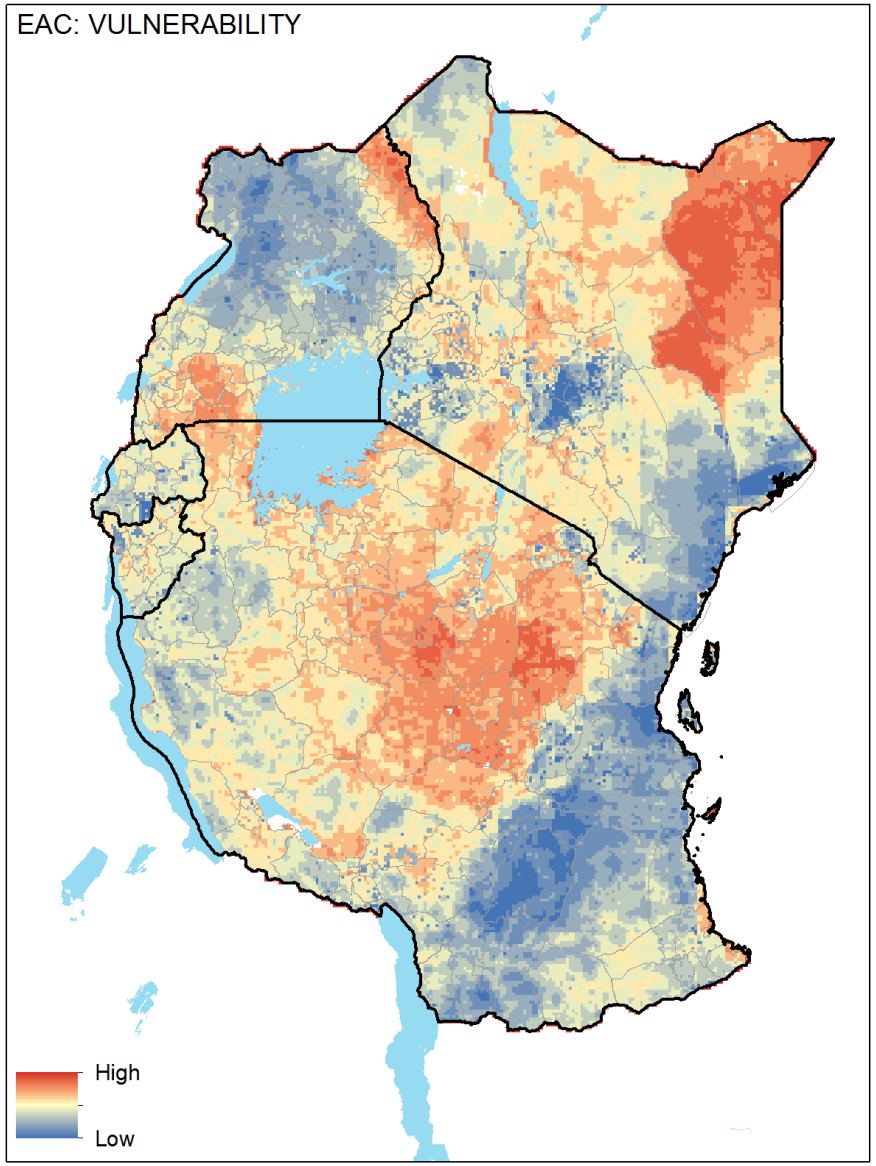
Photos by Bancy Mati

Impacts of poorly planned water management infrastructure



East Africa is vulnerable to Climate Change

- The climate of East Africa has changed dramatically in the last century or so,
- The number of extreme wet seasons in East Africa in the 2080 to 2099 period is estimated to increase from about 5% to about 20%.
- Thus, 1 in 5 of the seasons is likely to be extremely wet or dry by the end of 21st century, as compared to 1 in 20 in the late 20th century.



Climate Change Affects Water & Economies of EAC

- EAC faces challenges in water resources - droughts, floods, erratic rains, water-borne diseases
- Major droughts in EA were recorded in 1970, 1975, 1979-80, 1989-90, 1999/2000 and 2005 -2006, 2011-2012, affecting their economies

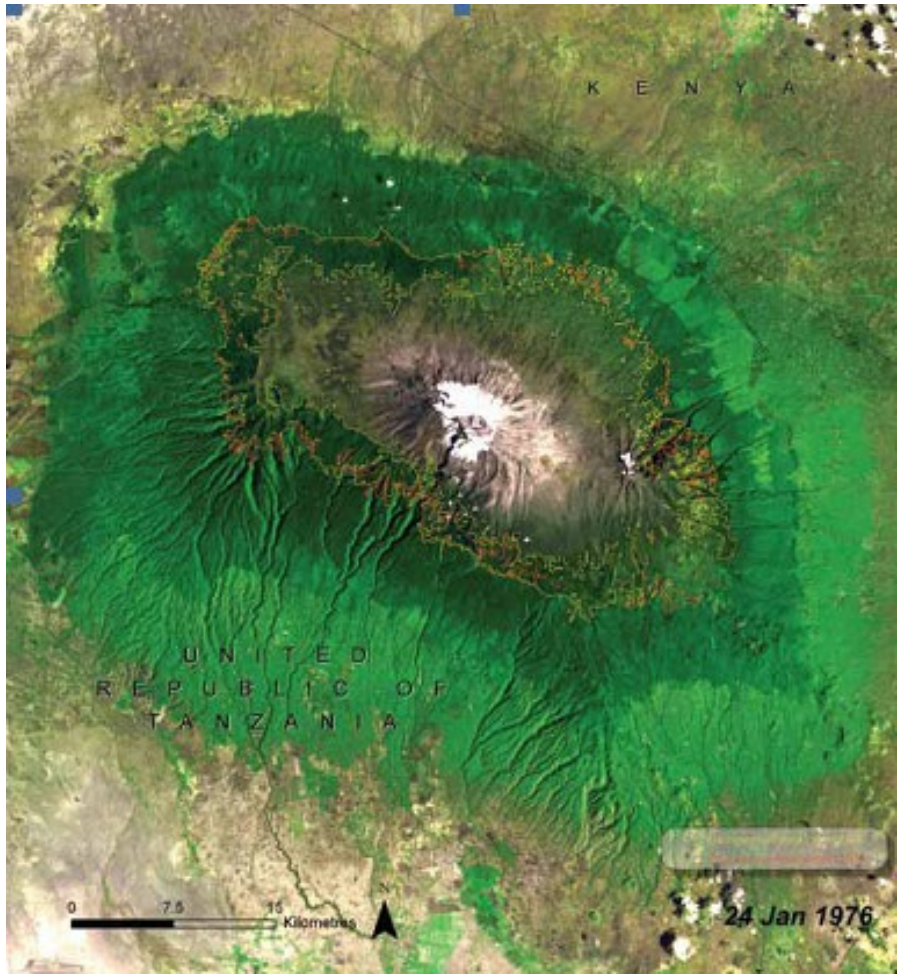
Economic Impacts of Drought in the East African Community

Drought year	Rainfall deficiency (%)	Agricultural GDP loss in %	GDP loss in %	Loss - export earning
1970/71	15.2	0.50	0.07	17.00%
1979/78	22.0	1.58	1.13	7.98%
1980/83	29.0	27.00	10.00	20.00%
1990/91	10.2	(0.22)	0.43	17.50%
1992/94	11.9	3.64	(1.60)	(9.00%)
1999/00	7.0	11.18	1.44	(8.48%)

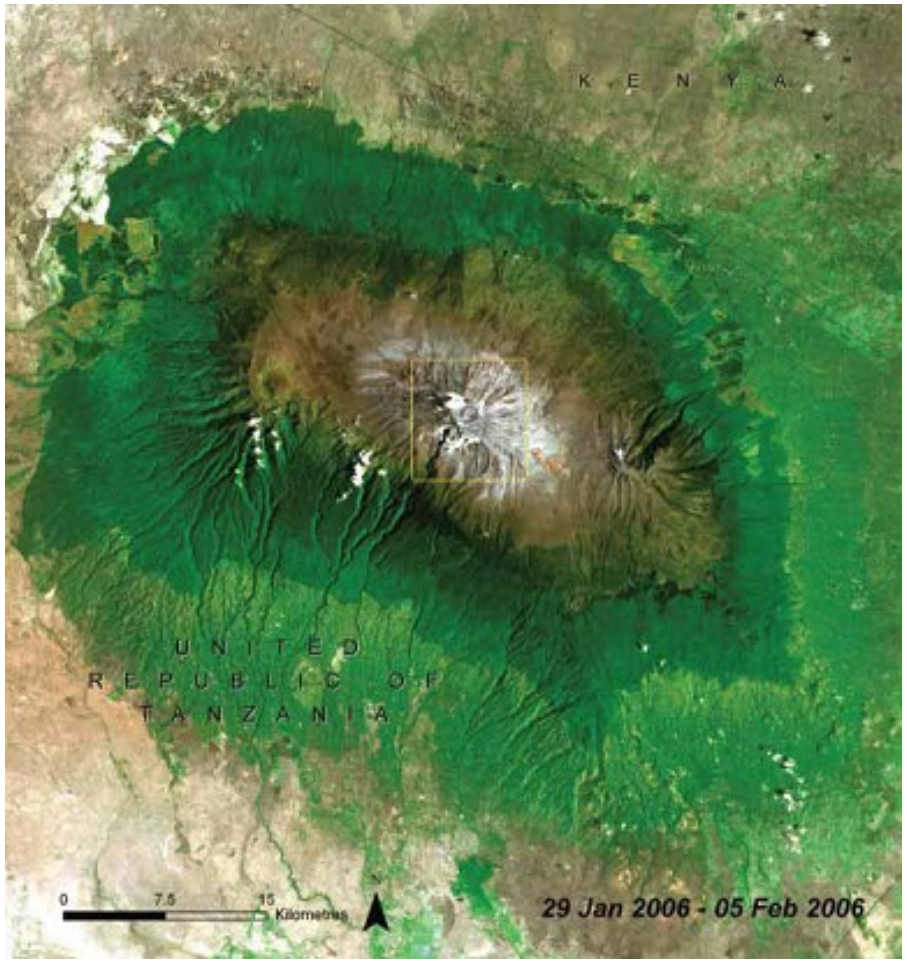
Source: Economic Impact of Climate Change in the East African Community - 2013

Effects of Climate Change on Water Towers are beginning to show

Mt. Kilimanjaro glaciers in 1976



Mt. Kilimanjaro glaciers in 2006



Satellite image comparing Mount Kilimanjaro's glaciers between 1976 and 2006

- Since 1912, the ice caps on Mt. Kilimanjaro have decreased by between 50 to 80%

Positive and Negative Impacts of Water Resource Availability & scarcity

Rainwater harvesting and storage has been upscaled in the over the last 20 years

Climate variability and erratic rainfall has escalated water scarcity in the dry zones

CONCLUSIONS

- Water security is a priority for the rural and urban communities in EAC countries for livelihoods and economic development.
- There is need for quality data to advice on water allocation and planning – yet most of the water resources are ungauged
- Climate change further complicates the challenge of balancing demand and supply.
- Today we will explore topics related to the contribution of data to decision support, thereby helping improve water resources (quantity, quality) and management and ultimately, water security in East Africa.
- Please share your experiences and ideas freely.

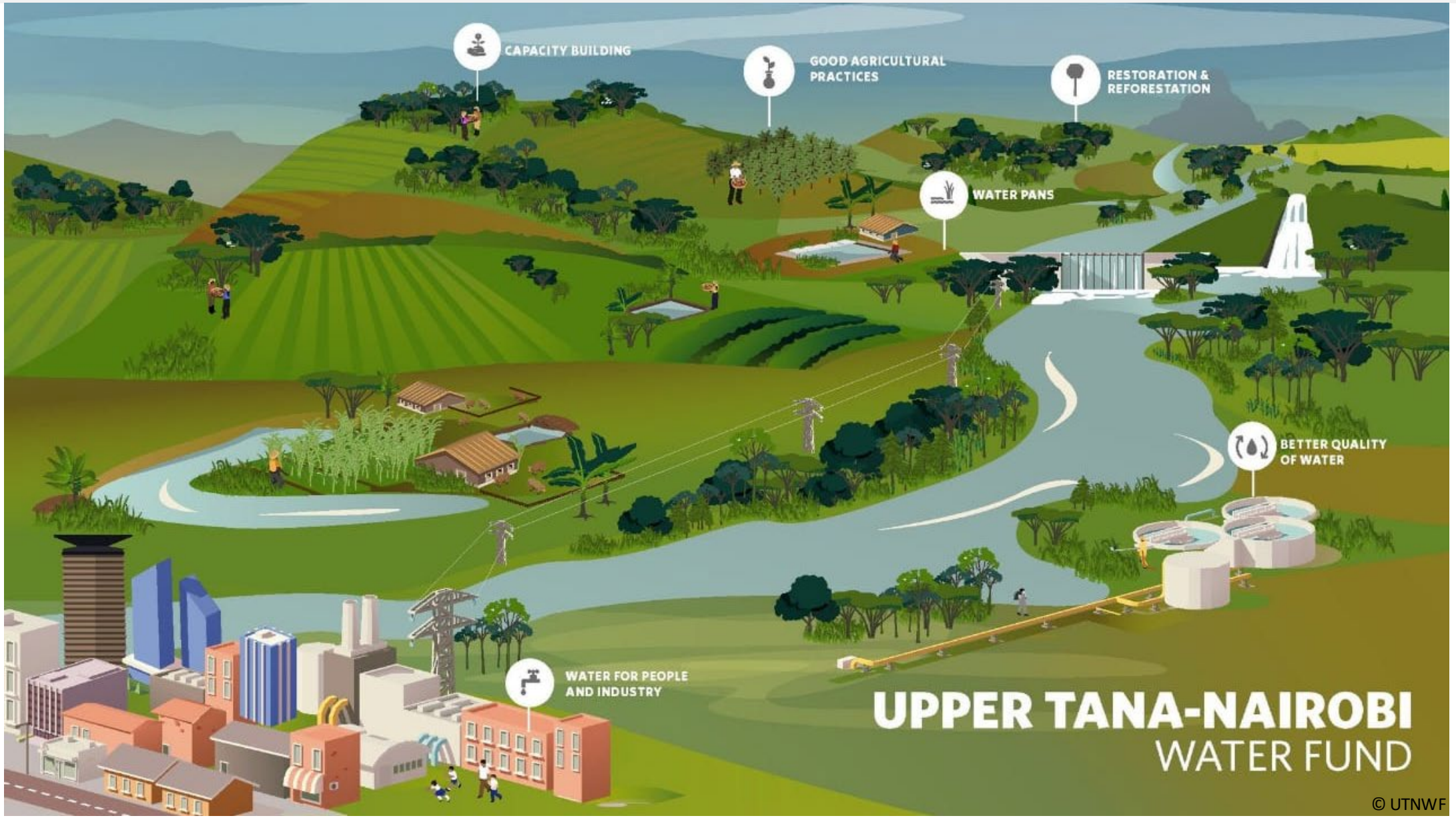
THANK YOU

Photo by B. Mati

WaterFund
Upper Tana-Nairobi

Current Status of Water Data Collection: Experiences, Challenges, and Lessons Learnt

John Gathagu


CAPACITY BUILDING
GOOD AGRICULTURAL PRACTICES
RESTORATION & REFORESTATION
WATER PANS
BETTER QUALITY OF WATER
WATER FOR PEOPLE AND INDUSTRY
UPPER TANA-NAIROBI
WATER FUND
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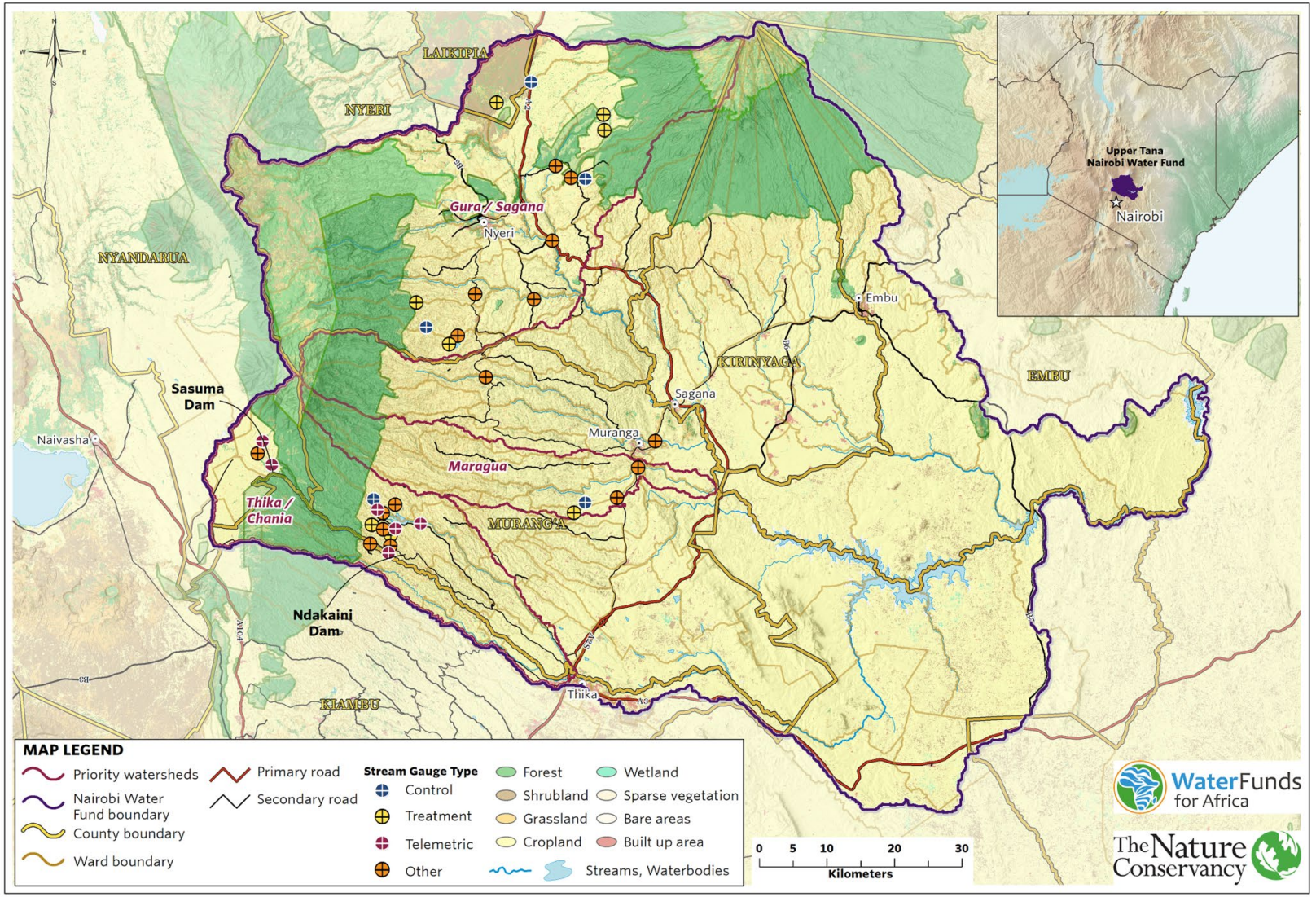
River Gauging Stations

WaterFund Upper Tana-Nairobi

- 28 RGS automated with Hobo water loggers
- Collecting more, reliable and accurate data at shorter time-intervals
- 7 telemetric stations installed



Monitoring of Water Quality and Quantity

WaterFund Upper Tana-Nairobi

Water Quantity

- Water levels (m)
  - ✓Telemetry
  - ✓Hobo loggers
  - ✓Gauge readers
- Discharge/flow (m^3/s)
  - ✓ADV
  - ✓ADCP
  - ✓Rating curves/equations

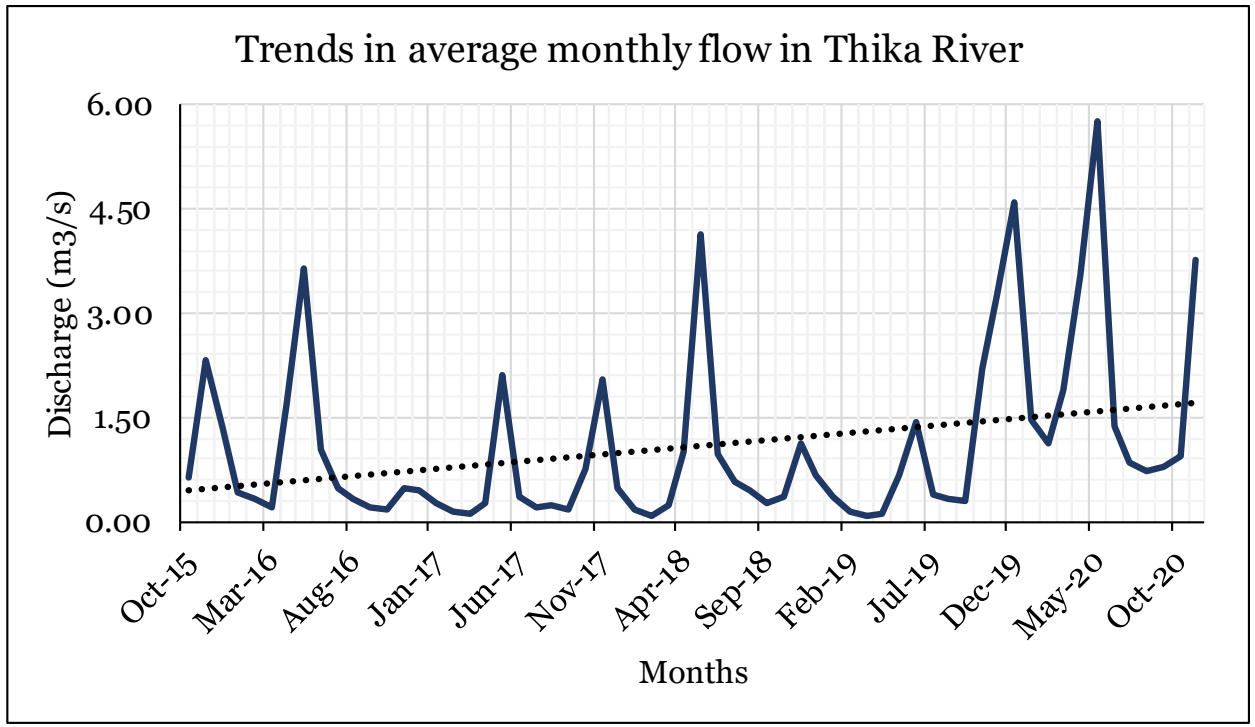
Water Quality

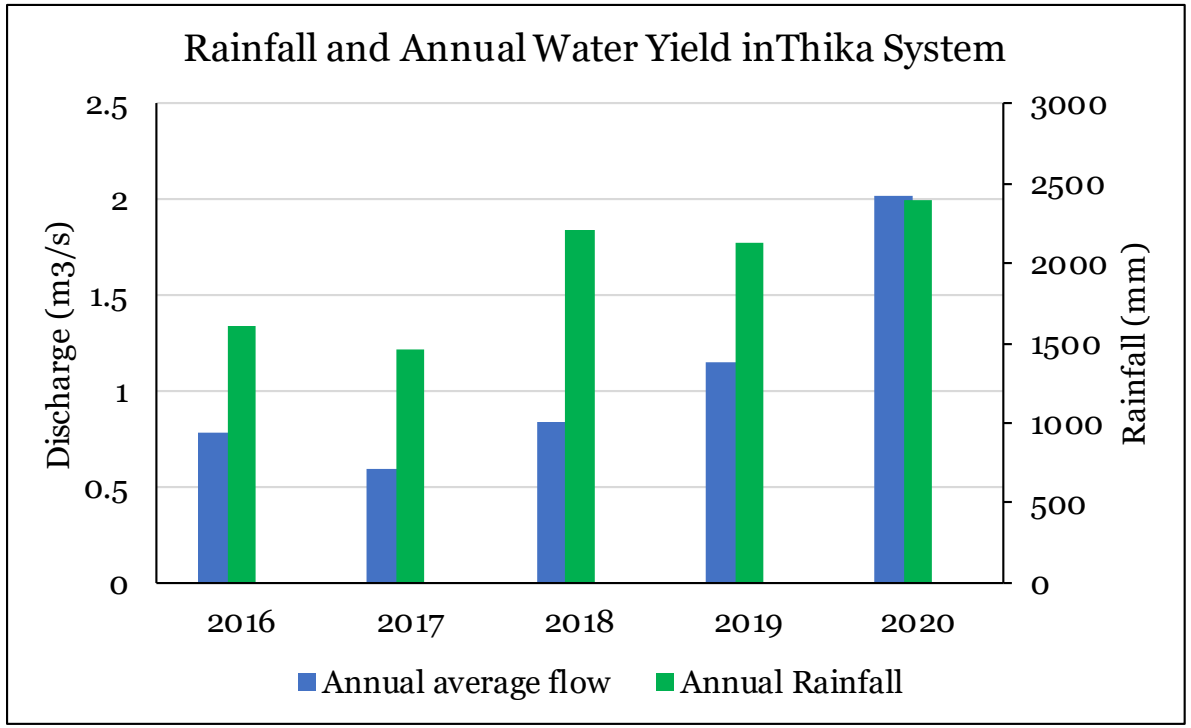
- Turbidity (NTU)
- Total Suspended Solids (mg/l)
- Other (temperature, pH, DO, TDS, EC, Salinity)

Objectives

1) Reduce TSS and turbidity of the upper Tana rivers
2) Increase the dry season flows
3) Reduce the annual average cost per unit of raw water treatment
4) Reduce the number of hours for which turbidity at treatment plants is more than 200 NTU
5) Increase the composition and abundance on aquatic macroinvertebrates in tiers 3 and below

Trends in Water Quantity

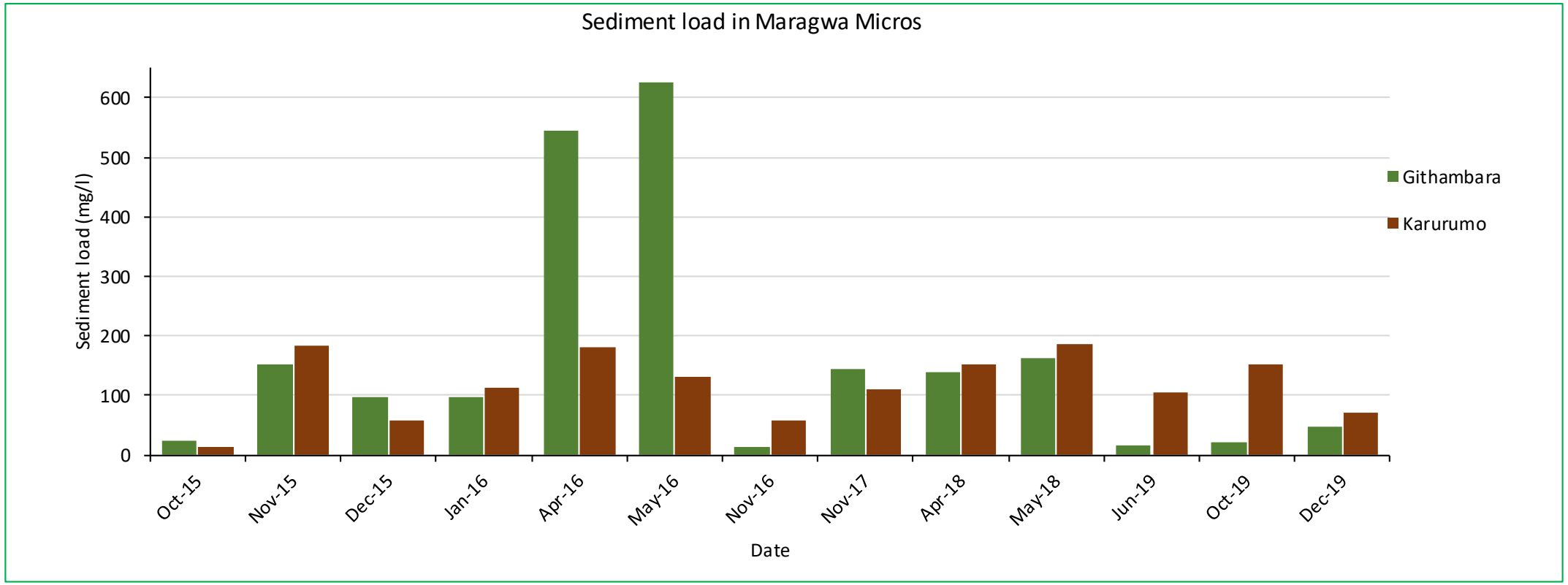




- 50% inflow to Thika dam (NCWSC)
- Annual water yield increased by 46.4% in 2019 compared to 2016 as baseline
- Average dry season water yield increased by 131.5% in 2020 compared to 2016 (0.340 to 0.787)
- Rainfall increased by 32.7% (2016 to 2019)

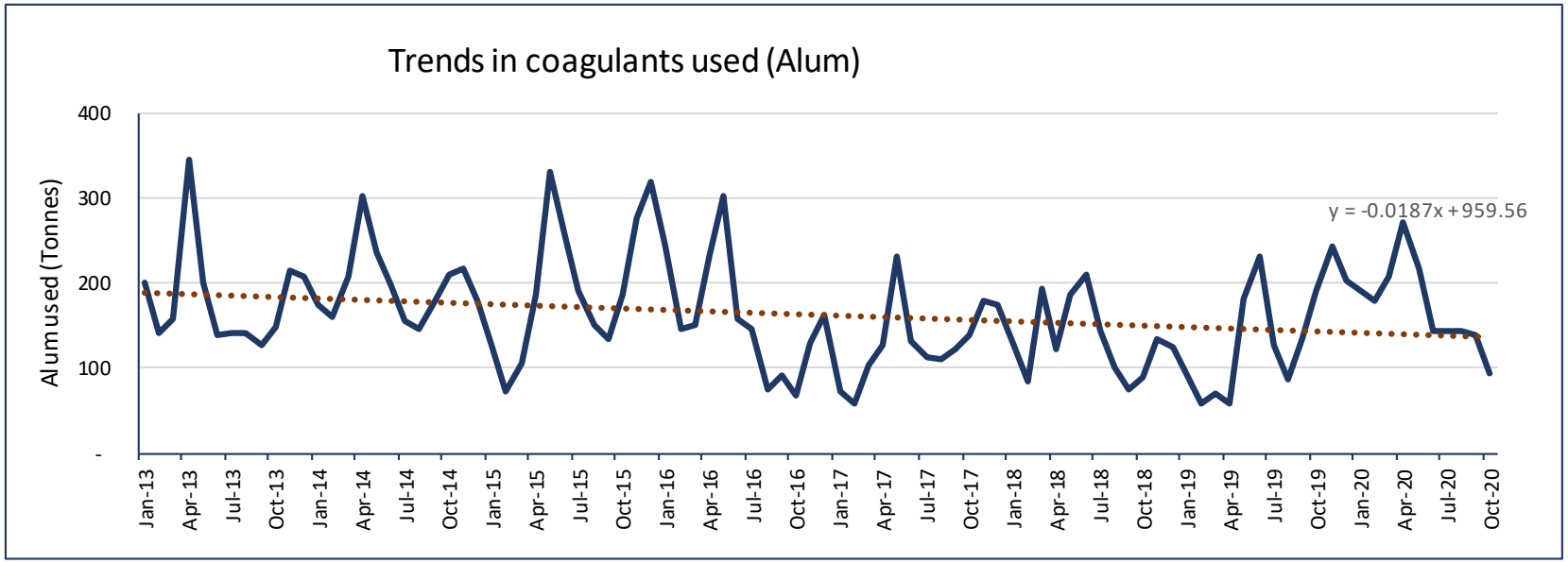
Trends in Water Quality

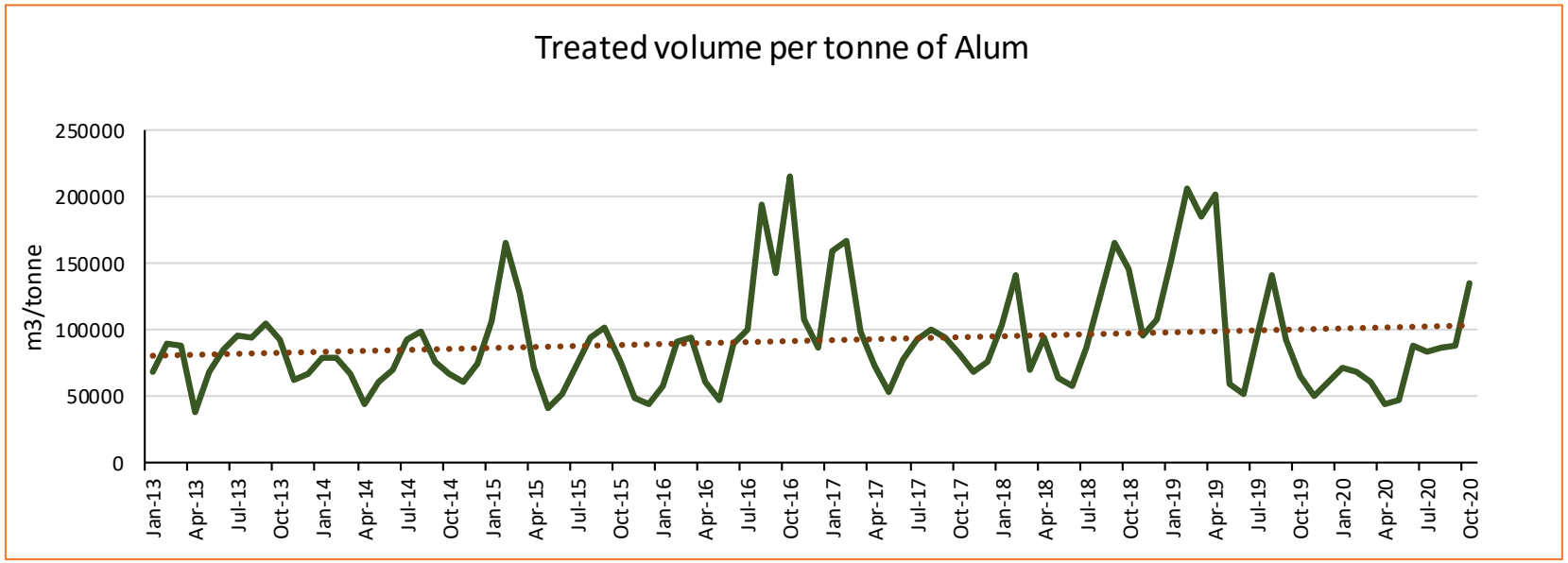
WaterFund Upper Tana-Nairobi



- Increased sediment load in **Karurumo** compared to baseline (2015)- 212%
- Reduced sediment load in **Githambara** by 42.3% in 2019 compared to (2015)
- 8.5% more rainfall in 2019 than 2015

Water Treatment

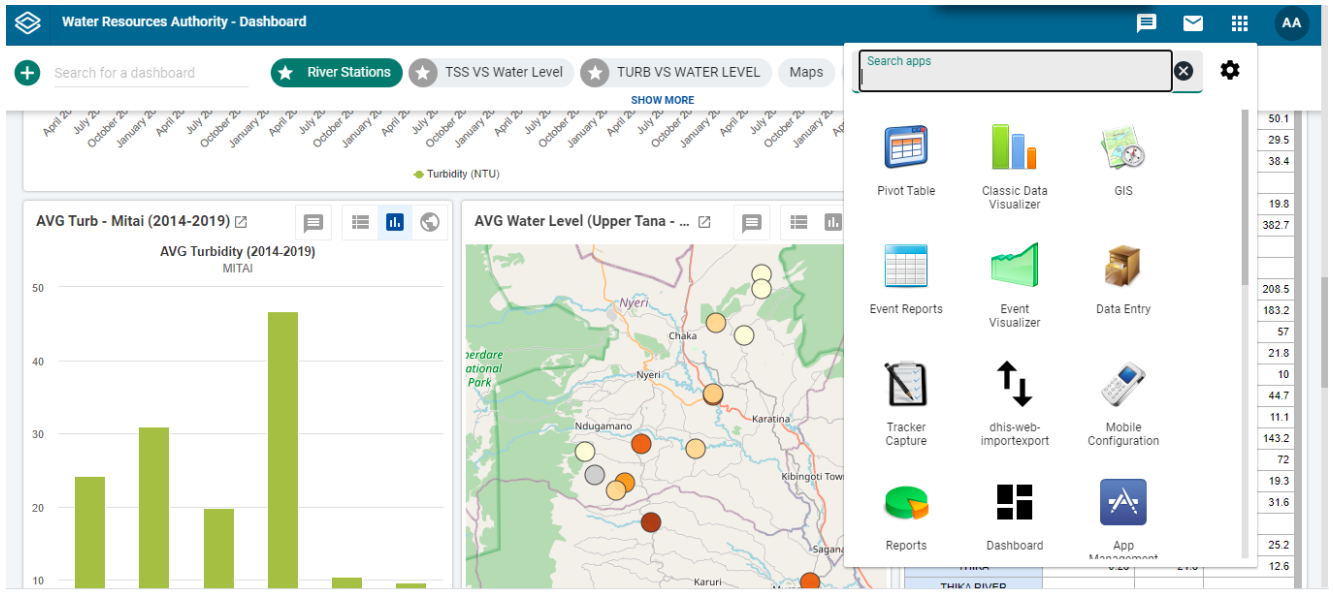


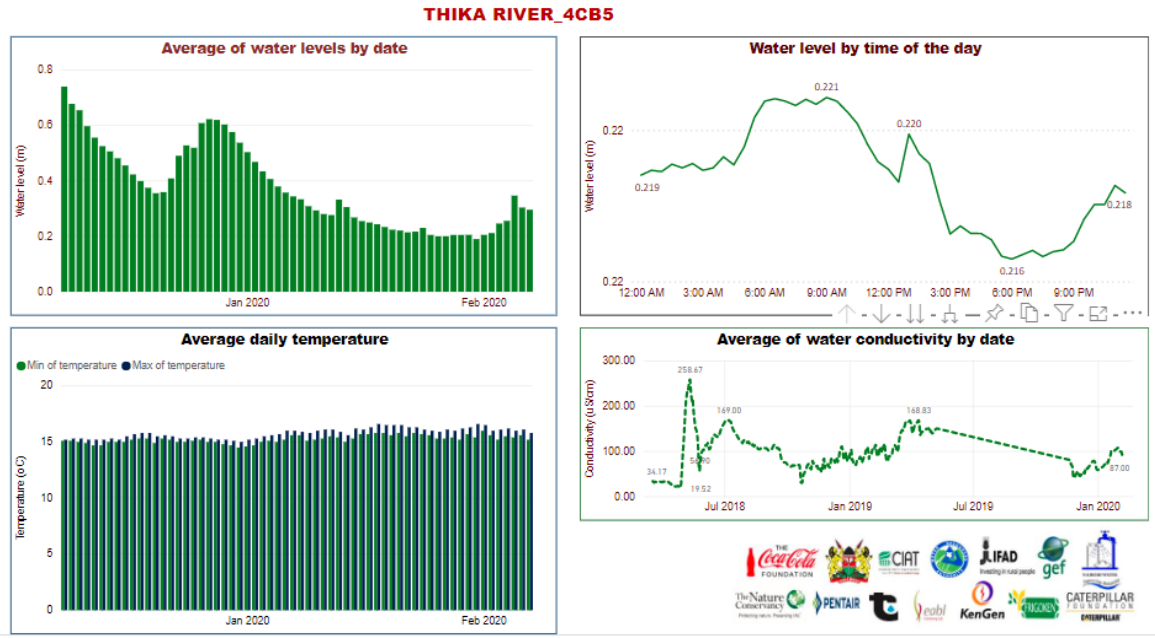


- Less alum used for less turbid water
- The amount of alum used is influenced by both amount of water treated and raw water quality (level of turbidity)
- Increasing unit of water per unit of alum used

Decision Support Dashboard / Tools

WaterFund Upper Tana-Nairobi





- DHIS
- Power BI
- Echo-mobile SMS platform
- BCGS

Lessons Learnt

WaterFund
Upper Tana-Nairobi

- Government regulations on data transmission and choice of equipment
- Climate variability – shifting weather patterns
- Automate water quality sampling
- Data and information sharing

THANK YOU!

Directorate of Water Resources Management

Data-driven approaches for decision-making in water resources management and development in East Africa

Data-Driven Decision Support for Improved Water Security in East Africa

6th May 2021

Dr. Zaake Tamukedde Benon

Commissioner, WRM&A

DWRM – MWE

Presentation Outline

1. Overview on Data and Policy
2. Use of Data to Inform Policy
3. Policy Impacts on Data Availability

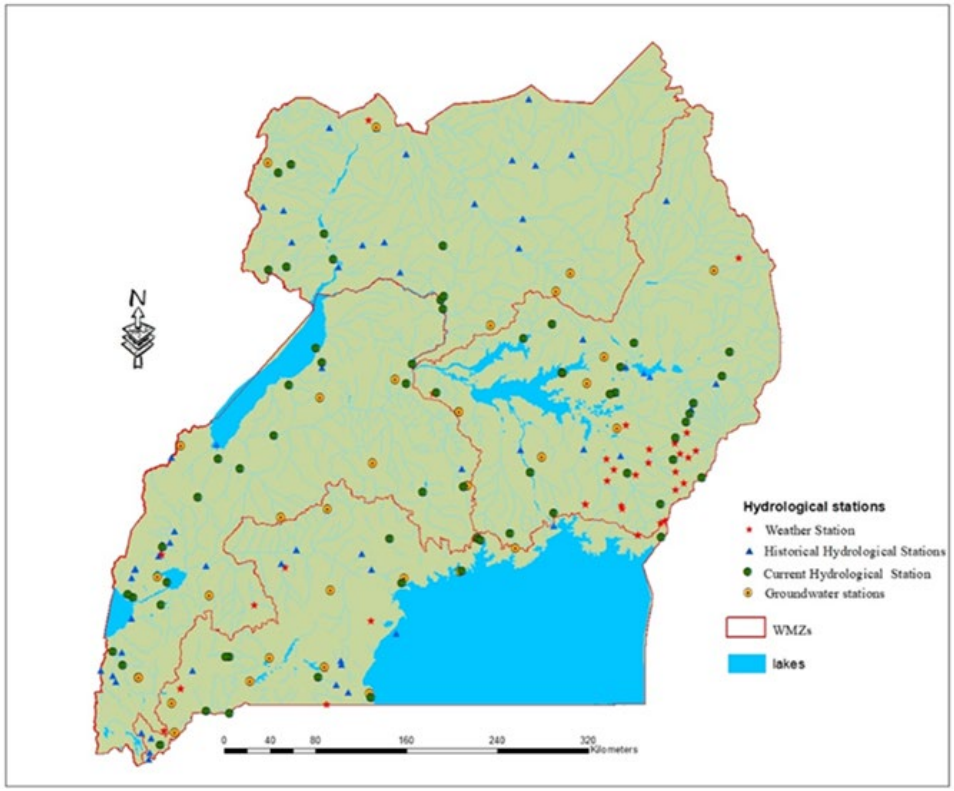
Overview on Data and Policy

- Government of Uganda is the custodian of all the country's water resources. This is done through the Ministry of Water and Environment (MWE) under the Directorate of Water Resources Management (DWRM)

- DWRM manages the water resources to ensure availability of water of adequate quantity and quality for the current and future generations through operationalization of its legal framework; 1) National Water Policy, 2) Water Act and the 3) Water Resources Regulations and the 4) Waste water Regulations.

Overview on Data and Policy

- The legal and Institutional framework enabled DWRM to set up networks for collection of various data sets
  - Water levels of both surface and groundwater
  - Discharge in rivers
  - Rainfall
  - Physiochemical & biological water quality parameters



Overview on Data and Policy

- Example of Monitoring Infrastructure Used for Data Collection

Gauging station

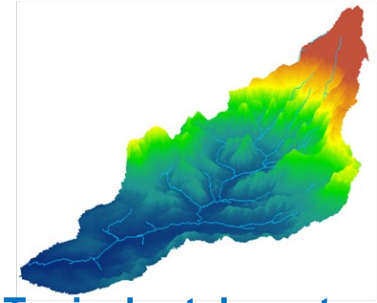
Groundwater Monitoring Well

Automated Gauging Station

Overview on Data and Policy

- Example of Data Collection, Transmission & Archival

Discharge Measurement



Typical catchment

Data reception

Data recording

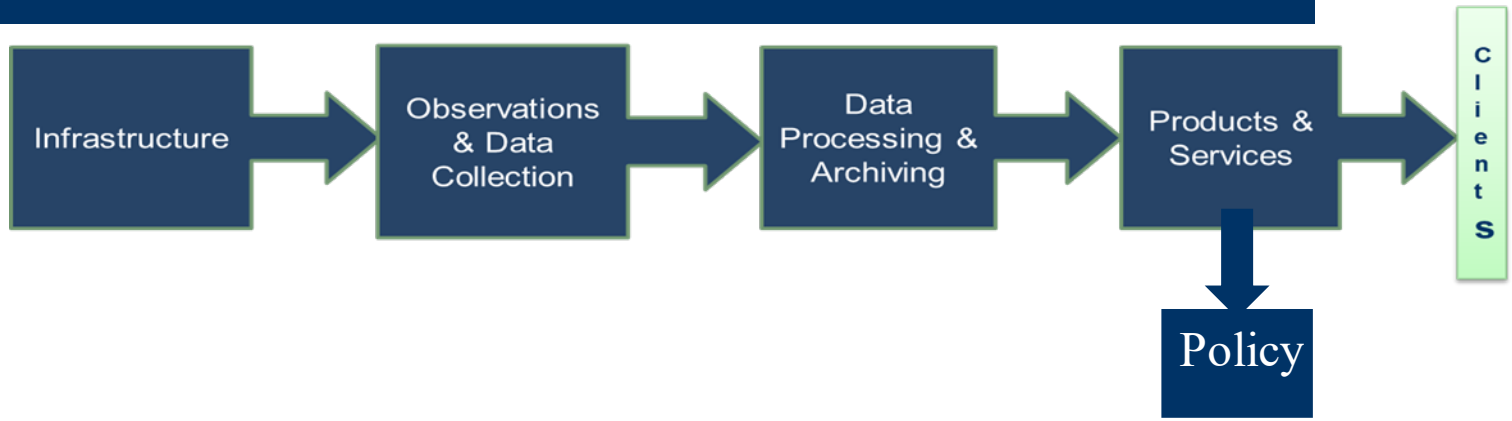
Data Transmission

Overview on Data and Policy

In addition DWRM collects and manages data on;

- Borehole logs
- Legal water users and waste water dischargers
- Registered drillers
- Dam safety cases
- Self-monitoring data from legal water users on water levels and discharges

Use of Data to Inform Policy



Data is processed & analyzed to inform various policies…examples highlighted below;

1. Water discharges are processed and analyzed to inform policy on environmental flow requirements d/s of major abstractors

Use of Data to Inform Policy

2. Water discharges and levels are processed and analyzed to inform the release and abstraction policy of Lake Victoria which has transboundary impacts

Use of Data to Inform Policy

3. Water flow and level data supports establishment and operation of Early Warning Systems on Floods and drought to influence policy on disaster management and gazette settlements outside flood plains

4. Processed groundwater data revealed depletion of groundwater in some towns in Uganda (e.g. Rukungiri town) and led to development a new water supply policy focusing on alternative water sources

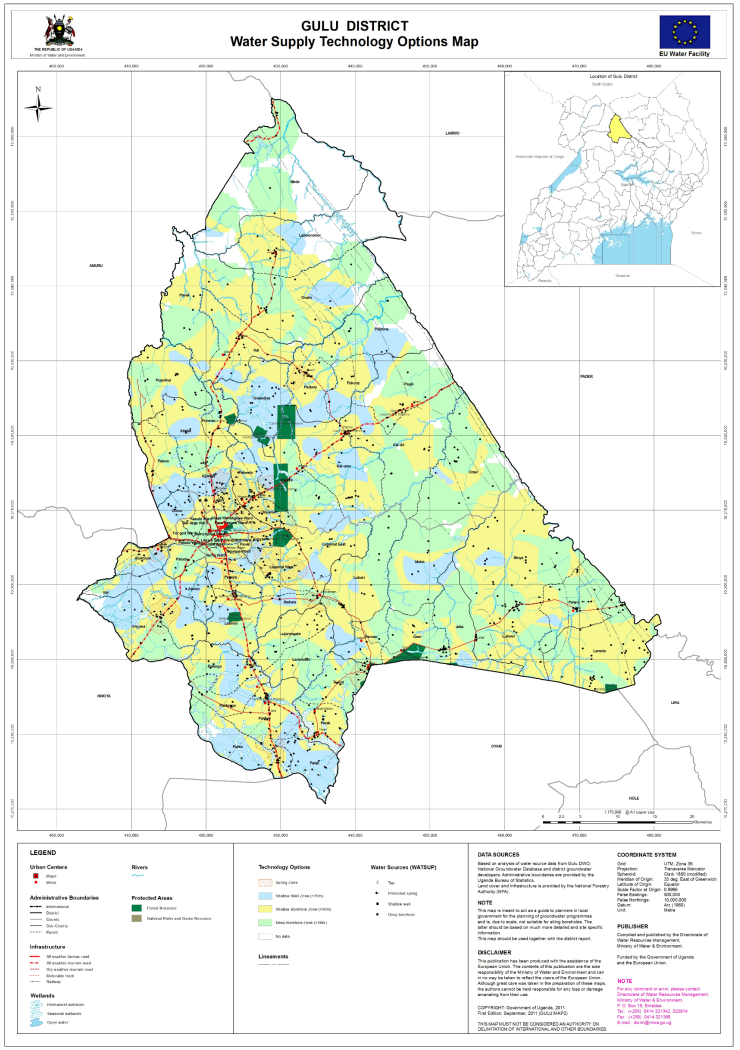
Use of Data to Inform Policy

5. Water quality data informs policy on standards for production of portable bottled water and discharge of waste water

6. Data used to run models that in turn inform Forecast Based Financing & trigger policy on early anticipatory humanitarian action being championed by the Uganda Red Cross

Use of Data to Inform Policy

7. Ground water mapping data used to inform policy on best technology for abstraction of groundwater



Policy Impacts on Data Availability

1. Policy requires users to pay for data which may limit data availability within the user community

2. Payments are made in form of Non Tax Revenue to government and go into a common basket. There is no opportunity to invest the payments directly into data management functions. Hence this leaves a funding gap and compromises data availability

Policy Impacts on Data Availability

3. Sharing of data on transboundary resources is sometimes delayed & complicated due to lack of a sharing protocols…e.g. Nile Basin Corporative Framework Agreement (CFA) has not been ratified by some countries

4. Need to add value to data that are being generated to provide information products that stakeholders need for various purposes

THE END

THANK YOU

The Value Addition of Stakeholder Engagement in Monitoring Water Resources – at Basin, Country and Regional Leve

Charles Sokile, Oxford Policy Management

Oxford Policy Management

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Introduction

- As fugitive resource as it is, water management, especially IWRM require all stakeholders to be involved.
- Monitoring of water resources which is even more challenging, require more stakeholder involvement
- But water management itself is very tribal- tribal language, terms, metrics, relations and even boundaries.
- Water monitoring by design, is very exclusive. Only a domain of experts and the selected few

A case for Stakeholder Engagement

- Stakeholder engagement is sine qua non for IWRM
- In order to have a sound IWRM, 3 things are key
  - technical expertise and assistance in the development and enhancement of data sharing,
  - water resources decision support tools;
  - funding
- Stakeholder engagement is a rubric that provides the full impetus

But how ? Evidence is key

- Stakeholders are everywhere, and are many,
- At **the basin level** – and below , in catchments, micro catchments and at the hydro-streets. IWRM is for them
- At **the country level** – where they hold much of the decision and the political economy and local hydro politics eg finance, investment, tariffs, rights, etc
- At the **regional level** – where for transboundary resources – dialogue for development require lots of evidence
- And beyond – internationally for hydrobargains

Do stakeholders appreciate data?

- Who generates data, and for who?
- How is data packaged and where is stored? Issues of retrieval
- Data share – how and with who?
  - Experts – crosscutters – setting agenda
  - Politicians, = powerful & influencers
  - Users – payers/ polluters, etec
- If they don't know, they will not act, and if they do, they will act in ignorance

How then do we engage stakeholders with evidence

- **Passive pathways** – let them fend for themselves, if it matters to them, they will know about it/// Knowledge Management & information seeking behaviours in the basin, country and region
- **Active pathways** – pro active information eg policy briefs, fact sheets, etc. dashboards, DA/ DSS? And many panels available out there
- **Dialogue of** the willing, the affected or the deaf?

What matters most here

- Data sharing protocol to support transparency in data sharing and gathering new data to ensure the DSS provides evidence based support to decision makers.
- Results that inform decision making,
- Participation in data sharing - collection of ‘live’ water monitoring data.
- Keep it simple - KISS

Take aways

- Establish a data coordination platform/steering structure at all levels
- Agree on regular forums (quarterly)
- Prepare a roadmap with clear roles and responsibilities
- Undertake Joint planning and implementation (all levels)
- Promote experience sharing among basins, countries and regions

Thank you

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