Development of a National Framework for Management and Regulation of Drinking Water Quality in Uganda

Undertaking No. 5 Objectives

- The provide a clear understanding of the problem concerning drinking water quality, its underlying causes and the measures need to address it.
- Examine the existing framework for management and regulation of drinking water quality in Uganda and provide suggestions for improving the framework so as to deal effectively with the water quality problem.
- The term '**Framework**' under this study =
  - The sum total of policies, laws, regulations, strategic plans and institutional arrangements that govern the activities within a sector or sub-sector

Key deliverables

- **Inception Report**
- **Situation Analysis** report on drinking water quality management and regulation in Uganda
- **Draft Framework** for drinking water quality management and regulation (policies, laws, regulations, institutional arrangements).
  - *Elements*
    - Drinking water quality monitoring and regulation;
    - Regulation of water quality testing laboratories;
    - Regulation of water treatment chemicals;
    - Regulation of household-level water purification technologies Implementation of water security and safety planning
    - Management of drinking water quality in emergency situations
- **Final Framework**

Execution of the undertaking

Two teams

1. Policy and legal framework
2. **Institutional and technical aspects of water quality management and regulation**

- The Technical Team Members
  - Dr. Nicholas Azza (Uganda)
  - Eng. Philip de Souza (South Africa)

Methodology

- Review of documents and data
- Holding of focus groups discussions with key stakeholders
- Institutional visits
- Site visits and inspection of water treatment systems
- Site visits to water testing laboratories;
- Review of relevant international literature;
- Report writing

Progress to date

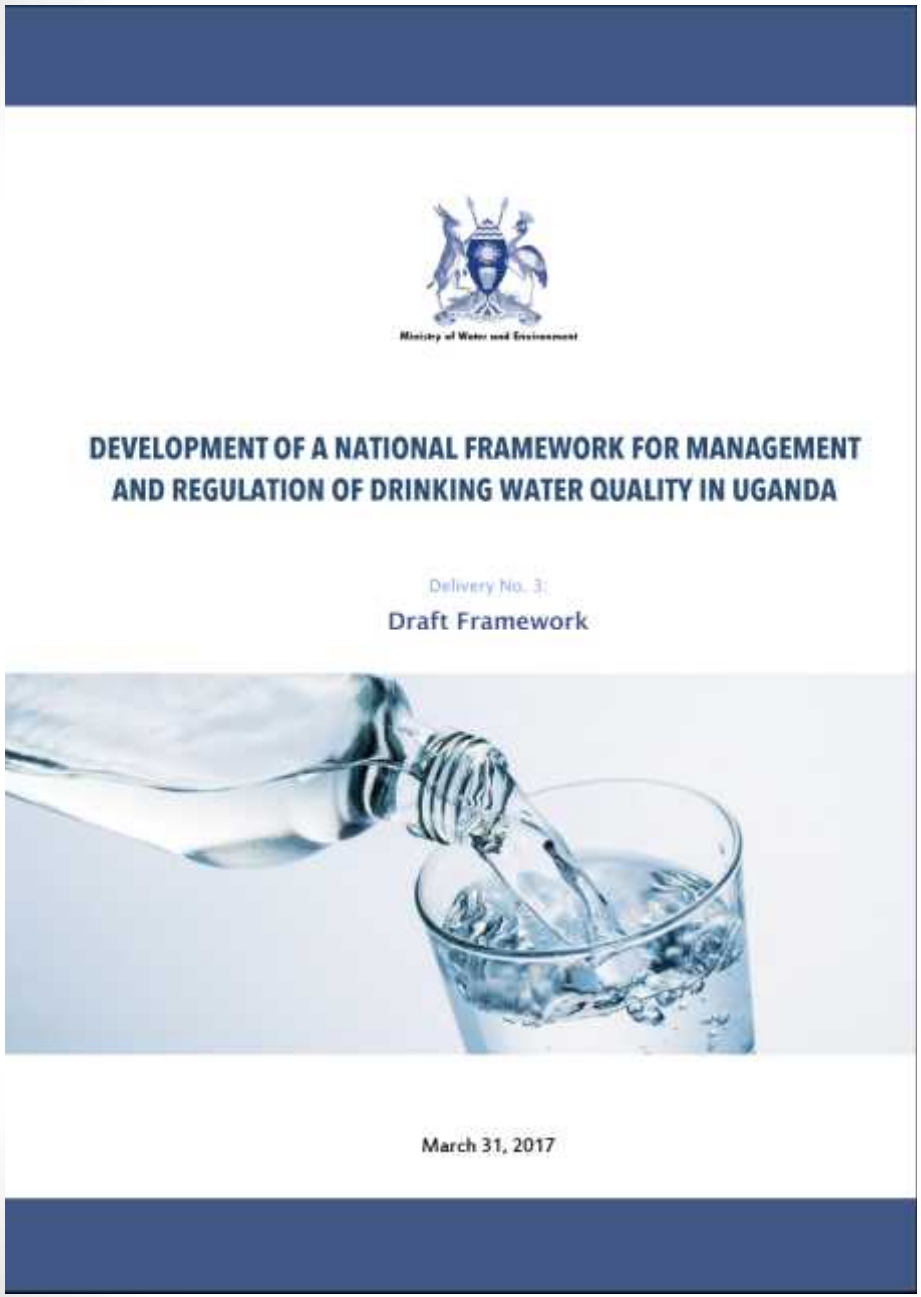
- **Inception Report –** September 2016
- **Situation Analysis Report –** Early March 2017
- **Draft Framework Report** – End of March 2017
- **Final Framework –** End of April 2017

Consultations carried out– interviews and focus group discussions

No.	Institution/agency	Times consulted
1.	DWD – Rural Water and Sanitation Department + TSUs	1
2	DWD – Urban Water and Sewerage Services Department (Operation and maintenance; planning and development)	2
3	Water and Sanitation Umbrella Organization - Central	1
4.	Private Sector – Private Operator – Kasanje Water Supply	1
5.	DWD – Water and Sewerage Regulatory Unit	0
6.	DWRM - Water Quality Management Department	3
7.	NWSC – WQM and WSP	3
8.	UNBS – Standards Development/enforcement	2
9.	MoH – Environmental Health Division	1
10.	MOIA – Directorate of Government Analytical Laboratories	1
11.	Private Sector - Chemiphar	1
12.	Austrian Development Aid	1

Consultations carried out– stakeholder workshops

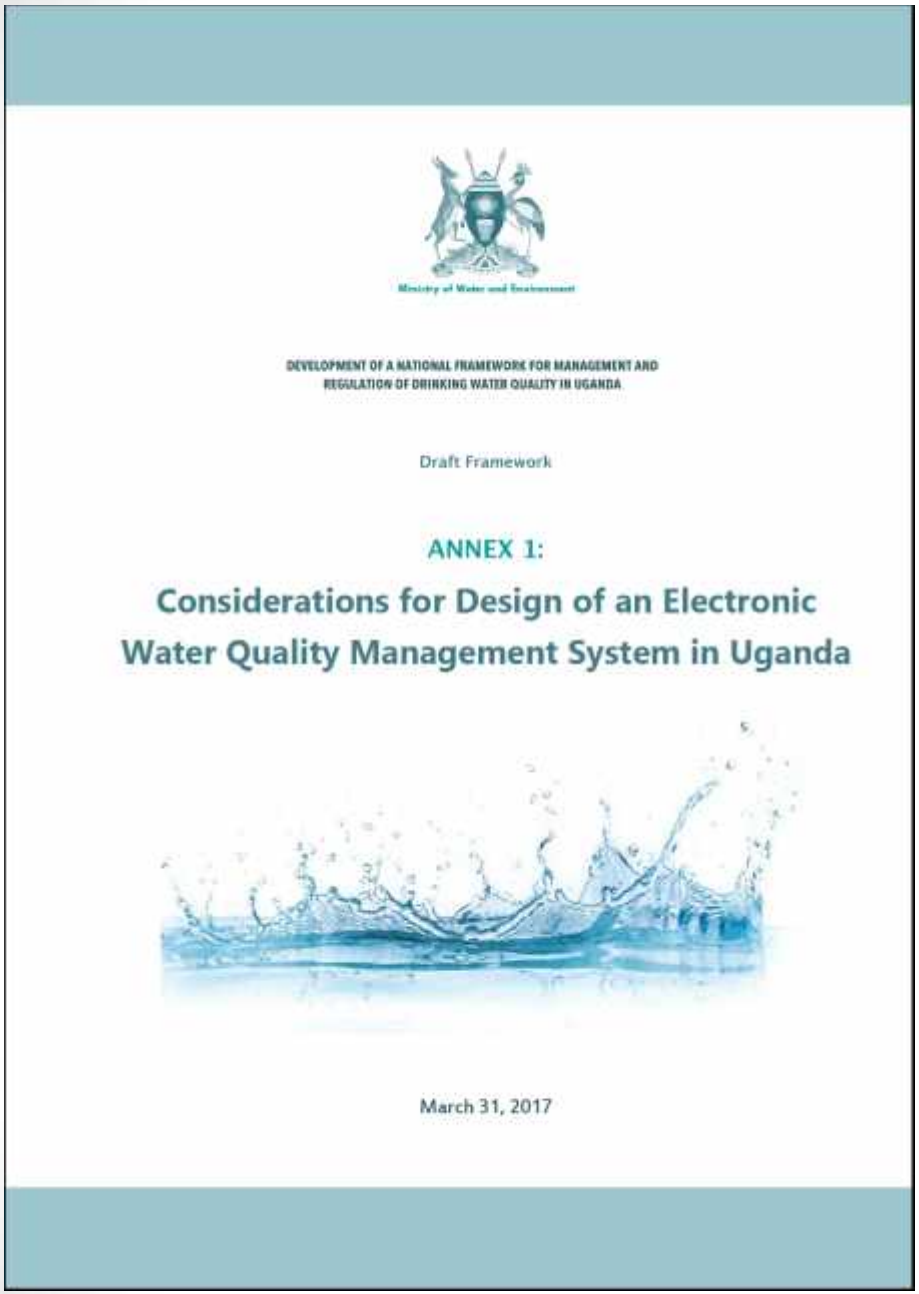
- Inception Phase – November 2016 – City Royale Hotel, Kampala
- Situation Analysis – Jan 2017 – Rivonia Hotel, Kampala
- Draft Framework – 10th April 2017 – Rivonia Hotel, Kampala



The Draft Framework

29 recommendations addressing:

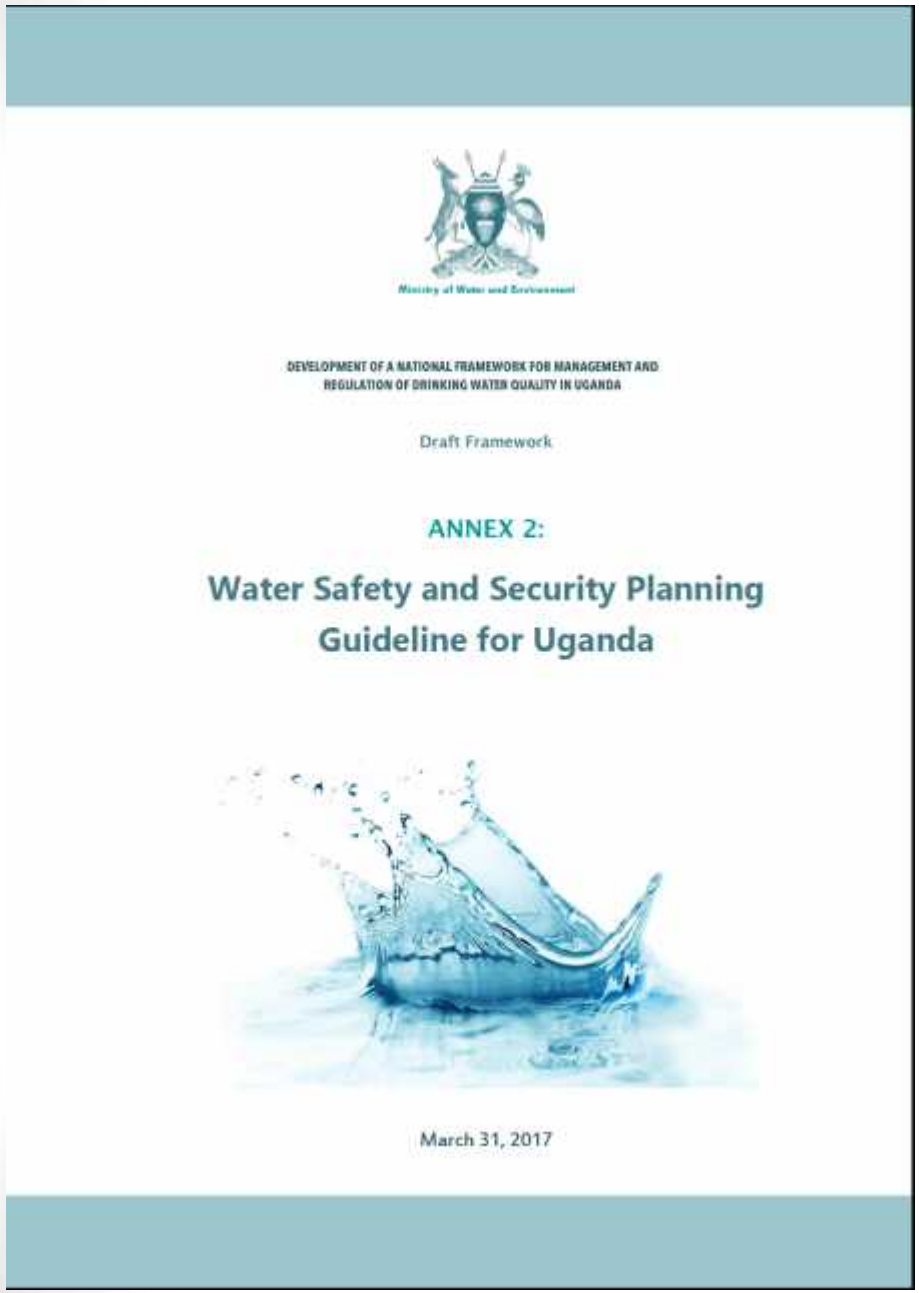
- Drinking water quality monitoring and regulation;
- Regulation of water quality testing laboratories;
- Regulation of water treatment chemicals;
- Regulation of household-level water purification technologies
- Implementation of water security and safety planning
- Management of drinking water quality in emergency situations



The Draft Framework

ANNEX 1 Covers:

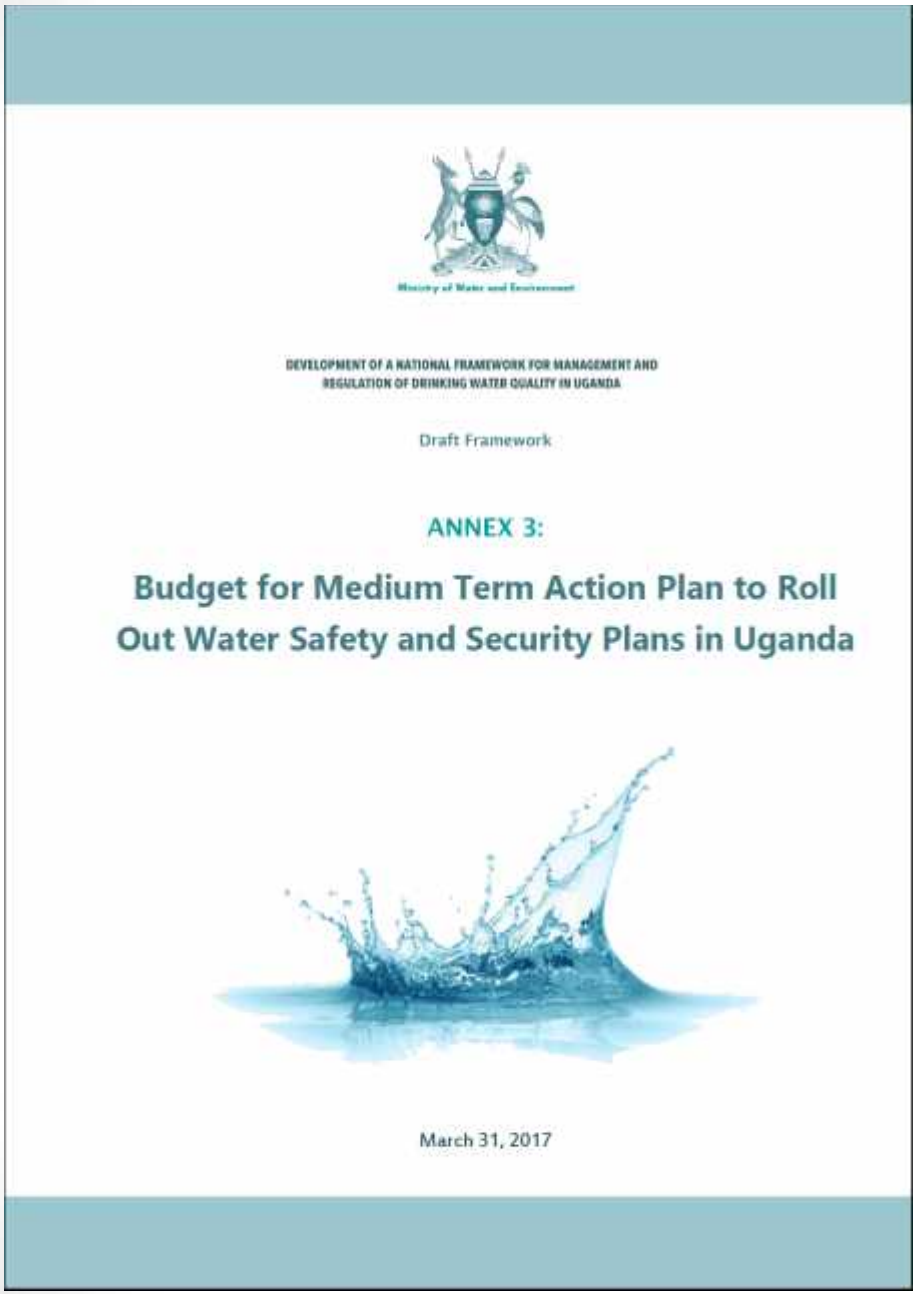
- Recommendations on how to set up an electronic water quality monitoring system in the country – to facilitate operational monitoring and regulation of drinking water quality



The Draft Framework

ANNEX 2 Covers:

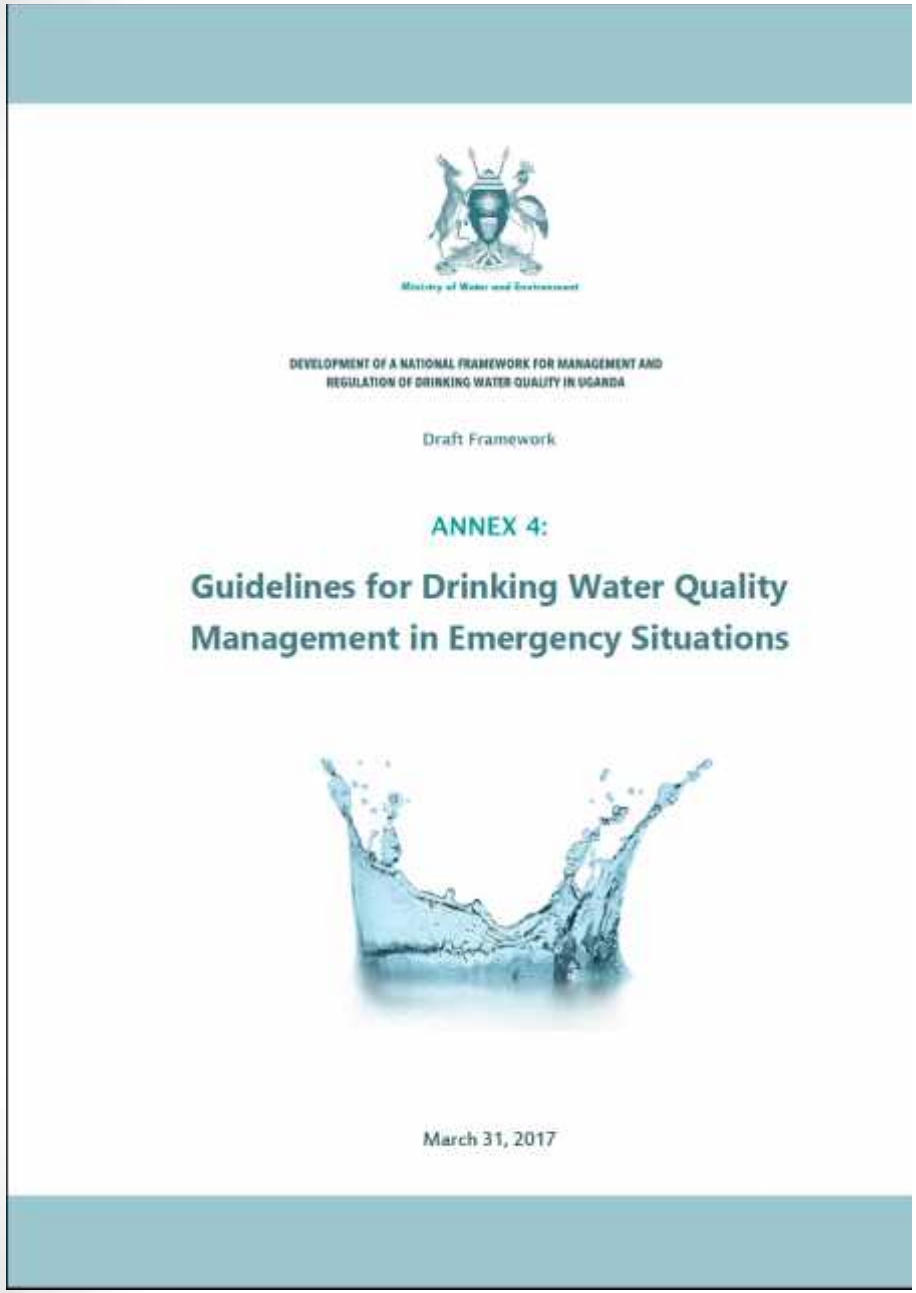
- Step-by-step guide on developing and implementing WSSPs
- Meant for utility managers and operators



The Draft Framework

ANEX 3 Covers:

- Detailed budget for roll out of WSSP in Uganda
- Awareness raising
- Training
- Strengthening technical facilities



The Draft Framework

ANNEX 4 Covers:

- Step-by-step guide on preparation of Emergency Response and Recovery Plans for Water Supply Systems
- Includes considerations for emergency water supply
- Includes scenarios of emergencies and typical responses

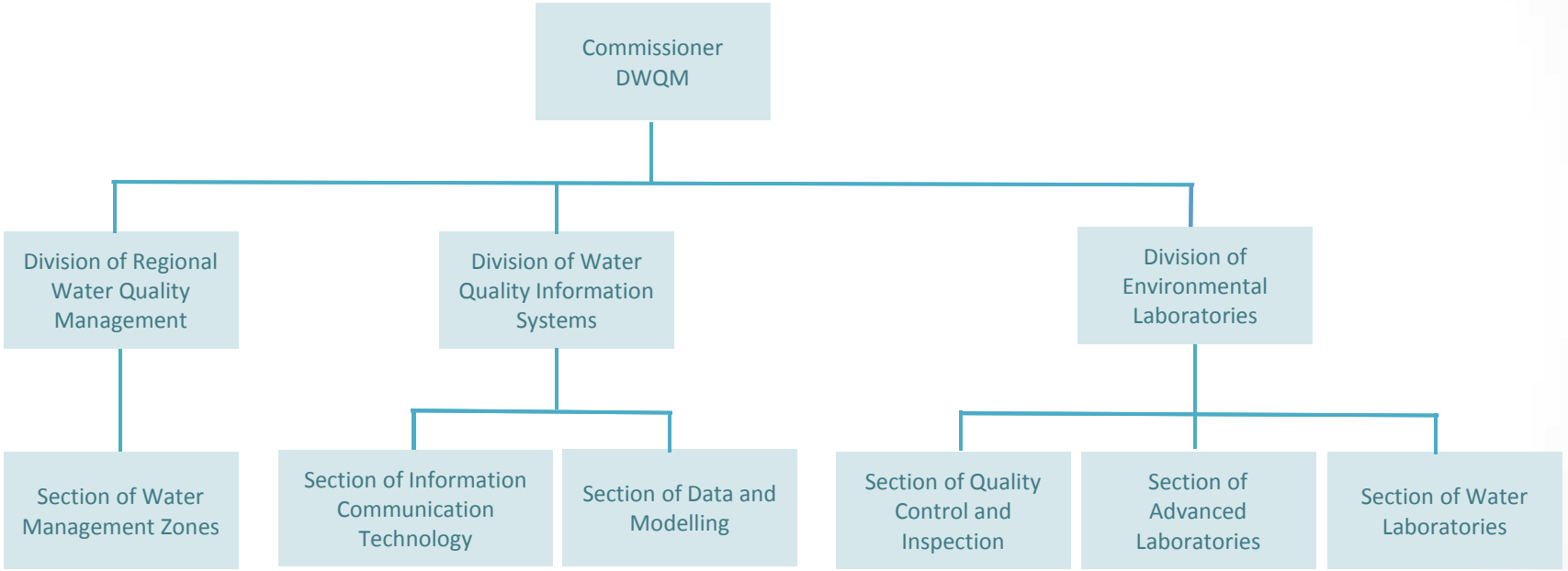
Some key findings

- The water policy and water act do not provide for drinking water quality regulation; no clearly defined agency to play this role
- Many water testing labs exist in the country; only two have ISO/IEC 17025 Accreditation; none of the labs has capacity to test for all parameters in the Potable Water Specification (US EAS 12 of 2014)
- All sector agencies not aware of the new drinking WQ standard; using the 2008 standards
- UPMiS being developing and showing great promise; but still no single system for water quality monitoring covering large towns, small towns, rural areas
- Water safety planning is a voluntary not mandatory undertaking under the law (US EAS 12)
- There is no law providing for certification and regulation of household-level water treatment technologies
- Water quality testing is ongoing but underfunded in small towns, rural growth centres and rural areas

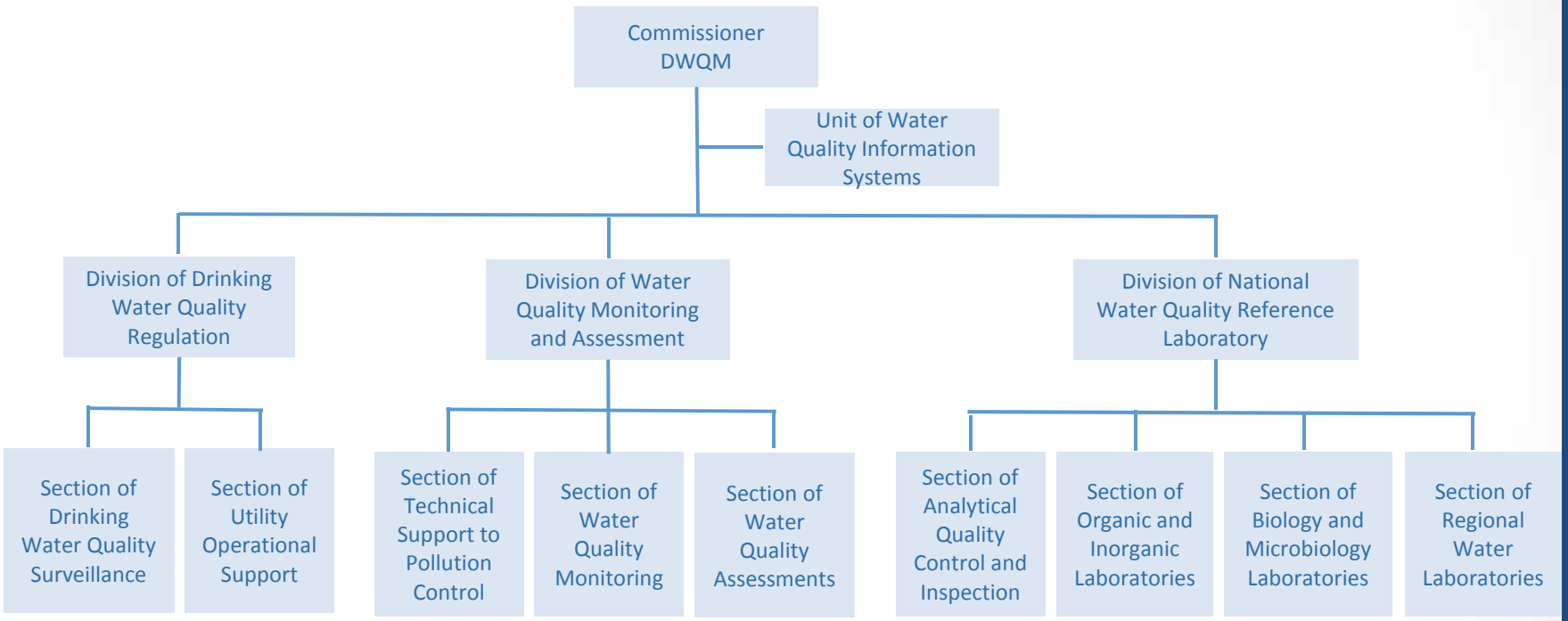
Some key recommendations

- The DWQM to be re-organised; create a Division for Drinking Water Quality Regulation
  - Medium Term recommendation – elevate Division to Department
  - Long-term recommendation – create an autonomous regulatory agencies under the MoWE
- The current Division of Environmental Laboratories to be re-organises and designated as the regulator for water testing laboratories
- Introduce regulations for implementation of the Potable Water Specification; introduce regulations for household-level technologies
- Establish the Appropriate Technology Centre as a unit of the proposed Water Resources Institute; ATC and DWQM to jointly assess household level technologies before certification by Director, DWD.

The present structure of DWQM



The proposed re-organisation



The action plan on WSSP

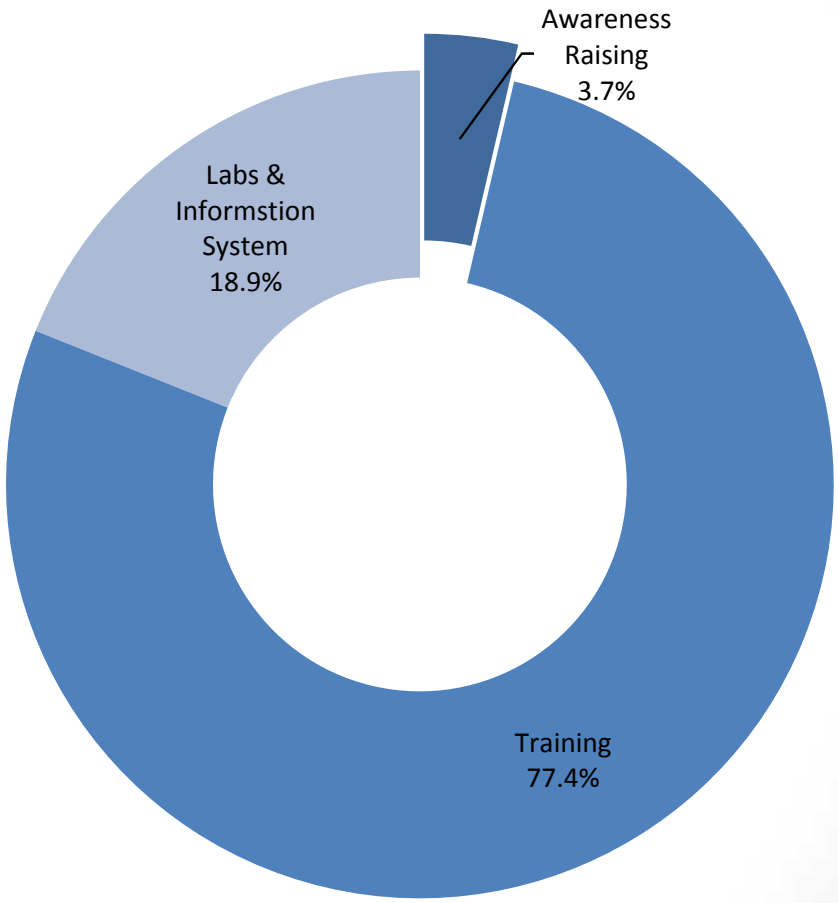
- **Immediate Objective 1:** Greater awareness and increased appreciation of the WSSP Concept amongst technical and non-technical staff of the water supply sub-sector.
  - *Activity 1.1*: Preparation and dissemination of awareness materials and WSSP Guidelines and manuals
  - *Activity 1.2*: Carrying out general awareness raising on WSSP

The action plan on WSSP

- **Immediate Objective 2**: Improved national capacity for preparation, implementation and auditing of WSSP
  - *Activity 2.1*: Carrying out technical training for authorities and operators of urban water supply systems on WSSP
  - *Activity 2.2* Carrying out technical training for authorities and operators of rural water supply systems on WSSP
  - *Activity 2.3:* Carrying out technical Training of Trainers (ToT) event on WSSP
  - *Activity 2.4:* Providing technical assistance to water supply systems in the development of WSSPs.
  - *Activity 2.5:* Providing technical assistance to water supply systems in the implementation of WSSPs.
  - *Activity 2.6*: Providing technical assistance to water supply systems in auditing of WSSPs
  - *Activity 2.7:* Providing technical assistance for incorporation of security risk assessments and security risk precautionary measures in WSSP.

The action plan on WSSP

- **Immediate Objective 3**: Enhanced laboratory facilities and information systems that supply WSSP
  - *Activity 3.1*: Designing, developing and operating and maintaining an Electronic Water Quality Management System (EWQMS) for Uganda
  - *Activity 3.2*: Improving the analytical capacity of water testing laboratories of water utilities



US $ 1.4 million over 5 years

Electronic Water Quality Management System

Criteria	Recommendation
Capabilities of the system	• Document depository • Ability to upload water quality data • Ability to view uploaded data • Ability to generate reports from the system
Will the EWQMS be a stand-alone system or part of any existing database system?	EWQMS should be a stand-alone application with its own identity/branding, and ability to import or export data/information to other databases/systems.
Licensed software or Free Open Source software?	Free Open Source Software in accordance with government policy
Modification of existing system or built from scratch	This needs to be studied further

Electronic Water Quality Management System

Criteria	Recommendation
Where to locate the EWQMS server?	Should be housed in the premises of an Internet Service Provider (ISP) to ensure that internet bandwidth for data upload does not become a bottleneck to the operation of the system. Periodical back-ups to be made
Will the EWQMS be accessible via a standalone website, or will it be linked to an existing MDA website	The EWQMS could be accessed from the existing MoWE website
Data exchange capability	Should have ability to exchange data with existing systems – UPMiS, NWSC, etc.
How will security be controlled?	System of passwords to introduce restrictions for upload, accessing or modifying sensitive data

Minimum WQ testing

Parameters

1. Electrical conductivity/TDS
2. Colour
3. Turbidity
4. Taste
5. Odour
6. Faecal coli/E.coli
7. Shigella sp
8. Salmonella sp

Parameters

9. Fluoride
10. Nitrate
11. Nitrite
12. pH
13. Aluminium
14. Iron (total)
15. Ammonium
16. Residual chlorine

Recommendations for mandatory WQ testing

Class A water supply systems
(conventional/advanced treatment systems)

Water treatment unit processes	Water quality parameters	Sampling and testing frequency	Essential water testing equipment
• Screening • Pre-sedimentation • Aeration • Chemical coagulation (alum/ organic polymers) • Clarification • Disinfection (hypochlorite/ chlorine/ UV light) • pH adjustment • Resins/ion-exchange	• Total coliform • E. coli • pH • Electrical Conductivity • Colour • Turbidity • Total solids • Total Hardness • Iron (II) • Iron (Total) • Nitrates • Nitrites • Aluminium • Residual chlorine	• Twice a month – testing for a minimum of 14 parameters • Twice a year (March and September) – carrying out full physico-chemical and bacteriological analysis	• Autoclave • Incubators with adjustable temperature • Filtration manifold • Laboratory bench Temp/pH/EC Meter • Potable digital Turbidimeter • Comparator for residual chlorine • Portable spectrophotometer for major ion analysis • Assorted glassware including titration apparatus for hardness • Water still • Oven • Weighing scale

Recommendations for mandatory WQ testing

Class B water supply systems (simple treatment)

Water treatment unit processes	Water quality parameters	Sampling and testing frequency	Essential water testing equipment
• Rapid/slow sand filtration • Disinfection (hypochlorite/ chlorine/ UV light)	• E. coli • pH • Turbidity • Residual chlorine	• Once a month – testing for a minimum of 4 parameters • Twice a year (March and September) – carrying out full physico-chemical and bacteriological analysis	• Membrane filtration equipment • Portable incubator • Digital pocket pH Meter • Portable digital Turbidimeter • Comparator for residual chlorine

Recommendations for mandatory WQ testing

Class C water supply systems (disinfection only)

Water treatment unit processes	Water quality parameters	Sampling and testing frequency	Essential water testing equipment
• Chemical disinfection (hypochlorite)	• E. coli • pH • Turbidity • Residual chlorine	• Once a month – testing for a minimum of 4 parameters • Once a year (March) – carrying out full physico-chemical and bacteriological analysis	• Simple presence/ absence test kits for coliform bacteria • Simple blacklight for E.coli confirmation • Digital pocket pH Meter • Turbidity tube • Comparator for residual chlorine

Recommendations for mandatory WQ testing

Class D water supply systems (no treatment)

Water treatment unit processes	Water quality parameters	Sampling and testing frequency	Essential water testing equipment
• No treatment (pump and distribute)	• E. coli • Turbidity	• Once every two months – testing for a minimum of 2 parameters • Once a year (March) – carrying out full physico-chemical and bacteriological analysis	• Simple presence/ absence test kits for coliform bacteria • Simple blacklight for E.coli confirmation • Turbidity tube

Water quality testing for rural point water sources

- Support new districts to acquire potable water testing kits
- Identify cheap and simple testing kits that can be used by WSCs to carry out tests
- Carry out a pilot study on pooling of resources for water testing by WSCs

- Cost US $ 15-40 to acquire;
- Similar amount of consumables for a few tests

Policy and legal team

- Looking at the policy and legal implications of the technical recommendations
- Drafting changes to the Water Policy and Water Act where the action called for is a small amendment to the policy and Act.

Conclusion

- Wide ranging recommendations made to address the multi-faceted problem of drinking water quality.
- The WQ problem can be tackled if recommendations are implemented – requires action by all players
- There are many practical tools that can immediately start to be used to improve drinking WQ
- In the end, not a quick fix problem

End