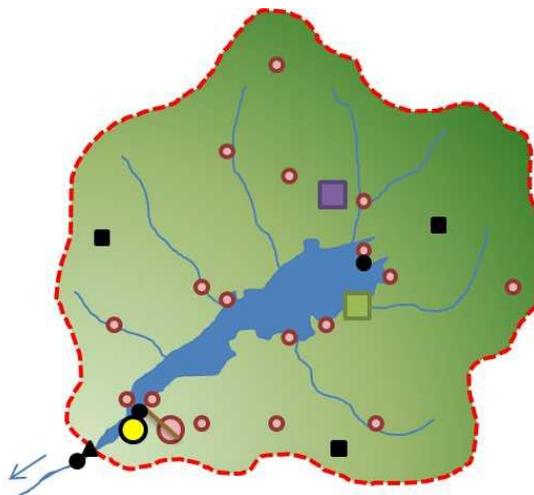




THE REPUBLIC OF UGANDA

Ministry of Water and Environment

**FRAMEWORK AND GUIDELINES FOR
WATER SOURCE PROTECTION**
Volume 1: Framework for Water Source Protection



1

May 2013

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Volumes

- Volume 1: Framework for Water Source Protection
- Volume 2: Guidelines for Protecting Water Sources for Piped Water Supply Systems
- Volume 3: Guidelines for Protecting Water Sources for Point Source Water Supply Systems
- Volume 4: Guidelines for Protecting Water Sources for Multipurpose Reservoirs
- Volume 5: Guidelines for Protecting Water Sources for Hydroelectric Power Plants

Table of Contents

Acknowledgements.....	6
1 Introduction	7
Need for the guidelines	7
Case studies of water source degradation	9
What are the guidelines for?	12
Who are the guidelines for?	13
Conceptual Model: Threat – Pathway – Water Source.....	15
Guidelines Process and Outputs.....	18
Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes.....	19
Budgeting for Water Source Protection	23
2 A Framework for Water Source Protection Planning.....	25
Step 1: Initiation and Preparation.....	25
Step 2: Technical Analysis	26
Step 3: Stakeholder Engagement	35
Step 4: Resource Mobilisation	42
Step 6: Implementation	53
Step 7: Monitoring and Regulation	60
3 General Annexes.....	62
ANNEX A: Relevant Ugandan Policy, Legislation and Regulations.....	62
ANNEX B: Further Information.....	62
ANNEX C: Ugandan Standards	63
ANNEX D: Water Source Protection Communications Strategy	65
ANNEX E: People/Institutions consulted during formulation of the Guidelines	74

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

List of Tables

Table 1: Over-arching objectives for Water Source Protection.....	13
Table 2: T/P/WS – Protecting the Water Supply for Town ‘A’ from Over-Abstraction by Pumping Station Town ‘B’	17
Table 3: T/P/WS – Protecting the Water Supply for Town ‘A’ from Industrial Discharge	18
Table 4: Sources of Ugandan Environment Data.....	28
Table 5: Hazard Types	30
Table 6: T/P/WS Table – Example: Protecting the Water Supply for Town ‘A’ from Urban Runoff	32
Table 7: T/P/WS Table – Protecting the Water Supply for Town ‘A’ from Soil Erosion.....	34
Table 8: Example of Target Monitoring: River Flows	34
Table 9: Example of Target Monitoring: Water Rationing in Kumbo.....	34
Table 10: Example Targets for Town ‘A’ Water Source	35
Table 11: Livelihood Analysis Template	41
Table 12: WSPP Financial Plan.....	44
Table 13: Example Roles and Responsibilities Chart	50
Table 14: PART A - Water Source Description Summary	51
Table 15: PART B - Aims, Objectives, Targets and Monitoring Summary	52
Table 16: PART C - Risks and Control Measures Summary.....	52
Table 17: PART D - Action Plan Summary	52
Table 18: PART E – Financial Plan Summary	53
Table 19: Protection Zones	55

List of Figures

Figure 1: Water Cycle.....	15
Figure 2: A catchment area (river example).....	15
Figure 3: Threat-Pathway-Water Source model elements	16
Figure 4: Example of the <i>Threat – Pathway – Water Source</i> Map	17
Figure 5: Water Source Protection Guideline Structure	19
Figure 6: Hierarchy of Water Management and Protection Plans	21
Figure 7: Steps in Water Safety Planning to protect water quality.....	22
Figure 8: Example of a Water Source Catchment Map.....	31
Figure 9: Celebrating the opening of a protected spring	54
Figure 10: Illustration of the Vadose Zone (US Geological Survey)	57

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Acronyms

CBO	Community Based Organisation
CLTS	Community-Led Total Sanitation
CMO	Catchment Management Organisation
DEA	Directorate of Environmental Affairs
DIM	District Implementation Manual
DWD	Directorate of Water Development
DWO	District Water Officers
DWRM	Directorate of Water Resource Management
EIA	Environmental Impact Assessment
FSSD	Forestry Sector Support Department
INGO	International Non Governmental Organisation
IUCN	International Union for the Conservation of Nature
JAF	Joint Assessment Framework
JSR	Joint Sector Review
MoAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MoEMD	Ministry of Energy and Mineral Development
MoFPED	Ministry of Finance, Planning and Economic Development
MoLHUD	Ministry of Lands, Housing and Urban Development
MWE	Ministry of Water & Environment
NEMA	National Environmental Management Authority
NFA	National Forest Authority
NGO	Non-Governmental Organisation
NWSC	National Water and Sewerage Corporation
OPM	Office of the Prime Minister
T/P/WS	Threat-Pathway-Water Source model
TSU	Technical Support Unit
UWA	Uganda Wildlife Authority
WMZ	Water Management Zones
WRM	Water Resources Management
WSDF	Water and Sanitation Development Facility
WSPC	Water Source Protection Committee
WSPP	Water Source Protection Plan

Glossary

<i>Water Source</i>	For the purpose of these guidelines, a Water Source is a geographical point, or piece of infrastructure, where water is taken from the environment and used for a specific socio-economic purpose, such as water supply, agriculture or hydroelectricity generation.
<i>Abstraction</i>	Taking water from the environment, generally by motorised or manual pumping from a well, borehole, lake, river or spring.
<i>Aquifer</i>	Any body of water-bearing rock that is sufficiently porous and permeable that water can be taken, often from natural springs or from artificially drilled or dug wells or boreholes.
<i>Contributor</i>	A stakeholder that contributes to the development or implementation of a Water Source Protection Plan through facilitation, information sharing, financial or in-kind contributions.
<i>Catchment/ Watershed / River Basin</i>	A drainage basin or area of land from which surface water drains to a single exit point (usually a point on a river or the estuary where a river enters the sea). Where there is groundwater, the movement of water is generally more complex because groundwater drainage does not always follow the same pattern as the overlying topography. In this report 'Catchment' is used by preference but some the literature refers to 'watersheds' or 'river basins', which usually have the same meaning.
<i>Control Measure</i>	Actions that can be taken to protect a Water Source.
<i>Hazard</i>	The nature of problem arising from the Threat that can harm the Water Source.
<i>Implementer</i>	The organisation that is the primary user of these guidelines to prepare a Water Source Protection Plan. For new schemes this will be the developer organisation, for existing schemes it is likely to be the owner of an asset (for example a Water Authority who owns a pumping station or a power company that owns an hydro-electric scheme), or a proxy (for example a Water User Committee who manages a multi-purpose reservoir although ownership lies

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

	ultimately with MWE).
<i>Pathway</i>	The physical route through the environment by which a Threat affects a Water Source. For example, a fuel spillage from a petrol filling station could affect a Water Source through groundwater flow or a surface watercourse.
<i>Piped Water Supply</i>	A water supply system where water is delivered to the end user through a pipe network. This includes both gravity flows schemes fed by spring and pressurised pumped systems from boreholes or surface water.
<i>Point Water Source</i>	A water supply where the user collects the water from the water source (well, borehole with handpump or spring)
<i>Risk</i>	The likelihood, or probability, of a Hazard having an adverse impact on a Water Source.
<i>Threat</i>	An activity, process, built structure or natural feature that presents a potential threat to water quality, water quantity or reliability of water in the environment which is subsequently used by a Water Source. For example, a Petrol Filling Station is a Threat because if petrol or diesel gets into public water supply it will cause health problems.
<i>End Water Users</i>	The people who benefit from the Water Source through supply of drinking water, water for agriculture and livelihoods, water for fisheries, or water for energy production.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Acknowledgements

Acknowledgements

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Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Need for the guidelines

1 Introduction

This volume presents the Framework for Water Source Protection Guidelines; this is then applied in four further volumes that give specific guidance for the following types of water infrastructure:

- Vol. 2: Piped water supplies (groundwater, surface water abstraction from lakes, rivers and reservoirs, gravity flow piped schemes from springs)
- Vol. 3: Point water supplies (point source abstractions from wells, boreholes, springs and surface water, generally in rural and peri-urban areas)
- Vol. 4: Multipurpose reservoirs and valley tanks (surface water impoundments and abstraction from rivers, lakes, reservoirs and surface runoff)
- Vol. 5: Hydroelectric Power Plants (hydroelectric dams, run-of-river hydroelectric power stations)

The four volumes (2-5) of specific guidance are intended for water infrastructure managers and relevant government officials at the national and district levels and are intentionally concise to encourage their uptake and use. However, some users may want, or need, a deeper insight into the water source protection process. Hence, the purpose of this Framework volume is to present a systematic guide to producing a Water Source Protection Plan for any type of water source.

Throughout this document, the process is illustrated using a hypothetical example of a town with a piped water system operated by the National Water and Sewerage Corporation (NWSC). **Please note that all figures and allocated responsibilities are for illustrative purposes only.**

Need for the guidelines

In Uganda, there are extensive forested areas and wetlands, which act as stores of water and perform water purification functions, however increasing population density and demand for land for agriculture, settlement and industrial establishments has led to their widespread clearance. The resulting farm bush landscape is poor at retaining and purifying water and this leads to in rapid water runoff, soil erosion and water shortages. Even though much of Uganda has a high annual rainfall, with an average of 1200 mm per year, water shortages in the dry season are increasingly common. Protection of water catchment areas, the areas that drain into the water source, is therefore crucial to retain water and to ensure sufficient water supply throughout the year.

In general, there is widespread and increasing activity that is potentially harmful to Uganda's water environment and water infrastructure. This appears to be due to a combination of increasing population with little or no access to improved sanitation, and problems caused by inappropriate land and wetland uses, and poor quality discharges from industry.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Need for the guidelines

Protection of water catchments in many countries especially those densely populated is no longer an option but a requirement. Compromised or degraded water catchments mean that societies that depend on them have either limited access to a sustainable source of water or consume contaminated water. Agencies responsible for the provision of drinking water to such communities often resort to expensive water abstraction technologies or complex treatment processes to render the water safe but such treatment comes at great cost to the societies and consumers of the water. In addition, water catchment protection can save money through lower costs for medication for water borne diseases and less sickness in the society.

The conventional approach to ensuring high quality water in public water supply systems is the construction and use of water treatment facilities at the point of abstraction. While this is generally effective, there is a capital and on-going cost associated with these systems therefore it is in the interests of the water utility (and end water user) that the quality of water being pumped from the environment is the best possible. The dirtier the water is, the more intensive (and expensive) it is to treat to an acceptable potable quality. Even then, there may still be residual problems with micro-pollutants that are difficult to remove effectively.

Water treatment systems are designed to handle incoming water quality within defined parameters. If there is a trend of water quality decline then this can reduce the lifetime of infrastructure or increase the need for further capital expenditure on more intensive water treatment, such as micro-filtration.

The quantity of water available for human use is affected by a number of complex factors, both natural and manmade. Specifically, soil erosion due deforestation and unsuitable farming practices is a widespread problem, which reduces the ability of a catchment to store water and buffer river flows, spring discharges and groundwater levels between wet and dry seasons.

A conventional engineering approach would be to move the abstraction point, or drill a deeper borehole, to maintain or increase the water yield. However, in some cases this option may not be financially, legally or technically viable.

There are many complex factors that may, or may not, influence the quality of water abstracted from a borehole, or from a river or lake. It is not possible to engineer the same level of centralised control on environmental water quality as it is with a water treatment facility. However, improving environmental water quality has multiple benefits for all water users in a given catchment. It is therefore in the interests of all stakeholders including domestic water consumers, farmers, fishermen, foresters and industries to have a high quality, unpolluted water environment. However, if responsibilities, actions, regulation and financing are unclear then general water quality decline is likely to continue.

MWE and its development partners aim to ensure that planned water-using and water-related projects are sustainable by protecting the quality and quantity of water they use. Protecting the water sources for new and existing water supplies is an increasingly urgent priority.

The Joint Technical Review (JTR) 2010 and subsequent Water Sector Working Group (WESWG) agreed that 3% of infrastructure budgets should be allocated to catchment and source protection. These guidelines were developed to enable these projects to implement this decision.

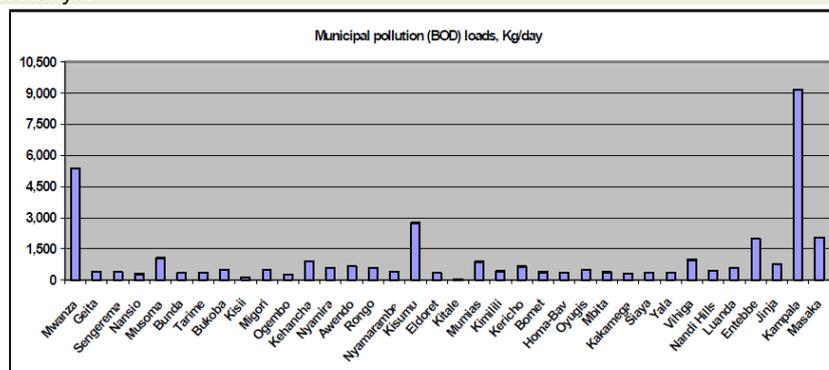
The following case studies on water supply projects illustrate increasing water quality and water quantity issues that affect sustainable water supplies.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Case studies of water source degradation

Case studies of water source degradation

Box 1: Kampala Water Supply at Gaba Water Works

Location	Lake Victoria: Kampala/Inner Murchison Bay																																																																										
<p>Map</p> <p>Lake Victoria Basin Commission (2007)</p>																																																																											
<p>Reported Problems</p>	<p>Water quality is one of the main problems being experienced by the lake and the figure below shows that Kampala is the biggest urban contributors of Biological Oxygen Demand (BOD), which is often caused by untreated, or partially treated, sewage. The figure also shows that Entebbe, Jinja and Masaka also make a significant contribution to the problem relative to urban areas to other countries, where the only comparable ones are Mwanza in Tanzania and Kisumu in Kenya.</p> <div style="text-align: center; margin: 10px 0;">  <table border="1" style="margin: 0 auto; font-size: small;"> <caption>Municipal pollution (BOD) loads, Kg/day</caption> <thead> <tr> <th>City</th> <th>BOD Load (Kg/day)</th> </tr> </thead> <tbody> <tr><td>Mwanza</td><td>5,500</td></tr> <tr><td>Geita</td><td>1,000</td></tr> <tr><td>Sengerema</td><td>500</td></tr> <tr><td>Namisio</td><td>500</td></tr> <tr><td>Musoma</td><td>1,000</td></tr> <tr><td>Banda</td><td>500</td></tr> <tr><td>Tarime</td><td>500</td></tr> <tr><td>Bukoba</td><td>500</td></tr> <tr><td>Kisiji</td><td>500</td></tr> <tr><td>Mogoti</td><td>500</td></tr> <tr><td>Ogumbo</td><td>500</td></tr> <tr><td>Kaharoche</td><td>500</td></tr> <tr><td>Nyamiramba</td><td>500</td></tr> <tr><td>Awendo</td><td>500</td></tr> <tr><td>Ronggo</td><td>500</td></tr> <tr><td>Nyamiramba</td><td>500</td></tr> <tr><td>Kisumu</td><td>2,500</td></tr> <tr><td>Eldoret</td><td>3,000</td></tr> <tr><td>Kilale</td><td>500</td></tr> <tr><td>Mumiet</td><td>500</td></tr> <tr><td>Kwailili</td><td>500</td></tr> <tr><td>Kericho</td><td>500</td></tr> <tr><td>Bomet</td><td>500</td></tr> <tr><td>Homa Bay</td><td>500</td></tr> <tr><td>Oyugis</td><td>500</td></tr> <tr><td>Mika</td><td>500</td></tr> <tr><td>Kakamega</td><td>500</td></tr> <tr><td>Siaya</td><td>500</td></tr> <tr><td>Yala</td><td>500</td></tr> <tr><td>Vitiga</td><td>500</td></tr> <tr><td>Nandi Hills</td><td>500</td></tr> <tr><td>Luanja</td><td>500</td></tr> <tr><td>Entebbe</td><td>1,500</td></tr> <tr><td>Jinja</td><td>1,500</td></tr> <tr><td>Kampala</td><td>9,000</td></tr> <tr><td>Masaka</td><td>1,500</td></tr> </tbody> </table> </div> <p>Lake Victoria Basin Commission (2007)</p> <p>The high nutrient loads from urban and rural runoff have been blamed for algal blooms that have increased treatment costs, clogged intakes and caused fish kills. Other pollutants are also a problem: organic/petrochemicals, heavy metals and others which are potentially harmful to health. Water hyacinth (an invasive non-native species) has spread prolifically around the lake shore. Soil erosion is also leading to siltation in some parts of the lake, for example the mouth of the Kagera River.</p>	City	BOD Load (Kg/day)	Mwanza	5,500	Geita	1,000	Sengerema	500	Namisio	500	Musoma	1,000	Banda	500	Tarime	500	Bukoba	500	Kisiji	500	Mogoti	500	Ogumbo	500	Kaharoche	500	Nyamiramba	500	Awendo	500	Ronggo	500	Nyamiramba	500	Kisumu	2,500	Eldoret	3,000	Kilale	500	Mumiet	500	Kwailili	500	Kericho	500	Bomet	500	Homa Bay	500	Oyugis	500	Mika	500	Kakamega	500	Siaya	500	Yala	500	Vitiga	500	Nandi Hills	500	Luanja	500	Entebbe	1,500	Jinja	1,500	Kampala	9,000	Masaka	1,500
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<p>Reported</p>	<p>There are numerous sources of pollution all around the lake, but the inner Murchison Bay area</p>																																																																										

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Case studies of water source degradation

Location	Lake Victoria: Kampala/Inner Murchison Bay
Causes of the Problems	<p>around Kampala is particularly vulnerable because of the enclosed nature of the lake at that point, which has limited water circulation, and the proximity of many sources of pollution¹. Notable sources of pollution are:</p> <ul style="list-style-type: none"> ▪ untreated, or inadequately treated, sewage and wastewater discharges; ▪ untreated industrial and commercial discharges; ▪ contaminated storm runoff from the urban area due to inadequate solid waste collection and management; <p>The quality in Lake Victoria is declining due to numerous point source and diffuse discharges. One that is commonly identified is the leaching of chemicals and nutrients from flower farms on, or near, the lake shore. There are also discharges from factories, abattoirs and tanneries. The problems have been amplified because of wetland loss and encroachment: the natural wetlands on the lake edge that would act as a natural filter that helps to remove nutrients, and other contaminants, from the water have been degraded².</p>
Water Sources Affected	<p>Many water users are affected by these problems. The most well defined impact is on the Gaba NWSC Water Works, which supplies the Kampala piped water system. Treatment costs have reportedly tripled between 2007 and 2010 from an estimate of US\$0.3 per cubic meter of water in 2007 to about US\$0.9 per cubic meter.</p> <p>The poor water quality also leads, paradoxically, to water scarcity for lakeside communities who are often very poor and cannot afford sufficient water treatment, or are forced to use large quantities of fuel wood to boil water.</p> <p>Cost estimates for the problems caused include³:</p> <ul style="list-style-type: none"> ▪ <i>The cost of different macrophyte control measures are manual cutting (mean US\$ 54 ha/year), mechanical removal (mean US\$189 ha/year), herbicide application (mean US\$ 110 ha/year) and combinations (US\$ 45 ha/year)</i> ▪ <i>Maintaining a clear passage for ships to dock at Port Bell in Uganda: US\$ 3-5 million p.a.;</i> ▪ <i>Cleaning intake screens at the Owen Falls (Nulubaale) hydroelectric plant at Jinja in Uganda: US\$ 1 million p.a.;</i> ▪ <i>Losses in local fisheries from accumulation of water hyacinth at fishing beaches and landing sites around the Lake making it difficult or impossible for fishing boats to be launched or recovered: US\$ 0.2 million p.a. but with a very serious local impact;</i>"
Water Source Protection	<p>The NWSC Gaba Water Works is the highest priority water source because it supplies drinking water to Kampala. Improving the water quality arriving at the intake will require action at a Catchment Plan level and through Transboundary partnerships. A Water Source Protection Plan for Gaba should focus on working with stakeholders in Inner Murchison Bay area, in particular Kampala City Council Authority, industries discharging into the Nakivubo Channel, NWSC wastewater treatment works, NEMA, DWRM, DWD, and stakeholders living and working by the lake shore or encroaching on the wetlands around the Inner Murchison Bay.</p>

¹ C. Kanyesigye (NWSC), Pers. Comms. 02.05.2012

² B. Nakangu (IUCN), Pers. Comms. 02.05.2012

³ p. 50 - LAKE VICTORIA BASIN COMMISSION (2007) *Regional Transboundary Diagnostic Analysis Of The Lake Victoria Basin*, East African Community, March 2007

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Case studies of water source degradation

Box 2: River Mpanga (Hydroelectric Power Plant, Fort Portal and Kamwenge Water Supplies)

Location	River Mpanga
<p>Map/Photo</p> <p>Marfanga, H. (2011)</p>	
<p>Reported Problems</p>	<p>The River Mpanga, in South West Uganda, originates upstream from Mount Rwenzori and flows through a cleft over the 50m Mpanga falls. The river then flows gently along the boundary of Queen Elizabeth National Park into Lake George Ramsar site. However it has been reported that river flows have 'reduced significantly in the last ten years'.</p>
<p>Reported Causes of the Problems</p>	<p>Declining water quantities is attributed to number of factors including: deforestation of the mountain slopes, replacement of indigenous tree species with non-native species like Eucalyptus (which has a very high water uptake), wetlands degradation, soil erosion and mining of sand and stones from the river banks. There are also reported problems with pollution from riparian settlements.</p>
<p>Water Sources Affected</p>	<p>Water supply for Fort Portal and Kamwenge Towns.</p> <p>Mpanga min-hydropower plant of 18MW capacity. The hydroelectric power plant was commissioned⁴, but it is not able to generate power to its full capacity throughout the year due to erratic river flows.</p>
<p>Water Source Protection</p>	<p>A water source protection plan should focus on the land management activities that cause soil erosion and loss of water storage in the catchment. Soil water retention is vital to ensure steady river flows throughout the year for the piped water supplies and the hydroelectric power generation.</p>

⁴ Daily Monitor (2011) Mpanga hydro power plant commissioned (<http://www.monitor.co.ug/Business/Technology/-/688612/1106832/-/9huacbz/-/index.html> accessed 01.03.2012)

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

What are the guidelines for?

Box 3: Mbarara Water Supply (River Rwizi)

Location	River Ruizi/Rwizi
Reported Problems	In the catchment of the River Rwizi/Ruizi the agricultural practices are unsustainable and there are siltation problems, wetland encroachment and wetland reclamation. One result is low flows in the river, which affects downstream town abstractions.
Reported Causes of the Problems	Falling water levels in the River Rwizi/Ruizi have been attributed to: <ul style="list-style-type: none"> ▪ Wetland drainage/conversion due to agricultural encroachment (crop and livestock farming) ▪ Possible decline in rainfall in the catchment over the last 10 years⁵; ▪ Settlement and commercial/industrial structures in the water courses⁶. ▪ River-bed sand extraction and poor farming practices leading to soil erosion, siltation and water quality problems.^{7,8,9} ▪ Impact of the pilot irrigation for banana plantations¹⁰. ▪ Increasing use of herbicides, pesticides and fertilisers.
Water Sources Affected	Mbarara Municipal water supply is experiencing water availability throughout the year, leading to water shortages in the dry season. Likewise, water quality has declined due to pollution from Solid waste, surface run off from motor garages and car washing bays, poor quality discharge from hotels, hospitals, schools and industrial establishments ¹¹ .
Water Source Protection	A water source protection plan should focus on the land management activities that causing soil erosion and loss of water storage in the catchment. Soil water retention is vital to ensure steady river flows throughout the year for the piped water supplies. A Catchment management plan that addresses drivers of water quantity/availability and water quality as well as addressing upstream and downstream relationships is required.

What are the guidelines for?

These Water Source Protection Guidelines should help the user identify the risk to a water source and to engage the people and organisations responsible for the problem in a positive way that lead to a mutually beneficial outcome.

Quite often, the activity or practice that is causing pollution (or is disrupting natural water flows) is harmful to a wide range of stakeholders. These guidelines help the user bring those stakeholders together to identify feasible solutions and agree on a Water Source Protection Plan to achieve them.

While each plan will set its own specific aims, they should work towards the general aims and objectives set out in Table 1 below.

⁵ Section 3.1, MWE-DWRM (2011) "The Declining Trends Of Water Resources In Uganda; A Case study of River Rwizi, Lake Wamala, Lake Victoria Catchments", Water Resources Monitoring & Assessment Division, Department of Monitoring and Assessment, DWRM, March 2011.

⁶ NEMA spokesman reported in <http://www.newvision.co.ug/D/8/18/728615>

⁷ SSENENDO, A. (2010) River Rwizi drying up, *New Vision Daily*, Aug 12, 2010 (<http://www.newvision.co.ug/D/8/18/728615> accessed 01.03.2012)

⁸ MUKOMBOZI R (2011) Uganda: Thousands At Risk As River Rwizi Shrinks, *The Monitor*, Aug 8, 2011 (<http://allafrica.com/stories/201108082101.html> accessed 01.03.2012)

⁹ NTV (2011) *Eco Talk – River Rwizi* (<http://youtu.be/uWsBmhY2qac> accessed 01.03.2012)

¹⁰ MWE-DWRM/COWI (2010)

¹¹ Kaburuku, (undated) *Characterisation Of Water Quality Of River Rwizi (Mbarara Municipality) Using Biological Indicators*, Department of Environmental Management, College of Agricultural and Environmental Sciences Makerere University

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Who are the guidelines for?

Table 1: Over-arching objectives for Water Source Protection

Aim	Objectives
1. Improved Water Quality	1.1. Health: Minimise the risk to human and livestock health 1.2 Equipment: Minimise risk of damage to pumps and water services equipment (e.g. through corrosion)
2. Reliable Water Quantity	2.1 Yield: Ensure adequate yield to meet water supply demand 2.2. Reliability: Minimise seasonal disruption or halt long term declines in water flows/levels
3. Better Livelihood Opportunities	3.1 Sustainable Land Management: Increase level and reliability of household income from better farming and forestry practices. 3.2 Poverty Reduction: Develop new sources of income and socio-economic security through better catchment management.

Who are the guidelines for?

These guidelines have been made for different stakeholders ranging from regulators, water users, to project managers. The roles they play include the following:

Implementer

There are the two main categories of implementers:

- Water Infrastructure Developer (Government/Public sector bodies, Private sector, NGO)
- Water Infrastructure Owner (Water Authority, Water User Committee, Electricity Generation Company)

The main user of this guidance will be the owner (in some cases the operator) of the Water Source. It is in their direct interest to lead the process because it is primarily for their benefit. They will need to understand and go through each step of the process to achieve the outcome they are after for their water supply, reservoir or hydroelectric power plant.

Before the use of Water Source Protection Guidelines, the developer or owner would make use of the quantity and quality of water available at their site and do their best to provide an engineering solution that would provide a good service. For example, NWSC installs water treatment systems to ensure that the quality of the water they provide to customers meet the necessary legal standards and guidelines. However, the quality and quantity of water in the environment from which the water is taken is declining so rapidly in many areas that it is no longer possible or cost effective to act alone. These guidelines are intended to help the Implementer reach out to other stakeholders and build working partnerships.

Protecting the water sources from threats, such as pollution, siltation and low water flows is likely to require interventions that will need technical and financial planning. These guidelines should help those responsible for designing and costing Water Source Protection Plans. Engineers using these guidelines should be able to put forward viable Control Measures options that stakeholders can understand, discuss and make decisions on.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Who are the guidelines for?

Contributor

There are several types of Contributor:

- National Government Ministries and Agencies
- Local Governments
- Water Users
- Landowners
- Non-Governmental Organisation (NGOs), Community-Based Organisations (CBOs), Faith-Based Organisation (FBOs)

A Contributor is an individual or organisation that provides input or assistance to the Implementer in preparing and implementing a Water Source Protection Plan.

The heart of the Water Source Protection process is the resolution of conflict or balancing of interests between different groups, organisations and individuals whose activities depend on and affect the quantity and quality of water in a river catchment or aquifer. It gives a mechanism for responsibilities to be taken on so that positive action happens.

The Implementer will need to build trust and work in partnership with a range of individuals, groups and organisations in their catchment. In part, this will come about through them understanding the Water Source Protection process and understanding how to engage with it. The aim is for these groups to work together to overcome conflicts and help the Implementer produce a plan that is to everyone's mutual benefit.

Delivering effective Source Protection will be a complex process that in many cases will require a mix of engineering solutions, training and behaviour change. To do this successfully, the stakeholders in the catchment are likely to need external support in terms of access to funding, training and technical advice on issues like sanitation improvement, improved agricultural skills and practices. This support may come from mandated government institutions, international development partners and NGOs. These guidelines will help those groups plan their support and capacity building with local stakeholders to get the best results.

Monitoring & Regulation

- MWE regulators (DWRM, Regulation Unit)
- National Environment Management Agency (NEMA)
- Local District Government (District Water Officers, District Environment/Natural Resource Officers)
- Water Sector Working Group
- Ministry of Energy and Mineral Development regulators (Hydroelectric only)

Water Source Protection works within the Ugandan national policy and legislative framework. It will also need to work within the framework of broader Catchment Planning that is being implemented by MWE. In some cases, permits or other legal instruments need to be applied to establish legally recognised 'Protection Areas' for the water source catchment. To do this successfully will require the input and oversight from various departments, in particular NEMA and the directorates of the Ministry of Water and Environment, however, it is anticipated that it should be the District Water and Environment Officers that take the lead and have primary authority.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

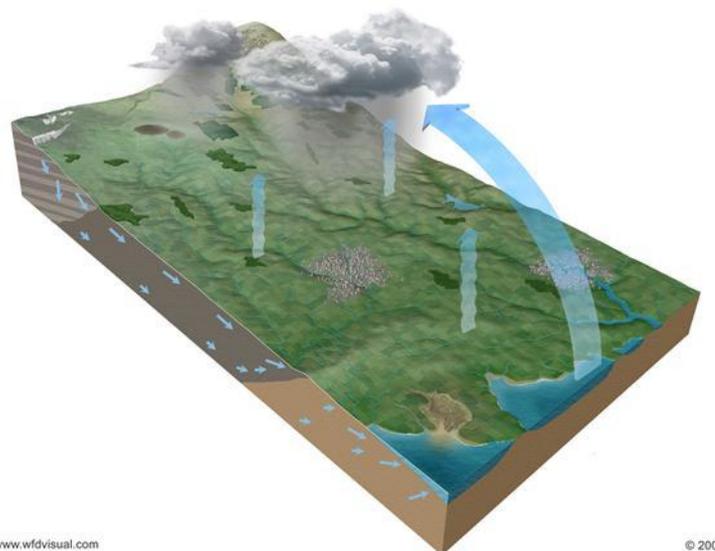
Conceptual Model: Threat – Pathway – Water Source

Where a catchment extends across more than one district, the district teams should co-ordinate and work together, either through the inter-district Water Source Protection Committee, or another suitable forum within the framework of catchment management.

Conceptual Model: Threat – Pathway – Water Source

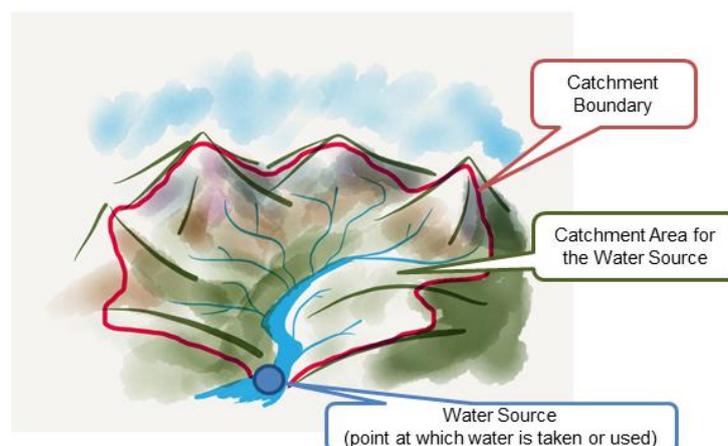
Water Sources, such as pumping stations, reservoirs and hydroelectric power plants use natural resources and are therefore vulnerable to changes in the environment, and in particular the Water Cycle (Figure 1) which deposits fresh water on the land, in the form of rain, which then flows over the surface of the land or through soil and rock in the ground.

Figure 1: Water Cycle



A catchment is an area of land that drains to a specific point (Figure 2). For these Guidelines, a catchment is the area of land that drains water to a pumping station, a spring, a well, a borehole, a reservoir or a hydroelectric power plant.

Figure 2: A catchment area (river example)



Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Conceptual Model: Threat – Pathway – Water Source

The quantity and quality of water reaching the Water Source will vary over time according to many natural and human factors. In trying to protect our Source, we must use an analytical model to establish links between cause and effect. For example, to show a Water Source can be affected by how farmers are managing the land upstream.

To do this a ‘Threat-Pathway-Source’ model has been adapted from good practice used in other countries. The parts of the model are summarised in the Figure 3 below.

Figure 3: Threat-Pathway-Water Source model elements

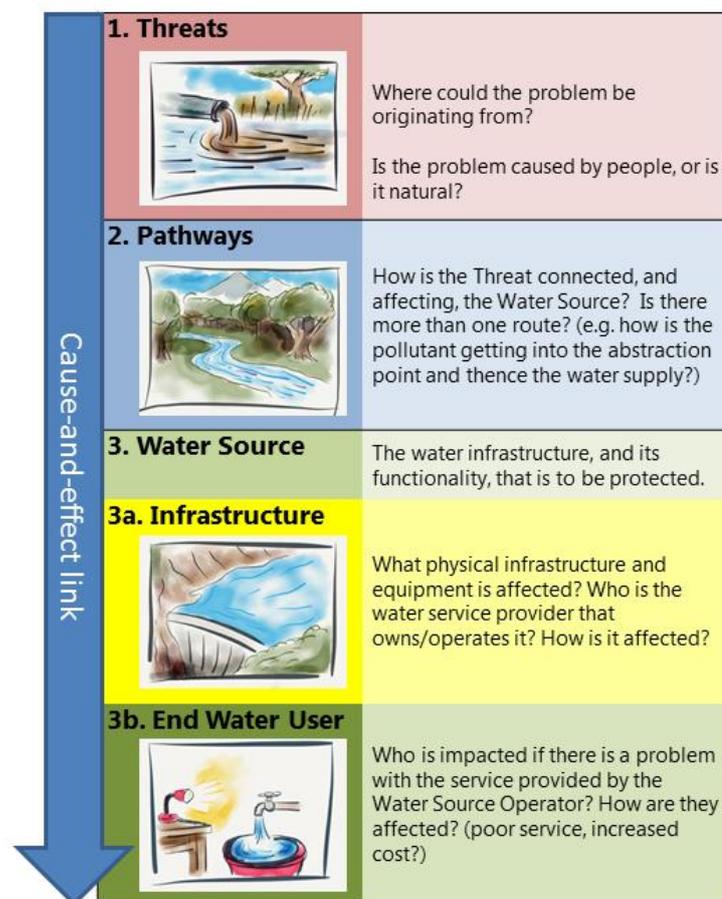


Figure 4 shows a diagram of a fictional example catchment area. The catchment area is defined by the broken red line; this is our area of interest when looking for activities that could be harming our Water Source, in this case a pumping station supplying a small town piped water system.

In this example, four threats have been identified: an industrial pollution source; soil erosion all around the catchment; the urban runoff from the town itself; and a major pumping station for another town, which is taking water out of the catchment.

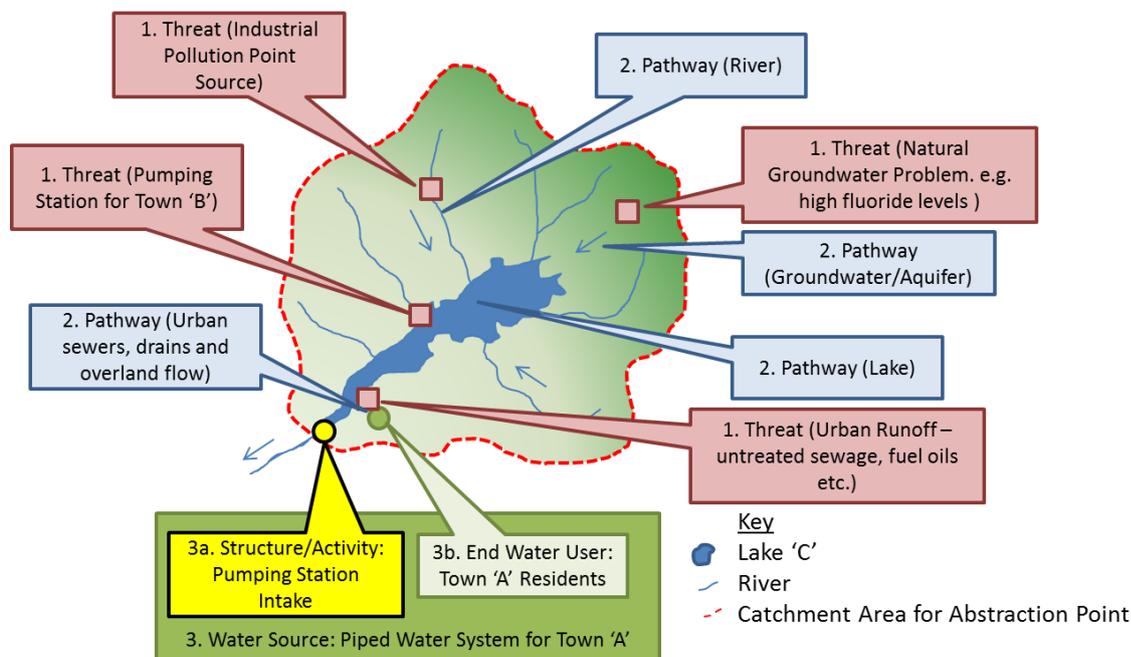
These Threats affect the Water Source through one or more Pathways. For example, the Industrial Pollution Point Source discharges toxic chemicals into a stream, the stream flows into the lake and our Pumping Station takes water from the Lake to treat and sell to customers in the Town.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Conceptual Model: Threat – Pathway – Water Source

In this way, because the industry is not paying for the machinery to treat its own discharges, that treatment cost is being passed to the residents of the downstream Town, plus all the environmental and human health damage that the industrial discharge will be doing to other water users in the catchment.

Figure 4: Example of the Threat – Pathway – Water Source Map



Commonly, it is a more cost effective solution for society as a whole to neutralise a problem as close to the source as possible. This may involve banning the use of particular chemicals (such as DDT) which are a known pollution hazard. However, some common liquid wastes, such as sewage, cannot be prevented and in these cases, treating them before they enter the environment is generally more economic and sustainable than trying to protect every potential water source (i.e. pumping station and handpump) individually.

The tables below show examples of using the *Threat-Pathway-Water Source* model from our fictional case study. The Control Measures are ideas of what to do to reduce the risk to the Water Source and the End Water User. However, not all these ideas will be effective, affordable or be compatible with the needs of other stakeholders in the catchment. That is why stakeholder engagement is central to the Water Source Protection process.

Table 2: T/P/WS – Protecting the Water Supply for Town ‘A’ from Over-Abstraction by Pumping Station Town ‘B’

Stage	Hazard/Risk	Control Measure (options)
1. Threat (Hazardous Activity) and release	High rates of pumping from a riverside pumping station to supply Town ‘B’ and other water users, not much of the water is returning to the nearby river or Lake ‘C’.	<ul style="list-style-type: none"> Reduce pumping rates, particularly at vulnerable times of year or during drought. Provide Town ‘B’ with an alternative water source.
2. Pathway (Water flowing in the environment – rivers, lakes, reservoirs, groundwater, soil, surface runoff)	The Town ‘B’ abstraction is reducing the flow of water from a nearby river entering Lake ‘C’. Lake levels are dropping, particular in dry years.	<ul style="list-style-type: none"> Measure river flows and lake levels. If they fall below an agreed threshold, then pumping should reduce or stop until the water flows recover.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Guidelines Process and Outputs

Stage	Hazard/Risk	Control Measure (options)
3a. Water Source: Water Infrastructure	The lake levels drop below the pumping station intake level.	<ul style="list-style-type: none"> Rebuild pumping station so that it can take water from Lake 'C' when levels are lower. Relocate, or build a new pumping station at another location that is less vulnerable.
3b. Water Source: Impact on End Water User	Water rationing is imposed	<ul style="list-style-type: none"> Implement water rationing to ensure fair distribution of limited water supplies. Find alternative water sources for water users. Reduce water demand by increasing water efficiency.

Table 3: T/P/WS – Protecting the Water Supply for Town 'A' from Industrial Discharge

Stage	Hazard/Risk	Control Measure (options)
1. Threat (Hazardous Activity) and release	An industrial plant is discharging untreated liquid waste into a river upstream from the Water Source.	<ul style="list-style-type: none"> Factory finds an alternative industrial process that doesn't produce the harmful waste. Factory treats waste before discharging into the environment; Factory finds a less sensitive discharge point.
2. Pathway (Water flowing in the environment – rivers, lakes, reservoirs, groundwater, soil, surface runoff)	Pollutants from the factory travel in the river water and into Lake 'C'. There is a chance that they can be abstracted by our Water Source.	<ul style="list-style-type: none"> Measure river and lake water quality. If they fall below an agreed threshold, then pumping should reduce or stop until the water flows recover.
3a. Water Source: Water Infrastructure	Declining water quality in the lake increases the amount of treatment needed to provide good quality water. Hard-to-treat pollutants will increase water treatment costs.	<ul style="list-style-type: none"> Pollution alarm system: if the factory accidentally spills chemicals into the river, then they call the downstream abstractors to warn them. The Water Source can then increase water quality monitoring to take action if the pollution plume reaches them. Relocate, or build a new pumping station at another location that is less vulnerable.
3b. Water Source: Impact on End Water User	Some pollutants may still get through and even in low concentrations may cause health problems after a long period.	<ul style="list-style-type: none"> Inform local doctors/health professionals to look out for symptoms that may be related to particular pollutants (e.g. those that cause cancer or birth defects) and insist they keep good records that could be used as evidence later.

Guidelines Process and Outputs

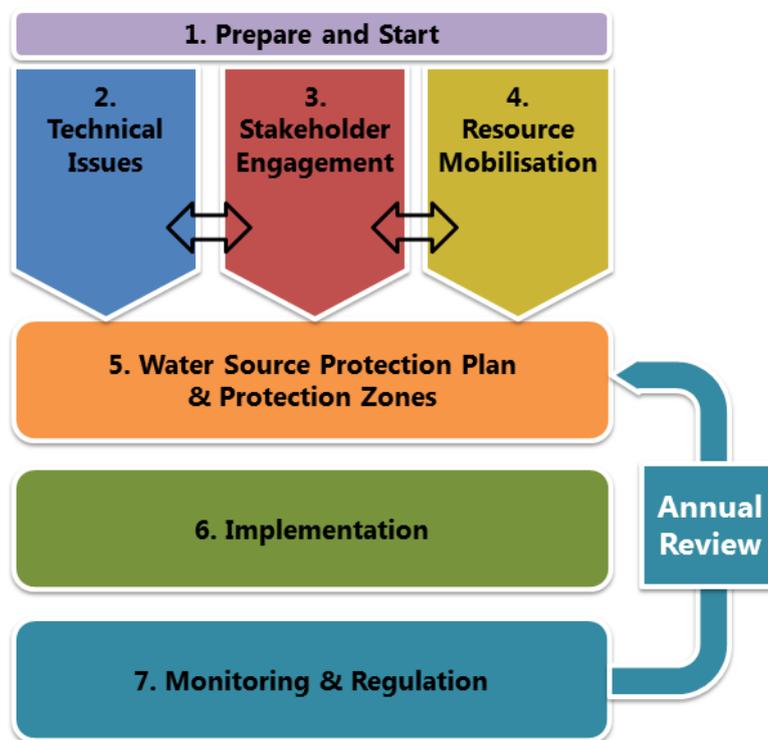
These guidelines are intended to be used to create a **'Water Source Protection Plan' (WSPP)**. This plan will be an agreed statement of objectives, actions, funding and other commitments between all the relevant stakeholders. Figure 5 shows the steps of the process that will produce a WSPP. Each step is described in the next section. Steps 2, 3 and 4 are three activity threads that are likely to progress at different speeds but should arrive at a point of agreement so that a Water Source Protection Plan can be signed off by all active parties.

Emphasis throughout is not just on finding technical solutions but also bringing stakeholders together to agree a common plan of action. Wherever possible the emphasis is on finding 'win-win' situations that improve the livelihoods of everyone in the catchment. For example, many of the problems reported have been caused by poor farming practices and deforestation that in turn cause soil erosion and siltation problems. Not only are such practices damaging to the water environment (and water services) but also to the livelihoods of dependent communities – loss of soil means loss of fertility which leads to declining yields. Better land management can boost productivity and rural incomes, while reducing the impact on the aquatic environment.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes

Figure 5: Water Source Protection Guideline Structure



Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes

The District Implementation Manual (DIM)

This District Implementation Manual (DIM) provides a comprehensive overview of the workings of the sector for stakeholders operating at various Local Government levels. The manual sets out the sector policy and institutional environment, stakeholder roles and responsibilities and outlines the procedures to be followed. The manual provides technical knowledge and information concerning the implementation of the water and sanitation activities in the sector.

The manual is intended as a reference document for practicing water and sanitation professionals as well as to provide orientation to new players in the sector. The emphasis of the document is on rural water supply and sanitation service delivery through District local Governments.

Protection of small, point sources (such as handpump boreholes and spring catchment) is also important for protecting the health and livelihoods of a large proportion of the population in Uganda, particularly in rural areas.

The revised DIM (2013) makes explicit reference to Water Source Protection Planning in Section 10.3.2, however the principles of protecting water sources are found throughout the manual. Implementers using Volumes 2, 3 and 4 should also refer to the DIM on guidance on technology choice, stakeholder engagement, procurement processes and institutional arrangements.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes

Guidelines for Catchment Based Water Resources Planning (CBWRP) in Uganda¹²

Catchment based water resources planning guidelines provide a framework for implementing and operationalizing Integrated Water Resource Management (IWRM) to enable participatory water resource planning that will relieve emerging conflicts and water scarcities and accelerate the development of sustainable and productive water infrastructure.

Draft Guidelines for Catchment Based Water Resources Planning (v7 July 2012) aim to:

- Provide a common water catchment planning framework for the WMZ planning teams;
- Provide the WMZ planning teams with an overview of the catchment planning process and the outcomes they are seeking;
- Help to create awareness and understanding of the catchment planning process and its value in supporting sustainable, equitable and more rapid economic growth and livelihoods.

The Guidelines for CBWRP emphasise the role of a Catchment Management Organisation (CMO) in planning for the catchment. The CMO has three main structures a Stakeholders Forum (SF), a Catchment Management Committee (CMC) and a Catchment Technical Committee (CTC). They should be kept informed of any Water Source Protection planning activity and are likely to be a good source of information and advice.

Catchment Based Water Resources Planning has a wider geographic scale and more comprehensive remit than Water Source Protection. One of the judgements to be made when using the Water Source Protection Guidelines is whether an identified Threat can be tackled through a Water Source Protection Plan or if it is beyond the ability of a single Implementer and requires a broader catchment-based approach. An example of this could be widespread soil erosion or poor sanitation.

A Water Source Protection Plan (WSPP) is an agreed plan between the Implementer and stakeholders on what actions need to be taken and who has responsibility for funding, implementation, monitoring and regulations. In most cases, these will sit underneath, and contribute to higher level catchment plans (see Figure 6). It is also likely that some WSPPs will become nested within other similar plans, for example, where one town abstraction point is downstream of another town's abstraction.

An important role of the catchment management plans, which will not be covered in the WSPPs, is control of new activities or structures that could affect the water quality or water resources of a catchment. For example, if a major new factory is proposed upstream of a water supply point, it will be for Catchment Management Organisation (CMO) to examine such a proposal. However, it is likely that the body responsible for that water supply point would want to be part of the dialogue on whether they would be impacted by this new activity. If the new activity is given the go-ahead, it may be necessary to update the WSPPs that are impacted and set up new agreements between stakeholders.

¹² Guidelines for Catchment Based Water Resources Planning in Uganda – Working Draft v.7, MWE, July 2012

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes

Figure 6: Hierarchy of Water Management and Protection Plans



Environmental Impact Assessment (EIA)

For new schemes, Water Source Protection planning should be considered during the Environmental Impact Assessment process, for eligible water supply works, in accordance with the National EIA Guidelines. This would require development of WSPP as a component of the mitigation (environmental management plan) to be approved alongside the EIA.

It is anticipated that future revisions of EIA regulations will incorporate requirement for Water Source Protection Planning as part of EIA process.

However, in the meantime, developers should be informed by NEMA and DWRM that they will be required to develop a Water Source Protection Plan.

Water Permits and Unregulated Activities

Prospective applicants for 'Water Use Permit' would be required to submit alongside the permit application forms, a Water Source Protection Plan, among other requirements. Where a water supply scheme is preparing an EIA (see above) it is only necessary to complete the Water Source Protection process once.

If the Implementer is in the public sector (e.g. the Directorate of Water Development, DWD) then Water Source Protection will be incorporated into operational practice (see below). NGO and private Implementers need to be sensitised and educated on water source protection and actively encouraged to use the Guidelines for their projects (even if unregulated) because it is in their direct interests to ensure the sustainability of their schemes.

DWD Design Manual

Water Source Protection will be incorporated into future revisions of the Directorate of Water Development's design manual for water schemes so that it is considered fully during water project development and implementation.

WSDF Operations Manual

The operating procedures of Water and Sanitation Development Facilities include the obligation and the budget to implement water source protection. These guidelines are intended to help WSDF teams and their partners implement that obligation. Future

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Relationship between Water Source Protection Guidelines and other water resources management frameworks and processes

revisions of the WSDF manual will incorporate provisions for compliance with these Guidelines.

Water Safety Planning

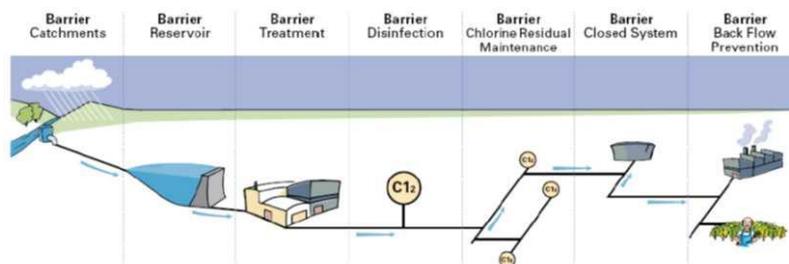
Drinking Water Safety Planning is an internationally recognised process that has the aim: *To consistently ensure the safety and acceptability of a drinking water supply*¹³.

Water Source Protection forms part of a wider approach of Water Safety Planning. Figure 7 shows the various stages commonly involved in water safety planning which focuses on ensuring that the quality of the water that reaches the end water user is of drinking water quality. It looks at each stage of the process from the environment from which the water is taken, through the water supply infrastructure to the tap where the end user takes the water.

These guidelines will help water managers to protect and improve water quality in the first two stages so that there is an adequate quality and quantity of water reaching the water abstraction and treatment point.

NWSC already undertakes Water Safety Planning and therefore these guidelines are also intended to help them extend those further to address catchment problems that affect their sources.

Figure 7: Steps in Water Safety Planning to protect water quality¹⁴



The guidelines also cover other activities, principally protecting reservoirs and dams from siltation and low flows so that they can perform their functions in providing a steady flow of water for hydroelectric-power or a reliable water quality and yield for agricultural and fisheries use.

Climate Change

Uganda has developed a Climate Change Policy (v. December 2012) which provides for mitigation and adapting approaches to climate change effects. With regards to water resources management, adaptation to more unstable climate is critical to the long term sustainability of Uganda’s water systems. Water source protection is therefore, a complimentary process because both have the aim of co-ordinating land and water users to improve the reliability, performance and sustainability of the water resources. There are number of activities where water source protection and climate change adaptation (and mitigation) would work together: *Reduced deforestation and*

¹³ Bartram J, Corrales L, Davison A, Deere D, Drury D, Gordon B, Howard G, Rinehold A, Stevens M. (2009) Water Safety Plan Manual: Step-by-step risk management for drinking water supplies. WHO, Geneva

¹⁴ taken from “Methods for risk analysis of drinking water systems from source to tap” Techneau (2010)

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Budgeting for Water Source Protection

soil erosion/increased forest/vegetation cover and better soil conservation: protects water sources, reduces risk of landslides and flooding; water and carbon storage and buffering improved.

- *Improved/protected performance of hydroelectric power plants:* improves renewable energy production and reduces demand for fossil fuel energy.
- *Wetlands protection and enhancement:* Provides water resource benefits, provides buffering against extreme weather events and provides an important carbon store.

This link to climate change adaptation means that these guidelines will be of interest to organisations working outside water sector (for example nature conservation and forestry) but whose activities in improving land management can also improve water resources management. Making these links with such organisations is highlighted in these Guidelines and climate change adaptation can be a driver that encourages their participation.

Water Sector Working Group and project budgeting

The Sector Working Group (WESWEG) brings together government and development partners to coordinate activities and investments in the investments in the Water and Environment Sector. The WESWG has an obligation for integrating application of WSPG in future investments in the sector. Specifically, the WESWG would ensure that Water Source Protection Planning is prioritised in the activities and budget (see section below on budget components).

- When WSPPs have been prepared scrutinise them to see what third-party contributions have been made, particularly from large stakeholders, such as industry or horticulture, that have been identified as major threat to the sustainability of the scheme, or where they stand to benefit financially from improved water resource quality and protection.
- Check to ensure that source protection costs and benefits have been factored into the overall life-cycle cost analysis for the scheme.

Budgeting for Water Source Protection

The cost of using Water Source Guidelines will be very context specific, however increasingly accurate data will be generated as more Water Source Protection Plans are created and implemented across Uganda. The interim MWE policy is that 3% of budgets for new water schemes should be allocated to water source protection. For Hydro-electric schemes, this proportion may be lowered because they are generally more capital-intensive. These provisions need to be enforced and reviewed regularly for possible update.

For existing water infrastructure where there are chronic water problems then water source protection planning will need budget and staff time allocated in the annual work plans and budgets of that organisation.

MWE should therefore make all efforts to institutionalise budgeting for water source protection as part of rolling out implementation of the guidelines.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Budgeting for Water Source Protection

1. Plan Production Costs

The process should take no longer than 12 months, unless the catchment around the source is particularly complex or controversial. The main costs are:

- Staff time and overheads;
- Transport and communication costs for meetings, site visits and data collection;
- Stakeholder meetings and site visits.

2. Plan Implementation Costs

This will constitute the biggest component of the WSPP budget. However, an accurate estimate of the costs can be developed only after the Water Source Protection Plan is produced. The budget should be based on the scope of the protection activities because of the uncertainty over what Control Measures will need to be implemented, how much they would cost to implement and what third-party contributions can offset the cost to the Implementer.

3. Monitoring and Regulation Costs

The Implementer should have a budget for monitoring and evaluating the implementation progress of the Water Source Protection Plan. The cost will depend on the indicators chosen and the targets set. The plan should be reviewed periodically, (e.g., annually) with the stakeholders who signed up to the Plan so that progress can be reported and assessed in a participatory manner and tasks (and associated funding arrangements) for the forthcoming year allocated and agreed.

There are direct and indirect costs incurred by District Local Governments, the WMZ teams, and the national regulatory bodies in overseeing and regulating the implementation of each Water Source Protection Plan. These costs could be covered as part of the Water Source Protection Plan if there are no specific budgets separately allocated to the regulators for this purpose. The WMZ team should keep a register of plans being prepared and implemented in each zone and keep other regulators informed on an annual basis so that work plans and budgets can be adjusted to accommodate these duties.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 1: Initiation and Preparation

2 A Framework for Water Source Protection Planning

This section describes the process of producing a Water Source Protection Plan (WSPP). This process is a mix of technical analysis and stakeholder engagement and the timescales involved in implementing this guidance will largely depend on the size and complexity of the catchment and the number of stakeholders involved.

The guidelines presented in this volume are generic, however, volumes 2-5 are specific to different water source types because they have different technical, legal and institution details.

If these guidelines are being used for a new Water Source, rather than an existing one, then the time and cost involved in preparing a WSPP should be considered when choosing a location for a dam, reservoir or abstraction point. Smaller catchments will generally have fewer risks to assess and manage.

The Guidelines make a distinction between *new* and *existing* schemes because it often involves a different set of actors, different funding mechanisms and mandates. In addition, for *new* schemes, a Water Source Protection Plan is intended to be an integral part of the overall project planning scheme, whereas for *existing* schemes the process is more standalone.

Step 1: Initiation and Preparation

Objective: *To identify the like water source protection problems to be addressed, to set the objectives for the water source protection and to identify the conditions needed to make water source protection successful.*

Step 1.1 NEW Schemes – Agree the approval process for the Water Source Protection Plan with the local Water Management Zone (WMZ) team

For new schemes, Water Source Protection Planning is just one of many aspects that will need to be developed. Each type of water infrastructure (water supply, reservoir, hydroelectricity) and organisation will have its own manuals, regulations and guidelines. It is important that WSPP integrates with those processes and that implementers and regulators are aware of their roles and responsibilities.

In all situations, a WSPP will be required as part of approving an Environmental Impact Assessment (EIA) or a Water Use Permit application by respective authorities.

If the Water Source, or its catchment area, includes a Protected area (Forest, National park, gazetted wetlands) then the lead agency responsible for the protected area (NFA or UWA or NEMA/DEO) will regulate aspects of projected area in accordance its mandate.

For *existing* schemes, the process is more standalone (i.e. not done as part of another planning activity) and is likely to be triggered by an identified need to tackle catchment problems that are threatening the performance and lifespan of a Water Source.

Step 1.2 NEW / Step 1.1 EXISTING – Define the problem and Objectives

- What type of Water Source is it?

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

- Water Supply – River Abstraction
 - Water Supply – Lake/Reservoir Abstraction
 - Water Supply – Groundwater Abstraction
 - Water Supply – Spring Abstraction
 - Multipurpose Reservoir – Online Reservoir
 - Multipurpose Reservoir – Offline Valley Tank
 - Hydroelectric – Dam
 - Hydroelectric – Run-of-River
- What is likely to happen in the future that may threaten the functionality of the water source?

Step 1.3 NEW / Step 1.2 EXISTING - Check the water resources policies and other natural resources strategies for the area

- Is a catchment plan in place? If so, what does it say in relation to this Water Source or its surrounding area?
- In which Water Management Zone (WMZ) is the Water Source, and what are the plans and priorities in this area?

See ANNEX A: *Relevant Ugandan Policy, Legislation and Regulations for further detail.*

Step 1.4 NEW / Step 1.3 EXISTING – Contact your local WMZ office

Water Supply Implementer is required notify Contact Water Management Zone (WMZ) office and formally notify the office of the plan to undertake a Water Source Protection Plan and request for technical support or guidance as appropriate. Each WMZ Team has the obligation to provide information about water resources and to assist those using the Water Source Protection Guidelines, to compile the outputs from Water Source Protection and to provide a link to wider Catchment Management Plans. Note that the mandates of the WMZ offices (with respect to the application of these Guidelines) are enforcement and compliance assistance and monitoring.

Step 1.4 EXISTING - Check activities and composition of Water Management Committees

In many areas, some form of catchment or water user committee may exist that brings local stakeholders together. These forums are essential in planning for water source protection. Therefore, you are advised to use such existing structures where possible rather than establish new ones. However, if working through an existing structure, be aware that their priorities and geographic coverage may not align with that of the Water Source, and its owners and users. In most cases it will be necessary to set up a specific Water Source Protection Committee (WSPC) but there should be good links with any overlapping water committees so that tension is avoided and co-operation is forthcoming.

Step 2: Technical Analysis

Objective: *To fully understand the water and land use challenges and how they relate to the functionality of the water source in order to create a short-list of physical, legal,*

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

educational or social actions that can be undertaken to improve the protection and performance of the Water Source.

Step 2.1 - Define the catchment for the Water Source

In most cases the catchment area for the Water Source will be known, but for new schemes there may be a need to map the catchment area so that the appropriate activities and stakeholders can be included in the water source protection plan.

- **Surface water catchments:** the topographic land area from which water drains to reach the abstraction point or dam. This can be done using a topographic map of the area.
- **Groundwater catchments:** the aquifer from where the water is taken and the area of land where rainfall or surface water recharges the aquifer. For confined aquifers, the recharge area may be some distance away from the Water Source. This can be done by looking at geological and DWRM water resource maps, but getting specialist geological advice is strongly recommended.

In some cases, the catchments may be very large (for example the Lake Victoria/Nile Basin) Then the decision will need to be made whether to:

- Work within the Catchment Management Plan process for that area and not create a separate Water Source Protection Plan; or
- To define a smaller sub-catchment (for example Inner Murchison Bay of Lake Victoria). The area covered by such a sub-catchment will depend on the water flow (the Pathways) and nature of the Threats facing the Water Source: a discharge of toxic chemical waste 20 km upstream could have a greater impact on a water supply, than riverbank encroachment 50 metres away. The decision on size of protection area to be planned for will require technical assessment of such issues and consideration by the Water source protection Committee, where appropriate. (Steps 3 and 4).

As a starting point the following could be followed:

- For surface water Sources from a river: take into account the land and tributaries that feed into the river upstream of the abstraction point. A distance not less than 10km upstream is recommended.
- For surface water Sources from a lake or reservoir: take into account the land area sufficient to address the identified problems. A radius of not less than 10km from of the Source is recommended.
- For boreholes, well and springs, the catchment area will depend on the underlying soils and geology. Consult geological maps and drilling logs from the area, but be aware that some aquifer units can be very variable over a short distance.

This can – and should – be adjusted as more information becomes available it become clearer whether the main Threats are close to the Source or a substantial distance.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

Step 2.2 - Collate information about the Water Source

It is important to understand and describe the relevant features and characteristics of the Water Source that you are trying to protect. This will include details like how much water is taken from the environment, how is it returned and who uses the water in-between. Specific information requirements are presented in the separate Guidelines.

Step 2.3 - Collate known information about the catchment

As well as collecting information and data about the area immediately around the Water Source, it is vital to understand the characteristics of the catchment from which the water is coming to supply it. For all Water Source types this includes:

- Land Area;
- Land Use and Habitats Types and areas;
- Water features: streams, rivers, lakes, artificial canals/drainage channels, reservoirs, major sewers or pipelines;
- Soils, Geology and Aquifers;
- Climatological, Hydrological and Environmental Monitoring Stations, and data;
- Sanitation coverage data (to get an idea of likely impact from untreated sewage);
- Planned future activities;
- Registered Water Permits and Waste Discharge Permits (to identify potentially competing water abstractions and potential point source pollution sources).

Table 4: Sources of Ugandan Environment Data¹⁵

Institution	Data Produced
Lands and Surveys Department	Topographic Maps
National Forestry Authority	Landcover Data, Vegetation Data
Uganda Bureau of Statistics	Socio-Economic
Agriculture Planning Department	Crop Data
Kawanda Agricultural Research Institute	Soils Data
Meteorology Department	Climate Data
Department of Physical Planning	Landuse Data
Makerere University, Department of Environment and Natural Resources	Biodiversity Data
Ministry of Health	Environmental Health
Directorate of Water Development	Water Quality, Quantity
Ministry of Energy and Minerals Development	Energy
Wetland Management Department	Wetlands
NEMA	National State of Environment Reports, District State of Environment Reports
Uganda Wildlife Authority	Protected Areas

See *Annex B2: Sources of Information for Uganda* for further detail on where to find data and information.

¹⁵ *Environmental data and statistics in Uganda*, NEMA/UBOS (undated).
(http://unstats.un.org/unsd/environment/envpdf/UNSD_UNEP_ECA%20Workshop/Uganda.pdf, accessed 07/06/12)

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

Step 2.4 - Are there any other Water Sources/Water Source Protection Plan areas within the catchment?

The Implementer should talk to the local Water Management Zone (WMZ) office about which problems and issues should be included within their WSPP, and which should be left alone to be dealt with by Catchment Management Plans.

If a Catchment Management Plan is already in place, or is in the process of being prepared or revised, then it should be used as a starting point for analysis and stakeholder engagement. It could be that some of the problems experienced by the Water Source have already been analysed and discussed in great depth.

Within the catchment of the Water Source may be another Water Source, such as a dam or town abstraction, which already has its own Water Source Protection Plan. In this instance, that plan and the stakeholders involved with it should be included in the stakeholder engagement.

If the catchment area supplying water to the Water Source crosses an international boundary then the local WMZ office or DWRM should be contacted. Such issues are potentially sensitive. Equally, some issues may have already been discussed and analysed through international mechanisms such as those under the Nile Basin Initiative, EAC, among others.

Step 2.5 - Produce a water balance for the catchment

For new water schemes, it is important to determine whether there is enough water available throughout the year for the Water Source, particularly in very small catchments.

For existing infrastructure where water shortages are a problem, then a water balance model can be used to see if the problem is related to changes in rainfall in the catchment since the scheme was designed.

At its most basic, the following data are needed:

- Monthly rainfall figures (in millimetres, mm);
- Monthly potential evapotranspiration (PET) estimates (in millimetres, mm);

$$\text{Rainfall (mm/month)} - \text{PET (mm/month)} = \text{Effective Rainfall (mm/month)}$$

This can be refined further if data is available on existing abstractions and discharges in the catchment (in cubic metres per month):

$$\text{Net Human Impact } \left(\frac{\text{mm}}{\text{month}}\right) = 1000 \times \left(\frac{\text{Abstraction } \left(\frac{\text{m}^3}{\text{month}}\right) - \text{Discharges } \left(\frac{\text{m}^3}{\text{month}}\right)}{\text{Catchment Area (m}^2\text{)}} \right)$$

$$\text{Indicative Resource } \left(\frac{\text{m}^3}{\text{month}}\right) = \left(\frac{\text{Effective Rainfall (mm/month)} - \text{Human Impact (mm/month)}}{1000} \right) \times \text{Catchment Area (m}^2\text{)}$$

As this model ignores water storage in the catchment, its use in such circumstances is limited. In circumstances involving a lake, wetland or highly permeable aquifers modify the model with assistance of an experienced hydrologist or hydrogeologist. However, the basic water balance should give an estimate of the months in which the Water Source is likely to be vulnerable to water shortages.

If the time, resources and data are available then it can be helpful to develop a computer software model of the catchment to model water balances, river flows, sediment transport, or water quality. However, this is generally a highly skilled and

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

expensive activity to be done by a qualified hydrologist. For Point Sources (Volume 3) this will not be feasible and would be unlikely to give useful information because the magnitude of the abstraction is so small compared to the levels of uncertainty in the data and modelling. For larger schemes (for example, more than 1 Megawatt hydroelectric generation, or 1 Mega-litre per day pumping capacity, an investment in modelling may be justified but it will vary between contexts and depend heavily on the quality of data available. If a Catchment Management Plan has been produced for the area then data may have already been collated and analysed to produce some water availability information.

Step 2.6 – Identify Threats

Using the list of generic threats, map the locations and details of Threats within the catchment area of the Water Source. In deciding whether an activity is a Threat or not consider whether the activity or site is likely to have one or more the hazards in Table 5

Table 5: Hazard Types

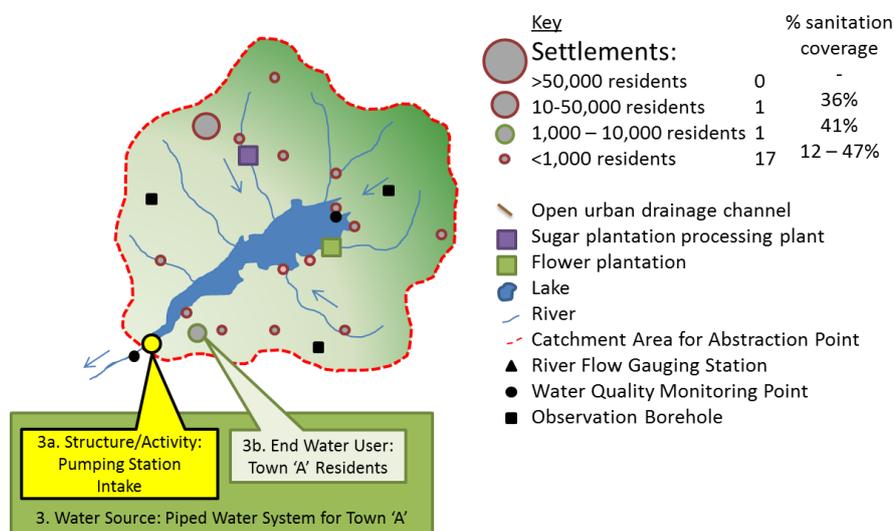
Hazard Type	Example contaminants/problems
Quality - Biological	<ul style="list-style-type: none"> ▪ Bacteria. ▪ Viruses. ▪ Protozoa. ▪ Helminths.
Quality - Chemical	<ul style="list-style-type: none"> ▪ Nitrate. ▪ Arsenic. ▪ Fluoride. ▪ Pesticides. ▪ Other heavy metals. ▪ Organic toxicants. ▪ Herbicides. ▪ Rodenticides.
Quality - Physical	<ul style="list-style-type: none"> ▪ Rubbish and floating debris (plastic bottles, polythene bags. ▪ Algae and plant material able to cause a blockage. ▪ Sand, silt, mud and other sediment resulting from soil erosion.
Quality - Radiological	<ul style="list-style-type: none"> ▪ Radioactive wastes and by-products from hospitals, industrial, research or military facilities.
Quantity – Flow	<ul style="list-style-type: none"> ▪ Reduced river/stream flows. ▪ Reduced borehole yield. ▪ Changes to seasonal variability of flows.
Quantity - Level	<ul style="list-style-type: none"> ▪ Reduced lake/reservoir levels. ▪ Reduced groundwater levels. ▪ Changes to seasonal variability of lake/reservoir/groundwater levels
Livelihood	<ul style="list-style-type: none"> ▪ Loss of income and nutrition resulting from soil degradation. ▪ Loss of time, income and education resulting from deforestation and longer trips to collect fuelwood. ▪ Loss of time, income and education resulting from water contamination or scarcity leading to longer trips for domestic water.

Producing a visual representation on a map can help understanding and communicating the relationships between the different activities and characteristics of the catchment (Figure 8 shows a diagrammatic example of our hypothetical case study).

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

Figure 8: Example of a Water Source Catchment Map



Step 2.7 - Identify Pathways

For each Threat, identify one or more pathways through the environment of your catchment by which the Threat could feasibly affect the Water Source.

If there is no feasible physical link between the Threat and the Water Source, then it can be discounted from further analysis.

Step 2.8 – Identify Hotspots

For each hotspot:

- Split the catchment into sub-catchments and micro-catchments.
- Draw the Threats and Pathways on a map.
- Identify the micro-catchments where the biggest problems are happening
- Prioritise these 'hotspots' for follow-up stakeholder consultation and Control Measures.

This process of identifying hotspots is particularly important for surface water abstractions that are taken from a large river.

If there are too many Threats, or they are spread widely across the catchment then Catchment Management Planning may be more effective than Water Source Protection Planning.

Step 2.9 - Short-list catchment Control Measures

Use the generic Control Measures in the Annexes (see Volumes 2-5 for water use specific options) as a starting point for discussions and analysis on how best to tackle systematically the problems identified in the previous steps.

The *Threat-Pathway-Water Source (T/P/WS)* model can help identify Control Measures, and where they should be used in the catchment. The suitable options should be listed in the third column of the T/P/WS Table below.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

Table 6: T/P/WS Table – Example: Protecting the Water Supply for Town ‘A’ from Urban Runoff

Stage	Hazard/Risk	Control Measure (options)
1. Threat (Hazardous Activity) and release	General urban runoff from rainfall events washes away a mix of pollutants, including untreated sewage, soil, fuel oils, industrial process chemicals and solid waste.	<ul style="list-style-type: none"> ▪ Improve solid waste collection and treatment in Town ‘A’ ▪ Educate and/or penalise residents and businesses for dumping waste in ditches and rivers. ▪ Improve sanitation infrastructure and education in Town ‘A’. ▪ Improve pollution prevention measures installed by high risk businesses (industry, petrol fuel filling stations).
2. Pathway (Water flowing in the environment – rivers, lakes, reservoirs, groundwater, soil, surface runoff)	The waste material is washed from the urban area directly into the lake, or via drainage channels that flow into the lake. The aquifer beneath the town is contaminated, which affects nearby wells and boreholes and may seep out into surface water and affect the town supply,	<ul style="list-style-type: none"> ▪ Install trash screens over culverts (and keep them clear and maintained) to reduce large solid waste entering the lake. ▪ Implement a Water Protection Zone around the pumping station to prevent or control potentially harmful activities. ▪ Gazette and protect any lakeshore wetlands that may be providing natural pollution filtration.
3a. Water Source: Water Infrastructure	The intake for the pumping station gets blocked by solid waste, causing disruption to the operation. Declining water quality in the lake increases the amount of treatment needed to provide good quality water.	<ul style="list-style-type: none"> ▪ Implement a Water Protection Zone around the pumping station to prevent or control potentially harmful activities. ▪ Install trash screens and upgrade water treatment systems. ▪ Relocate, or build a new pumping station at another location that is less vulnerable.
3b. Water Source: Impact on End Water User	Water costs go up as water treatment is increased. If water treatment fails then there is an increased health risk.	<ul style="list-style-type: none"> ▪ Inform water users about why water costs are going up and link to their own polluting activities that are contributing to the problem.

Step 2.10 - Identify opportunities for improving livelihoods and reducing poverty (Win-Win situations)

To build stakeholder confidence in the process it is a good idea to get some positive results quickly. This is most likely to occur where there is least resistance among stakeholders. For example, training farmers in soil conservation measures and better cropping techniques can rapidly reduce soil erosion and improve farmer yield and incomes and self-esteem.

Confidence builds confidence and should make it easier to negotiate harder agreements where the direct benefits to the stakeholder responsible for the Threat are less tangible or immediate.

Step 2.11 - Identify Options for Protection Zones

Current Ugandan legislation provides for a range of ‘Protection Zones’ which can confer levels of regulator protection:

- Water Protection Zones (Water Act, Cap 152)
- Protected Forests (National Forestry and Tree Planting Act, 2003)
- Protect Wetlands (National Environment Act 1995, National Environment (Wetlands; River Banks and Lake Shores Management) Regulations, 2000)).
- Protection zones for river banks (National Environment (Wetlands; River Banks and Lake Shores Management) Regulations, 2000)).

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 2: Technical Analysis

- Protection zones for lake shores (National Environment (Wetlands; River Banks and Lake Shores Management) Regulations, 2000).
- Hilly and Mountainous Areas (National Environment Act 1995)

Only Protected Forest Zones have had widespread application and many of these areas suffer from encroachment and degradation. While these are useful legal tools, they need legitimacy among the landowners and residents in the catchment and surrounding area.

In looking at options for Protection Zones the key questions are how effective they could be at protecting the Water Source (and wider public interests) and how they would impact on the livelihoods of those within or near the potential zones.

Step 2.12 - Socio-Economic Impacts

What impact is catchment degradation having on the local people and the local economy? Understanding this will help to get political and public support for the process when it is understood that better environmental quality can lead to a healthy population and stronger economy. It is vital to make the issue relevant to the day to day lives of ordinary people.

Indicators to look at include:

- Impact on healthcare costs (to families and health services);
- Loss of productive time – due to disruption or poor quality water or electricity supply;
- Loss of school days – due to illness among pupils or disruption to school functioning from water or electricity supply disruption;
- Frequency and damage costs of landslides;
- Design life of water infrastructure – higher maintenance and replacement costs due to problems with incoming water.

Compile and summarise the information into a table like the example below. The third column for Control Measures is left blank for the moment as that comes under Step 6.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection
Step 2: Technical Analysis
Table 7: T/P/WS Table – Protecting the Water Supply for Town ‘A’ from Soil Erosion

Stage	Hazard/Risk	Control Measure (options)
1. Threat (Hazardous Activity) and release	Deforestation and bad farming practices are leading to widespread soil erosion around the catchment.	
2. Pathway (Water flowing in the environment – rivers, lakes, reservoirs, groundwater, soil, surface runoff)	Soil, silt and sand is being washed from the land into streams, rivers and Lake ‘C’	
3a. Water Source: Water Infrastructure	Water abstracted has increasingly dissolved solids and suspended solids, which is increasing treatment costs and wear of the pumping machinery.	
3b. Water Source: Impact on End Water User	Increasing treatment and maintenance cost lead to higher water prices.	

Step 2.13 – Choose Targets, Monitoring and Indicators of Success

The planning process should choose parameters that should be routinely measured as indicators of progress. They should be easy to measure and relate to the objective of the Water Source.

Care should be taken to ensure that where there are indicators that are influenced by multiple factors, those other factors are also measured. For example, the Tables 8 and 9 below show an example from Cameroon where catchment Control Measures resulted in increased river flows feeding the Water Source, which in turn reduced the occurrence of water rationing endured by the End Water Users. Rainfall is also measured to show that the restored river flows are more likely to be due to the improved catchment management than to changes in rainfall.

Table 8: Example of Target Monitoring: River Flows¹⁶

Months	2008	2009	2010	2011
February	10	50	70	150
March	5	20	30	120
April	5	15	15	100
Rainfall (ml/sic)	2,206	2,460	2,450	-

Units: litres in 20 seconds

Table 9: Example of Target Monitoring: Water Rationing in Kumbo¹⁷

Months	2008	2009	2010	2011
February	20 days	20 days	-	-
March	30 days	30 days	20 days	15 days
April	30 days	-	10 days	4 days

¹⁶ Tah, H. M. (2011) *Improved Watershed Management – Kumbo Watershed: Experience & Lessons Learned*, KivenK development/Canadian Society for Civil Engineering, September 2011

¹⁷ Tah, H. M. (2011) *Improved Watershed Management – Kumbo Watershed: Experience & Lessons Learned*, KivenK development/Canadian Society for Civil Engineering, September 2011

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

Targets should relate to the aims and objectives so that there is clear logical path and it also needs to be clear who will be doing the measurements. Indicators could include water quality indicators, measured against national standards – such as the Environmental Water Quality Objectives, being developed by DWRM; or soil erosion rates, or land use changes, or electricity output. Using indicators that are already routinely measured (such as those used by the annual Sector Performance Report, SPR) is preferable because there is a greater chance of historical measurements to form a basis for comparison.

Targets should always be SMART:

Specific, Measurable, Attainable, Relevant, and Timely.

Be aware that collecting data has a cost therefore there needs to be clear funding support or use of an existing monitoring system

Table 10: Example Targets for Town ‘A’ Water Source

Aim	Objectives	Targets/Indicators	Monitoring responsibility
1. Improved Water Quality	1.1. Health: Minimise the risk to human and livestock health	1.1.1 - XX% of drinking water samples meet national and WHO guideline standards 1.1.2 – XX deaths/1000 people from water-related diseases	1.1.1. Implementer 1.1.2 District Health Officers
	1.2 Equipment: Minimise risk of damage to pumps and water services equipment (e.g. through corrosion)	1.2.2 – Pumping station maintenance costs in line with expected lifetime costs.	1.2.1. Water Supply operator (NWSC)
2. Reliable Water Quantity	2.1 Yield: Ensure adequate yield to meet water supply demand	2.1.1 – No. of days with no water rationing less <X/year	2.1.1. Implementer
	2.2. Reliability: Minimise seasonal disruption or halt long term declines in water flows/levels	2.2.1 – No. of days with disrupted/no water supply <X/year	2.2.1. Implementer
3. Better Livelihood Opportunities	3.1 Sustainable Land Management: Increase level and reliability of household income from better farming and forestry practices.	3.1.1 – Increased crop yields due to improved soil management and fertility	3.1.1 District/Sub-county Agriculture Office
	3.2 Poverty Reduction: Develop new sources of income and socio-economic security through better catchment management.	3.2.1 – Poverty indices improve	3.2.1 District/Sub-county Agriculture Office

Step 3: Stakeholder Engagement

Objectives: To sensitise, inform and build trust with all stakeholders about the water source protection and what their obligations and opportunities are. To fully understand the people and organisations that influence or are influenced by the proposed Water Source Protection Plan. To work out the most likely ways of aligning stakeholder interests to the need of the WSPP.

NOTE: Steps 3.1 – 3.5 should be done in parallel rather than in sequence.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

Step 3.1 - Identify stakeholders

Identify individuals and organisations that should be contacted. The aim is to raise their awareness of the problem to be solved, and why they should care. There are likely to be several groups:

- Within the catchment of the Water Source:
 - Their activities may be harmful to the Water Source;
 - They may be affected by the same problems that affect the Water Source;
 - They may have little or no involvement or interest in land or water management;
 - Their existing type and location of activity may help solve the problems faced by the Water Source (e.g. natural habitat conservation).
- Downstream of the Water Source:
 - The behaviour or operation of the Water Source may affect them;
 - They may be affected by the same problems that affect the Water Source;
- Not within the same hydrological or hydrogeological area:
 - Government agencies and directorates;
 - Customers and indirect water users;
 - National and International NGOs and Development Partners;

Step 3.2 – Identify Local Government Councils in catchment area of Water Source

To build support and legitimacy, it is important to engage with political leaders as well as technical officers.

When the catchment for the Water Source is defined (Step 2.) identify the local government councils that are upstream or up-gradient from the water source. These include:

- Districts (LC5)
- Urban Municipality/Rural Local Government (LC4)
- Sub-county/Division (LC3)
- Parishes/Wards (LC2)
- Villages/Cells (LC1) – in the immediate vicinity of the source only

Step 3.3 – Sensitisation Meetings with Local Government

For each District identify and meet the following authorities, among others:

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

- District (LC5) Chairperson
- District Councillors from location
- District Chief Administrative Officer (CAO)
- District Natural Resources Management (forestry, wetlands, environment, lands)
- District Water Officer
- District Engineer
- District Agriculture Officer
- District Commercial Officer
- District Planner
- District Community Development Officer

Each meeting should make the stakeholder aware of the project and to ask for their insights into water and land management issues.

The WMZ should be able to help to identify and provide contact details of key District staff and political leaders.

To reduce time and travel costs, Water Source Protection should be included as an agenda item in local government project meetings, rather than done as a separate exercise. If the Implementer works at the District Local Government the matter can be raised as part of normal business practice.

Working with individuals and organisations that already have established personal links and regular contact with the local government stakeholders will make sensitisation easier and quicker.

Step 3.4 – Sensitisation meetings within MWE organisations or other lead institutions

Meet the following local/regional offices to make them aware of the project and to start gathering issues, data and information:

- National Forestry Authority (NFA) (if active in the area)
- Water and Sanitation Development Facility, Umbrella Organisation
- Technical Support Unit (TSU)
- Uganda Wildlife Authority (if active in the area)

Not all of these organisations may have an active mandate (e.g. a protected forest or National Park) in the catchment area of your Water Source and therefore may not be relevant.

It is important to establish relationships with key local officers from the different government organisations that fall within the responsibility of the Ministry of Water and Environment. Additionally, for multi-purpose reservoirs and dams, agencies reporting to the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) should be engaged, and for hydroelectricity schemes it is the Ministry of Energy and Mineral Development (MoEMD).

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

The WMZ should be able to help to identify and provide contact details. Every MWE team should help Guideline Users by providing access to data, reports and local knowledge.

Step 3.5 – Identify overlapping projects and sensitisation meetings with NGOs and CBOs

Which Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs) or Faith Based Organisations (FBOs) are active in the catchment area for the Water Source? There may be projects that are not explicitly related to water, but involved with improving farming and land management, which could be of benefit for water management. These include projects around wildlife conservation, agro-forestry, agricultural extension or climate change adaptation.

The WMZ should develop a database of major projects in each catchment.

Step 3.6 NEW / Step 3.6A EXISTING – Include Water Source Protection as an agenda item in project stakeholder meetings

Stakeholder engagement will be part of the project process for new water infrastructure so that water source protection is included in this consultation process rather than creating another forum. Invite stakeholders from the wider catchment or source protection area to attend the meetings and keep stakeholders updated on progress.

The process of stakeholder engagement will depend on the Implementer organisation or scheme type. If the manual of this type of scheme has not yet been updated to include reference to Water Source Protection Guidelines then make sure that water source protection is included as a discussion item with stakeholders.

The catchment area of the Water Source may extend into more than one District. Invite representatives from other Districts and the relevant Sub County Chief (Senior Assistant Secretaries), District Community Development Officers and Natural Resource Management/Environment Officers. This should be done by writing to the Chief Administrative Officer (CAO) for each District.

[Step 3.6B – Establish a stakeholder Water Source Protection Committee (WSPC)]

If in Step 1.4 it was found that no suitable stakeholder committee or group existed then it will be necessary to establish a Water Source Protection Committee (WSPC). Setting up a WSPC should be by a mix of direct invitation (to get key stakeholders on-board) and open invitation to others who may wish to be involved or observe (to build transparency and trust).

Produce a draft constitution and Terms of Reference that sets out:

- Roles and responsibilities:
 - Chair
 - Secretary (record keeper)
 - District and Sub-county representation
 - Committee Members
- Draft aims and objectives

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

- Draft Rules of Procedure for regulating the conduct of meeting, decision making, and sharing of costs and benefits.

Step 3.7 NEW – Establish and maintain dialogue with stakeholders

Develop and implement a communications plan that includes messages and updates in water source protection to stakeholder about the project.

Step 3.7 EXISTING - Organise a sensitisation meeting

A sensitisation meeting is an opportunity to reinforce the messages and relationships from the bi-lateral sensitisation meetings (Steps 3.2, 3.3, 3.4). The aim should be to open up discussions on prioritising 'Hotspots' from Step 2.8 and begin discussing and short-listing control measures (Step 2.9).

A) Before the meeting:

- Set a date and time
- Agree an agenda with provisional WSCP members
- Find and book a venue that is accessible to as many stakeholders as possible
- Publicise meeting in the catchment area through civic leaders, local radio and newspapers and organisations already involved.

B) At the meeting:

- Hold meeting and formally establish the WSCP (if that is the option being followed, otherwise tell the meeting which committee will handle this water source protection issue)
- Make sure that proper notes are taken of the meeting that capture the questions and concerns raised by stakeholders and the decisions taken.

C) After the meeting:

- Within one week circulate meeting notes and appreciation to the organisations who took part.

Suggested agenda for first meeting:

1. Opening (mayor/local civic leader)
2. An introduction to the scheme (the Implementer)
3. Background and goals of the water source protection (Chair WSCP)
4. Technical aspects (District Council NRM/Water Officer)
5. Financial aspects (District Council NRM/Water Officer)
6. Questions and answers
7. Vote on WSCP
8. Closing

Natural Resource Management Officers for the districts involved should prepare a technical working paper for discussion at the stakeholder meeting. This is a useful way of getting the local knowledge and increasing District ownership of the process.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 3: Stakeholder Engagement

Step 3.8 - Capacity Building and Support

To improve the quality of discussion and decision-making around planning control measures, it is advisable to organise site visits and short training sessions to improve understanding and appreciation of the challenges and opportunities.

A) Site Visits (1 day)

- Organise a visit to the proposed site of the pumping station and water works; and to hot spots around the catchment to show the problems and how they are impacting the water supply system.

B) Water Source Protection training day for WSPC members

- Organise a half or one day workshop to explain the principles behind water source and catchment protection – why it is needed and how it can work and does work elsewhere.
- Get speakers from different perspectives: e.g. Forestry (NFA), Wetlands (WMD), Water Resources (DWRM or the local WMZ office)

Suggested topics:

1. The water cycle – where our water comes from.
2. Why good catchment management is important
3. Simple solutions for protecting water sources
4. Examples from Uganda and worldwide of success.

Step 3.9 - Links between poor land and water management, land tenure and livelihoods

Use results from the stakeholder and technical analyses to identify the stakeholders whose activities are likely to do most harm to the new water source – and where opportunities exist to tackle both poverty and catchment degradation.

Where a person or organisation is doing an activity that poses a Threat to a downstream Water Source, it is important to understand why they are behaving in this way. Two main scenarios can open the door to win-win situations:

- **Inefficient practices:** Soil erosion is often caused by bad land management. Not only does this cause water quality and quantity problems downstream, but it also affects the livelihoods of people upstream by stripping away nutrients and fertility of the soil. This results in lower yields and reduced agricultural incomes. By turning this around and implementing better farming and soil management practices, rural livelihoods can be improved and downstream impacts on Water Sources can be reduced.
- **Externalised Costs:** Many preventative treatment and pollution practices are seen as a cost to companies and therefore are avoided if possible. Polluters will generally only tackle the problem they cause if one or more of the following come into play:
 - It is in their direct commercial interest – i.e. the pollution is directly harming their own business interests at that site or other sites.
 - Prosecution and the 'Polluter Pays Principle' if they do not comply with legal discharge standards and permits. Enforcement of regulation can be effective but often faces problems and sometimes, the penalties

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

and fines are lower than taking preventative action and therefore can be an inadequate incentive.

- Reputational risk: poor practices can lead to bad media publicity and political pressure. If the business is an exporter, it may come under pressure from multi-national customers who are scrutinising their supply chains as part of protecting the reputation of their own brands.
- Payment for Watershed Services – the polluter is paid to undertake actions that will reduce the risk of their activity causing harm by the water users who will benefit.

Understanding the land tenure situation in the catchment is critical. The legal status of land varies throughout Uganda and is complex and political. Poor land management is often linked to insecure land tenure because farmers are unwilling to invest time, energy and money into land which they could lose control of at any time.

Table 12 is a template questionnaire for Stakeholder Livelihood Analysis:

Table 11: Livelihood Analysis Template

Question	Answer
Stakeholder Name	
Stakeholder Organisation	
Location	
Livelihood/Occupation	
Activities that are impacting the Water Source	
Awareness of their impact?	AWARE / NOT AWARE
Reasons for continuing with those harmful activities	<input type="checkbox"/> Activity generates income <input type="checkbox"/> Lack of awareness/training/education on alternatives <input type="checkbox"/> Lack of resources/tools/finance to adopt better practices <input type="checkbox"/> Lack of land tenure security <input type="checkbox"/> Not willing to take on activities that incur additional costs <input type="checkbox"/> Cultural/historic reasons other.....

Stakeholders are only likely to change their behaviour in a way which fits with water source protection if they are incentivised to do so. The first priority should be to create 'win-win' opportunities, but there will be instances where the person or organisation taking positive action (or inaction) will not benefit directly. In such cases, ways should be found to provide some form of compensation or social recognition. It is important to note that stakeholders do not always act out of rational self-interest and that there are likely to be complex local social, cultural and political issues that will need to be handled with care.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Step 4: Resource Mobilisation

Objective: To establish what human, technical and financial resources are available to implement water source protection.

To produce a realistic and workable Water Source Protection Plan it is critical to build partnerships between individuals and organisations so that the short-listed control measures can be implemented successfully. This discussion needs to start early in the process as it will influence both the technical analysis and forms part of the trust-building in the Stakeholder Engagement.

Step 4.1 - Identify own resources available for water source protection

- Identify what financial resources are available in the budget for land acquisition and water source protection measures (for example, from the 3% of project budgets for new infrastructure)
- Identify in-kind contributions (if any).
- Identify what other resources, projects or skills may be available for water resource protection.

The Implementer should evaluate options for acquisition of land for protection and find a workable balance between cost and the effectiveness at protecting the water source. Acquisition of land or the control of activities taking place on land is not the only control measure but it is likely to be the most effective but contentious, so sensitisation and discussion of the issue needs to happen early, otherwise there maybe conflict later in the process.

Step 4.2 - Identify what other projects, and resources may be available as direct or in-kind contributions to protect the water source

The WMZ should develop and maintain a database of major projects in each catchment and active non-state actors (national, local and international organisations, private sector).

This is an iterative step that will be revisited as Stakeholder engagement and the technical analysis of viable catchment Control Measures progress.

- Are there any projects or programmes for catchment or habitat rehabilitation and protection that have overlapping, geographical areas, objectives and stakeholder groups?
- Are there any funding opportunities from Government, Development Partners or International NGO's for catchment protection measures?
- Is there willingness among local organisations and local government to pay, or make in-kind contributions towards water source protection measures?

Step 4.3 - Group and bi-lateral meetings to agree on financial and in-kind contributions toward short-listed Control Measures

Financial sustainability of the Water Source Protection Plans will be a critical on-going issue. The Implementer will have the challenge of keeping the WSPP partners on-board and contributing to the agreed activities and targets.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Five types of cost should be considered¹⁸, plus a fifth factor: income.

Capital Expenditure (CapEx)

This is the expenditure needed at the beginning of a project, for example for building a new structure or setting up a new training programme. This is often funded from grants from central government allocations, development partners, loans or NGOs. There may be cost associated with getting this capital such as the transaction cost of fundraising and interest payments on loans.

Operating Expenditure (OpEx)

This is the cost of keeping a system or programme running. For water supply system, this will include regular payments for staff salaries, fuel, electricity and water treatment chemicals. It is generally expected that this will be covered by user fees or general taxation.

Capital Maintenance Expenditure (CapManEx)

CapManEx is the cost category that is least clearly understood, much less planned for. CapManEx includes expenditure on asset renewal, replacement and rehabilitation costs, based upon serviceability and risk criteria. CapManEx covers the work that goes beyond routine maintenance to repair and replace equipment in order to keep systems running. Accounting rules may guide or govern what is included under capital maintenance, and the extent to which broad equivalence is achieved between charges for depreciation and expenditure on capital maintenance. Capital maintenance expenditures and potential revenue streams to pay those costs are critical to avoid the failures represented by haphazard system rehabilitation.

An example would be the replacement of a pump, which even with regular maintenance will need renewal or replacement eventually, which is likely to be expensive.

Expenditure Direct Support (ExpDS)

Direct support is structured support to service providers and users or user groups related to the operation and management of water, sanitation and hygiene services.

Direct support includes the following types of activity:

- performance monitoring
- technical advice and information
- administrative support (e.g. help with tariff setting)
- organisational support (e.g. to achieve legal status)
- conflict resolution
- identifying capital maintenance needs (including advice on financing)
- training and refresher courses.

¹⁸ Adapted from work done by IRC International Water & Sanitation Centre (<http://www.washcost.info>, <http://www.waterservicesthatlast.org>). More guidance available from: www.akvo.org/wiki/index.php/Finance_Portal

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

The costs of support before and during the construction of a water or sanitation system are not included. They are considered to be capital expenditure support. Direct support is often referred to as institutional support, post-construction support and follow-up support.

Direct support is always related to a particular project, programme or geographical area. Expenditure on indirect support is about creating and regulating the enabling environment for water, sanitation and hygiene services and is not particular to a programme or project.

Expenditure Indirect Support (ExpIDS)

Indirect support is about creating and regulating the enabling environment for water, sanitation and hygiene services. It includes the costs for macro-level policy formulation, planning, regulation, sector-level monitoring, developing IT systems, maintaining frameworks and institutional arrangements.

Indirect support includes capacity support to service authorities. Service authorities are those bodies, often district local government or an equivalent, with legal responsibility for guaranteeing water, sanitation and hygiene services in a defined area, fulfilling functions such as planning, coordination, oversight of service delivery. It may be the legal owner of water and sanitation assets but not necessarily so. In some cases, service authorities may also have delegated functions of regulation. They may also be responsible for technical assistance (e.g. the Technical Support Units) but can contract this out to an association of community-based providers, an NGO, or the private sector.

Indirect support includes costs on support to increase capacities, for example capacity building for professionals and technicians and capacity support to local government as service authorities, to adhere to national norms, standards and guidelines.

In comparison to direct support, expenditure on indirect support is not particular to a programme or project.

Income

Income to cover the expenditure incurred by the water source protection is vital. When looking for solutions, focus should be placed on tangible socio-economic benefits that can arise from implementing the chosen Control Measures.

The difficulty comes where the individual or organisation that makes the expenditure is not the one who benefits directly through increased income. In such cases, approaches such as Payment for Watershed Services (see Box 4) should be considered because otherwise a lack of equity is likely to damage trust and lead to a failure of the plan.

These different categories are derived from the Life Cycle Costing Approach for WASH projects. By including these different categories there is a much greater chance of creating interventions that can be financially sustainable. For more details visit: <http://www.washcost.info/>

Table 12: WSPP Financial Plan

Water Source:	NWSC Abstraction from Lake 'C' for Town 'A' piped water system
Threat:	1. Urban runoff leading to declining water quality at Water
Control Measure:	Improve sanitation infrastructure and education in Town 'A'.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection
Step 4: Resource Mobilisation

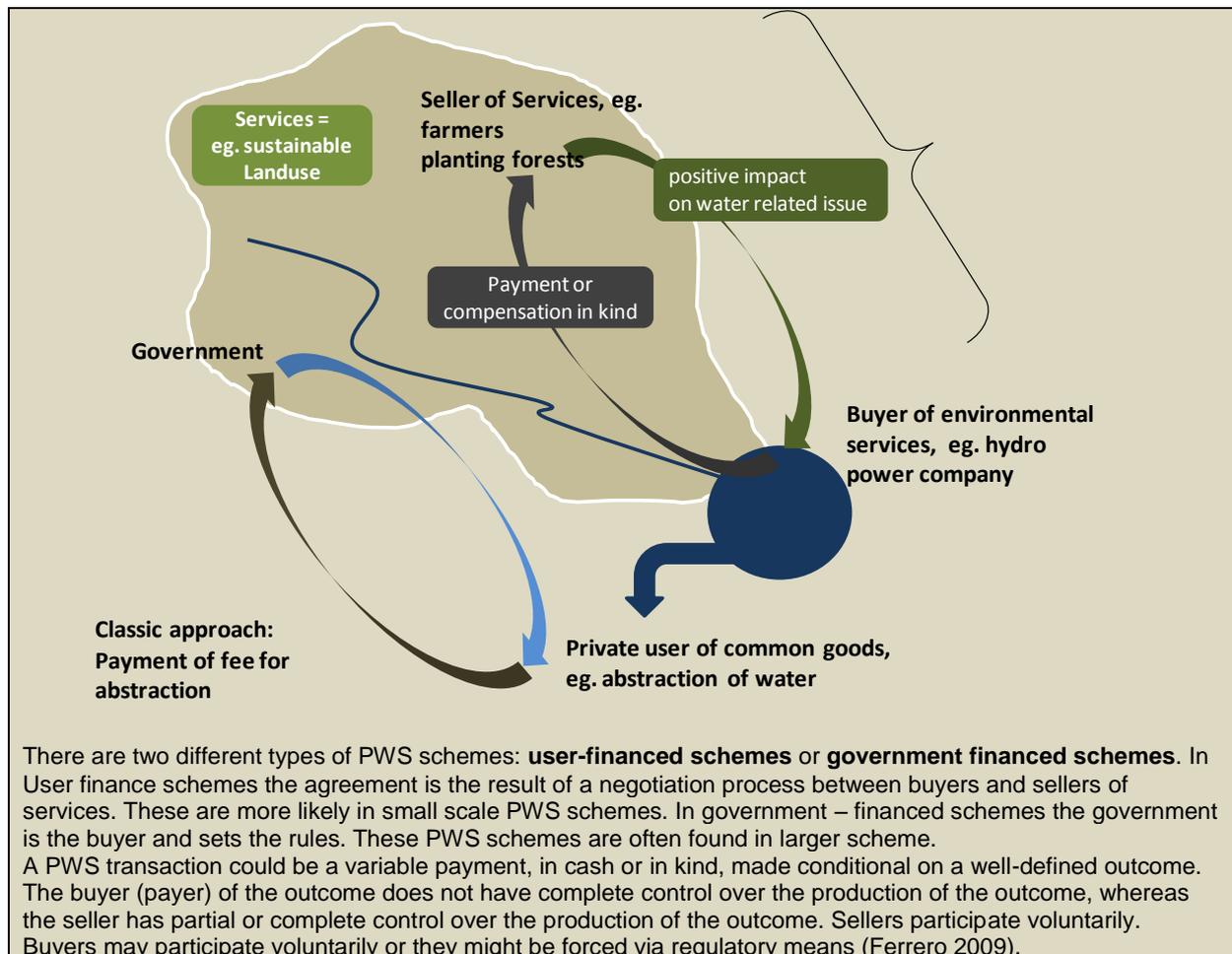
Who does it?	NWSC				
Who checks it?	NEMA				
Item	Cost Type	Cost	Who does it?	Contributions Partner	Amount
Restored and Upgraded wastewater treatment works	CapManEx	\$1million	NWSC	NWSC	\$0.X million
	CapEx			Development Partner	\$0.X million
Piped sewerage system restored and extended	CapManEx	\$1million	NWSC	NWSC	\$0.X million
	CapEx			Development Partner	\$0.X million
				Town 'A' Council	\$0.X million
Latrines	CapEx	\$0.Xmillion	Sanitation NGO	NWSC NGO Beneficiaries	
Improved road drainage	CapManEx	\$X,000/year	Town Council	Town Council	\$X,000/year
	OpEx	\$X00/year		Uganda Road Fund	\$X,000/year
Sanitation and hygiene education programme	CapEx	\$X,000	District Health Officer	NGO	In-kind support (2 outreach staff)
	OpEx	\$X,000/year			
Composting scheme with pollution/runoff controls	CapEx	\$X,000	NGO	NGO	\$X,000
	CapManEx	\$X00/year		Development Partner loan	\$X,000
	OpEx	\$X00/year			
	Income from fertiliser sales.	\$X0,000/year			

Box 4: Payment for Watershed Services (PWS)

Principal idea and concept
<p>The basic idea of economic approaches such as payment for ecosystem services is the system of exchange of goods or services with payment on a free basis.</p> <p>With respect to the management of environmental resources the PWS approach is based on resources which could have an economic value, such as the price of water or on ecosystem services that are provided by these environmental resources for human activities such as flood protection or water purification through wetlands. The economic approach uses the mechanisms of exchange between supplier of goods or services ("sellers") and buyers of goods or services in order to achieve a certain target level of impact.</p> <p>It has to be stressed that the introduction of PWS could be targeted on the protection of natural resources or more on poverty reduction. In any case if PWS should be introduced as a management approach in areas of high level of poverty and high pressure on natural resources, aspects of poverty alleviation or income generation should be considered from the beginning in the planning of the PWS.</p> <p>In order to illustrate the PWS concept, the following is a useful starting point. In one albeit not universally accepted definition, PWS transactions are: (1) voluntary, (2) between at least one service buyer (3) and at least one seller (4), focused on a well-defined service (or a land use likely to provide service) and (5) conditional upon contract compliance.</p>
<p>Concept of services and payment flows in a PWS scheme and in a classic agreement</p>

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation



Step 4.4 - Land issues and compensation

Land issues in Uganda are complex and vary considerably from area to area. Consult the District Land Surveyor for the District(s) where the scheme is.

Maximise land area for Water Source Protection. The purchase of land allows that area to be fenced off to protect the water infrastructure from vandalism and to stop harmful and polluting activities in the immediate vicinity of the well, borehole, spring or surface water feature.

- For groundwater and spring sources use Annex L in Volumes 2, to determine the optimum area.
- For surface water sources, focus on purchasing and fencing off river bank and lake shore areas. As a minimum the area between the Water Source (and its buildings, such as water treatment works, turbine hall etc.) down to the riverbank or lake shore should be fenced off. There are cases worldwide where a whole micro-catchment has been fenced off to maximise protection, but these are usually only happen in sparsely populated areas.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Even where land cannot be purchased there are various legal means to influence land use, particularly in or adjacent to gazetted wetlands and river banks. Refer to The National Environment Act 1998 and The National Environment (Wetlands, Riverbanks And Lakeshores Management) Regulations, 3/2000

Also, for example, in the Water Act Cap 152:

“39. Offences.

(1) Any person who -

(a) causes or allows water to be wasted, misused or without reasonable cause, excessively consumed; or

(b) takes or uses water for a purpose other than provided by the water permit”

More specifically from The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3/2000:

“21. Identified action of river banks and lake shores.

(1) Each Local Government shall after the recommendation of the appropriate local environmental committee make by-laws -

(a) identifying river banks and lake shores within their jurisdiction which are at risk from environmental degradation;

(b) promoting soil conservation measures along river banks and lake shores including the following -

(i) bundling; (ii) terracing; (iii) mulching; (iv) tree planting or agro-forestry; (v) grassing; (vi) soil engineering, compaction and placement of fills; (vii) zoning and planning; (viii) baggions; and (ix) control of livestock grazing.

28. Duty of private owner users.

(1) Every land owner or user in whose land a river bank or lake shore is situated shall have a duty to prevent and repair degraded river banks and lake shores through the following or any other measures -

(a) soil engineering; (b) agro-forestry; (c) mulching; (d) bundling; (e) grassing; (f) control of livestock grazing; or (g) terracing.

(2) A landowner or user who fails or refuses to carry out the measures provided under sub-regulation (1) commits an offence.

Step 4.5 – Record Pledges

Enter resources pledges into PART E Financial Summary of the Water Resources Plans Template

STEP 5: WATER SOURCE PROTECTION PLAN & PROTECTION ZONES

Objective: To get an agreed Water Source Protection Plan that can be submitted to regulators and used as Terms of Reference for implementation (Step 6) and monitoring (Step 7). To get actions allocated to organisations and individuals, supported with an overall estimate of time and cost.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Step 5.1 - Project Stakeholder Group Meeting to discuss and short-list Water Source Protection Control Measures

The Water Source Protection Committee (or the Stakeholder forum that is hosting the topic) should meet for sufficient time to short-list Control Measures and take key decisions that will allow the draft Water Source Protection Plan to be written. An agenda should include the following items:

- An overview of the catchment Threats to the Water Source, why this is important and who else is affected by the same problems. This may have to be handled sensitively to keep those causing the Threat on-board during the process.
- Control Measures should be presented in turn with an opportunity for giving new ideas,
- The workshop activity can be used to look at the advantages and disadvantages of each in turn. Create a list of the most favourable Control Measures.
- Look at the favoured Control Measures in combination to see how well they complement each other or are incompatible.
- Discuss and agree which stakeholders should be responsible for implementing each Control Measure, and what they would need (finances, training, technical support, permits or government support).

Step 5.2 - Review and update Water Source Protection Objectives

One of the first activities of Water Source Protection is setting the objectives (Step 1.1). These should be revisited by the WSPC to check that they are still valid. Through the process of analysis and discussion, it could be that previously unthought-of objectives have become known or existing ones need a change in their wording.

Step 5.3 – Consult on Protection Zone options

A) Based on the technical analysis in Step 2.11 and land options in Step 3.4:

- Decide on type and size of zone to be implemented.
- Work with an Authority who has the legal mandate to establish the protection zone (For example, a Water Authority has the legal mandate to establish a water protection zone under The Water Act Cap 152, while MWE has the power to gazette rivers and wetlands).
- Define the area/boundaries of the protection zone and get it ‘gazetted’• Undertake sensitisation and education programme among households and communities living in or near the protection zone.
- For privately owned land a separate MoU or other legal agreement may be necessary. Consult the District Local Government.
- Define and agree the rules and bylaws governing activities within the Protection Zone (i.e. what is forbidden and what is encouraged).

“Gazetting” means gaining legal recognition as a result of an official notice with the details of the area or zone being published in The Uganda Gazette.

Under Section 81 of the Water Act, Cap 152:

“81. Protected zones.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Subject to section 91, an authority may -

- (a) establish a protected zone on land adjacent to -
 - (i) any water, borehole, treatment or other works forming part of a water supply or from which a water supply is drawn; or*
 - (ii) any sewer, sewerage treatment works or outfall;**
- (b) erect and maintain fences on or enclose the land under the protected zone; and*
- (c) prohibit activities within the protected zone, as it sees fit.”*

Step 5.4 - Agree roles and responsibilities among stakeholders

Table 14 shows an example of how to set out roles and responsibilities for each control measure, who is responsible for implementing it and who will provide the oversight. Also important is the 'Plan B' – what should be done if the Control Measure fails to work or is not implemented quickly? It may be decided that these secondary measures are carrying out in parallel.

Step 5.5 - Agree timeline and milestones

It is important to set commonly agreed goals and timescales so that there is common understanding of what should be achieved and when. This links to monitoring and evaluation and the objectives agreed between stakeholders during the plan making process.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection
Step 4: Resource Mobilisation
Table 13: Example Roles and Responsibilities Chart

Water Source: NWSC Abstraction from Lake 'C' for Town 'A' piped water system						
Threat	Control Measure	Who does it?	To be completed by end of:	Who checks it is done?	Action if the control fails	
					What to do?	Who does it?
1. Urban Runoff from Town 'A'	Improve solid waste collection and treatment	Town 'A' Council	Dec 2013	NEMA	Install (or check existing) trash screens and filters.	NWSC
	Improve sanitation infrastructure and education in Town 'A'.	NWSC / Town 'A' Council	June 2015	NEMA	Increase protection and pollution filtration capacity of lake shore wetlands.	DEA NWSC NGOs
	Improve pollution prevention measures installed by high risk businesses	Businesses in Town 'A'	June 2013	Town 'A' Council	Take enforcement action against polluters	NEMA
	Implement a Water Protection Zone around the pumping station and drainage channels from Town 'A' to prevent or control potentially harmful activities.	NWSC	June 2013	MWE	Re-examine incentives and awareness raising to encourage people to comply.	NWSC
2. Pumping Station for Town 'B'	Establish monitoring system and thresholds	NWSC	Dec 2013	DWRM	Initiate water rationing plan	NWSC
	Improve wastewater infrastructure to return clean water to Lake 'C'	NWSC	Dec 2015	Catchment Management Stakeholder Group	Move pumping station intake to allow for lower lake levels	NWSC
3. Industrial Discharge	Treat waste before discharge	Factory operator	Dec 2013	NEMA	Warn NWSC of pollution incident	Factory operator
4. Soil Erosion	Farmer outreach education and development programme	Farming NGO	Started by Jan 2014	MoAAIF	Increase protection and pollution filtration capacity of lake shore wetlands.	DEA NWSC NGOs

Step 5.6 - Write the Water Source Protection Plan

A Water Source Protection Plan needs to be clear, specific and concise. It should be translated into the local language where the need arises. The document can be compiled from the components described in the previous steps:

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Part A: Water Source Description

This first section gives the basic details of the water source, its location and details of the Water Source Protection Committee.

Table 14: PART A - Water Source Description Summary

PART A	WATER SOURCE DESCRIPTION
1. WATER SOURCE NAME:	
2. OPERATOR	
3. WATER SOURCE TYPE:	Piped Scheme / Multipurpose Reservoir / Hydroelectric Power Plant* / Other.....
4. TAKES WATER FROM:	Watercourse (River/Stream) / Lake or Reservoir / Spring / Groundwater*
5. LOCATION: (name, grid reference)	
6. SUB-COUNTY:	
7. DISTRICT:	
8. CATCHMENT PLAN AREA:	
9. WATER MANAGEMENT ZONE (WMZ)	Victoria / Albert / Kyoga / Upper Nile*
10. WATER SOURCE PROTECTION COMMITTEE	
<i>If using a pre-existing committee then give name and details:</i>	
Chair:	Position: Organisation:
Secretary:	Position: Organisation:
Member:	Organisation:

*Delete as appropriate

Part B: Aims, Objectives, Targets and Monitoring

The section should describe what the plan is trying to achieve and use the table below to describe the objectives for each aim, the targets to be met and who will monitor them.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 4: Resource Mobilisation

Table 15: PART B - Aims, Objectives, Targets and Monitoring Summary

PART B	Aim	Objectives	Targets/Indicators	Monitoring responsibility
1.	Improved Water Quality			
2.	Reliable Water Quantity			
3.	Better Livelihood Opportunities			

Part C: Description of Threats

This should summarise the analysis of the problems and the Control Measures undertaken in Steps 1, 3 and 6, supported by some descriptive text.

Table 16: PART C - Risks and Control Measures Summary

PART C	Hazard/Risk	Control Measure (options)
1. Threat (Hazardous Activity) and release		▪
2. Pathway (Water flowing in the environment – rivers, lakes, reservoirs, groundwater, soil, surface runoff)		▪
3a. Water Source: Water Infrastructure		▪
3b. Water Source: Impact on End Water User		▪

Part D: Action Plan

The Action Plan should give a description of what Control Measures will be implemented and the table below can be used to summarise the activities, responsibilities and deadlines.

Table 17: PART D - Action Plan Summary

PART D Threat	Water Source: Control Measure	Who does it?	To be completed by end of:	Who checks it is done?	Action if the control fails	
					What to do?	Who does it?

Part E: Financial Agreement

The financial agreement should summarise the output from the previous parts of Step 7. This should be backed up by individual contracts or semi-formal agreements (such as a voluntary Memorandum of Understanding) between the Implementer and the signatory partners to the WSPP.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 6: Implementation

Table 18: PART E – Financial Plan Summary

PART E		Water Source:				
Threat:						
Control Measure:						
Who does it?						
Who checks it?						
Item	Cost Type	Cost	Who does it?	Contributions Partner	Amount	

Part F: Evidence Base

This section is likely to be the longest and could be presented in a separate volume. Its purpose to present all the evidence collated during the preparation of the plan is to make it clear how the decisions that went into the Action Plan (Part D) were arrived at.

Section D should comprise:

- Minutes of WSPC meetings, wider stakeholder workshops, public events and bi-lateral meetings. Clippings of any media articles.
- A list of Stakeholders engaged and their key points and contributions.
- Technical analysis: relevant data analysis, research and modelling.
- Stakeholder and livelihood analysis – where possible be transparent, however some of this information may be commercially or socially sensitive.

Step 5.7 - Get all key stakeholders to make a public, signed commitment to delivering the Water Source Protection Plan

If the Implementer hopes to influence the behaviour of other in their water supply catchment then they need to establish trust and legitimacy among the majority of the stakeholders. It should be accepted that it is unlikely to get all stakeholders to agree. Wider politics or local social tensions and feuds can sometimes be stronger than the attraction of mutual self-interest.

A publically signed commitment is a good way of raising morale and confidence, getting publicity and greater local awareness of the problems and solutions. A public commitment also provides a lever to hold signatories to account during implementation.

Step 6: Implementation

Objective: To successfully use the plan to achieve the agreed aims and objectives and to protect the Water Source.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 6: Implementation

Step 6.1: Implementing Protection Measures as set out in the agreed Water Source Protection Plan

For implementation to be successful there need to be clear, well defined roles, responsibilities, resources, actions and agreed timescales.

For each milestone, such as starting or completing a particular project of activity, it may be a good idea to get some publicity through local media and a small public event to generate interest and enthusiasm. Visible progress is important for public and stakeholder moral.

Figure 9: Celebrating the opening of a protected spring



Step 6.2: Establishing Protection Zones

This step is not mandatory but could be important because Protection Zones confer legal powers that can be very helpful for protecting water sources. In some cases, the water body may already have been designated (also known as ‘gazetted’). A list is provided in the 6th Schedule of *The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3/2000*.

Step 6.2a: Choose the type of Protection Zone

There are various types of protection zones provided for in Ugandan legislation for different contexts (Table 20). While noting that these other types of protection zone are available, this guidance focuses on the Water Protection Zones from the Water Act, Cap 152, as guidelines for their use have not been previously established. What follows is a proposal for how this legal measure could be enforced. Take note that the Act specifies that Water Protection Zones are for use for protecting water supply and sewerage infrastructure and so does not apply to hydroelectric power plants, or other water uses.

The Control Measures chosen through the WSPP process can be targeted at protection zones so that investment can be more focused on higher risk areas within the catchment.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 6: Implementation

Table 19: Protection Zones

Protection Zone	Powers	Legislation
Water Protection Zone	A water authority may: (a) establish a protected zone on land adjacent to - (i) any water, borehole, treatment or other works forming part of a water supply or from which a water supply is drawn; or (ii) any sewer, sewerage treatment works or outfall; (b) erect and maintain fences on or enclose the land under the protected zone; and (c) prohibit activities within the protected zone, as it sees fit.	Water Act, Cap 152
Wetland/River Bank/Lake Shore Protection Area (Full/Partial/Community Conservation)	Soil and river bank conservation is promoted, and not doing so is an offence. The following activities are regulated within the protection area: 1. Brick making. 2. Recreational activities such as fishing, maintenance of green spaces. 3. Cultivation. 4. Drainage. 5. Commercial exploitation of wetland resources. 6. Sewerage filtration. 7. Fishing using fish gear and weirs, fish farming and other aquaculture. 8. Construction of transport and communication facilities such as roads, railways, telephone lines. 9. Burning. 10. Any exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes.	The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3/2000
Forest Reserves	Section 6 allows for the creation of forest reserves: (b) a strict nature reserve for the purpose of - (i) protecting streams, rivers, lakes, lakeshores, riverbanks or wetlands; (ii) soil, slope and environment protection; or (iii) protecting the ecosystem; Section 13 states that: (1) A forest reserve shall be managed in a manner consistent with the purpose for which it is declared. (2) For the avoidance of doubt, a forest reserve shall not be put under any use other than in accordance with the management plan. It also states that: (b) forests shall be developed and managed so as to – (v) conserve natural resources, especially soil, air and water quality;	The National Forestry and Tree Planting Act, 2003
Hilly and Mountainous Areas	Not a statutory designation, but:- every land owner or occupier whose land is situated in a mountainous and hilly area shall take measures - (a) to reduce water run off through the grassing of medium and steep slopes; (b) to mulch and bund gardens on medium and steep slopes; (c) to practice agroforestry; (d) to prevent the burning of grass in areas of intensive agriculture or on steep slopes.	The National Environment (Hilly And Mountainous Area Management) Regulations, 2000.

Water Protection Zones (Surface Water)

It is proposed that there should be three levels of Surface Water Protection Zones:

Surface Water Protection Zone 1 (SPZ1)

This is the area around the Water Source with the highest level of protection: all human and animal activities are excluded from this area by use of fencing and regular patrols. The extent will be limited in both cases by land ownership, compensation and Human Rights issues which will require detailed stakeholder engagement and

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 6: Implementation

negotiation. Some water-intensive plant species (such as *Eucalyptus*) should be prohibited in this area and any existing trees removed and replaced with less harmful native species.

Surface Water Protection Zone 2 (SPZ2)

This should use the same principles set out in *The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3/2000* for limiting harmful activities and encouraging beneficial activities, in addition to the requirements set out for Zone 3, below.

Surface Water Protection Zone 3 (SPZ3)

This is the rest of the catchment supplying the Water Source that does not fall within Zones 1 or 2. Within this area, there should be a targeted campaign to ensure that all qualifying abstractions and locations using Prescribed Substances (Annex E4) and Prescribed Premises and Trades and (Annex E5) under the *Water (Waste Discharge) Regulations, No. 32/1998* are permitted.

Water Protection Zones (Groundwater)

There are three levels of Groundwater Protection Zone:

Groundwater Protection Zone 1 (GPZ1)

This is area immediately around the well or borehole (within 10 metres). All activities not relating to the use of the water point should be excluded. Unless water users need to come to water point to collect water then this zone should be securely fenced off to prevent unauthorised access and vandalism, which could contaminate the water source. Animals should be prevented from entering this area and a separate trough provided for livestock watering.

Groundwater Protection Zone 2 (GPZ2)

Within this Zone Prescribed Substances (Annex E4) and Prescribed Premises and Trades and (Annex E5) under the *Water (Waste Discharge) Regulations, No. 32/1998* should be allowed. In addition, there should be no latrines, open defecation, burial grounds or livestock pens or sheds within this zone.

Existing premises and users should be encouraged to find alternative substances, processes or location, or to install pollution prevent measures.

The funding and compensation for taking action would be the subject of negotiation between all relevant stakeholders.

The following provides practical guidance on how to estimate suitable distances between groundwater Water Sources (wells, boreholes) and Threats that could pollute them. The focus is on bacterial and viral contaminants that present a risk to human health, however there are many other potential harmful contaminants, and site specific investigations should be done if a health problem is identified or if a taste or smell problem is reported by water users (for example, if there is the taste or smell of hydrocarbons like petrol or diesel in the water).

Two different estimate methods of increasing complexity and comprehensiveness are presented. The choice of which to use will depend on the data and information

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 6: Implementation

available at the site being investigated, and the skills and the resources of the person undertaking the assessment.

Using these guidelines does not guarantee protection of the water source but is a sound precautionary measure based on experiences in Uganda and worldwide¹⁹.

Level 1: Basic Protection Distances

Volume 3 of the Water Source Protection Guidelines provides the following criteria for groundwater point sources, which is adapted from the District Implementation Manual (2007):

- Concrete apron and drainage channel to prevent water entering well/borehole
- For hand pumps (shallow wells, boreholes) a fence should be constructed with a minimum distance of 5 steps (3m or 10ft) around the apron and 1 step (60cm or 3ft) along the drainage channel. Access should allow for disabled water users (e.g. those in wheelchairs) but not allow livestock to get in.
- For livestock watering, a separate trough should be provided outside the fenced off area (supplied by a pipe or channel from the handpump)
- Secure at least 50m x 100m land in the upstream/surrounding area of water point to conserve water shed under natural vegetation cover.
- The well or borehole should **not** be located:
 - In a wetland or an area prone to flooding
 - Within 50 metres (80 metres if downhill) from:** latrines, open defecation, soakaways, septic tanks, graveyards, livestock pens/kraals, waste storage or dumping, livestock spaying/dipping, bathing or washing activities.
 - Within 250 metres:** No Prescribed Trades or Premises (Annex A1), petrol filling stations or fuel/oil/chemical storage tanks or depots.

Level 2: Geology/Vadose Zone Matrix

The following has been adapted from “Guidelines for separation distances based on virus transport between on-site domestic wastewater systems and wells”²⁰ and it is recommended that those wanting to understand the scientific basis refer to this document.

Information Needed:

- **Distance between the borehole/well and the nearest sewage discharge to ground** (e.g. latrine or where open defecation is commonly practised). Find out by visiting the area and conducting a survey, including distance measurements - Global Positioning System (GPS) tools may make this easier than older tape measure methods, but reliability of the GPS accuracy needs to be tested in the field.
- **Geology type of the aquifer** – information available from drilling log for the borehole and geology maps available from DWRM.

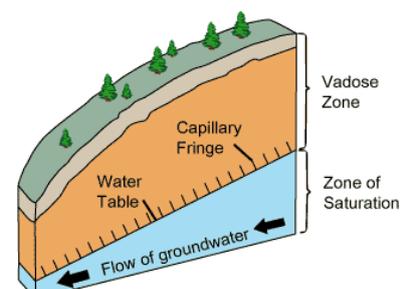


Figure 10: Illustration of the Vadose Zone (US Geological Survey) [tewater_sport.pdf](#)

¹⁹ WHO (2006) *Protecting Groundwater for Health: Managing the Quality of Drinking-water Sources*, IWA Publishing, London

²⁰ Moore, C., Nokes, C., Loe, B., Close, M., Pang, L., Smith, V., Osbaldiston, S. (2010) "Guidelines for separation distances bas systems and wells" Environment Science and Research Ltd. New Zealand. <http://www.envirolink.govt.nz/PageFiles/31/Guid>

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 6: Implementation

- **Vadose Zone type and thickness (metres)** – this is the distance between the ground surface and the water table. This can be found from borehole logs or water level measurements of wells in the area.

Distance Separation Estimation²¹

Hydrological Settings		Vadose Zone thickness (metres)				
Aquifer	Vadose Zone	2m	5m	10m	20m	30m
Gravel	Gravel					
	Sand (alluvial)					
	Silt					
Sand (alluvial)	Gravel					
	Sand (alluvial)					
	Silt					
	Ash					
	Pumice sand					
Karstic or Fractured Rocks	Gravel					
	Sand (alluvial)					
	Silt					
	Ash					
	Pumice san					

Key	Color
Possible within 50 m	Yellow
Possible within 100 m	Orange
Possible within 300 m	Red
Requires 300 m or more separation	Grey

Limitations

If the geology type does not fit with the categories given in the table above, consult a hydrogeologist for more detailed advice.

The distances are broad estimates and they are based on the intentional discharge of treated sewage effluent into the ground from a septic tank through a conventional trench in soil 1 metre thick.

Where soils are thinner or sewage discharges are untreated then the separation distances should be maximised, either by fencing off the area around the borehole, or working with the surrounding community to move or improve sanitation and livestock activities further away.

Groundwater Protection Zone 3(GPZ3)

This is rest of the catchment supplying the Water Source that does not fall within Zones 1 or 2. Within this area, there should be a targeted campaign to ensure that all locations using Prescribed Substances (Annex E4) and Prescribed Premises and Trades and (Annex E5) under the *Water (Waste Discharge) Regulations, No. 32/1998*

²¹ Table 8.2 from Moore et al (2010)

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 6: Implementation

Step 6.2b: Establish legal recognition and byelaws of Protection Zones

The procedure for declaring a Water Protection Zone is not defined in legislation. However, it should follow a similar process to that for “specially protected areas” as set out in *The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, No. 3/2000*:

1. *The declaration of a Water Protection Zone may be initiated by the district council on the recommendation of the Water Authority, District Environment Committee or the Executive Director;*
2. *Where the District Council initiates the process of declaring a Water Protection Zone, the District Council shall;*
 - a. *inform the Executive Director in writing of its intention;*
 - b. *cause an environmental impact assessment to be carried out to demonstrate the benefits of the protection area and justify its extent and bye-laws.*
 - c. *ensure that the view of the people inhabiting the areas contiguous to Water Protection Zone are taken into account by convening the meeting of the Water Source Protection Committee; and*
 - d. *prepare and submit a report containing findings in paragraphs (a), (b) and (c) of this sub-regulation to the Executive Director.*
3. *The executive Director shall consider the reports submitted under sub-regulation (2) and (3), and may make recommendations to the Minister.*

The byelaws for the Protection Zone should clearly state what activities are and are not permitted within the zone, and if there are any seasonality or other conditions attached to the restrictions.

Step 6.2c: Pay compensation to those displaced from the Protection Zone

In some cases it may be necessary to relocate activities, businesses or sanitation away from designated Protection Zones in order to protect the Water Source. In doing so, the Implementer should refer to the latest policy on relocation and compensation arrangements, for example: ***The Uganda National Land Policy, Ministry Of Lands, Housing and Urban Development, March 2011***

Section 91 of the Water Act, Cap 152 also gives guidance on compensation:

91. Compensation to be paid.

(1) If damage is caused to land in the exercise of powers conferred on an authority by this Act, the authority shall, if required, compensate all parties interested in the land for all damage sustained by them in consequence of the exercise of those powers, subject to this Act.

(2) For purposes of this section, "damage to land" means loss suffered as a result of

(a) deprivation of the possession of the surface of any land;

(b) damage to the surface of land and to any improvements, crops or trees on the land;

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

Step 7: Monitoring and Regulation

Step 6.2d: Physically demarcate Protection Zones

Experience in Uganda has shown that statutory zoning is rarely respected unless physically marked out so that people using the area can clearly see where they are or are not allowed to go.

Fences and walls are commonly used to demarcate and protect land. However, this requires land ownership and is expensive to install and maintain, especially for large areas. In many cases, excluding people from the land is not the aim – what is more important is to show the areas, such as river banks and lake shores where particular activities are not allowed or strictly controlled.

Markers can include metal or wooden posts or stone markers. There should be clear signage to explain what the zone means and what activities are and are not permitted. This should be done in English, the local language(s) and using symbols and pictures. When installed there should be awareness raising campaigns to inform people living near the zone perimeter about the new development and what the signs mean.

Step 6.3 NEW - Complete handover to Water Authority

Ensure that all documentation has been handed over to the operating Water Authority as part of the handover process for the scheme.

Where there the Implementer is both the developer of the scheme and the operator (e.g. NWSC) there still may need to be some internal handover between the staff with the different functions.

Step 6.3 EXISTING / Step 6.4 NEW - Final confirmations of monitoring and regulation responsibilities.

Meet with officers from the relevant district offices such as the District Natural Resource Management/Environment, and with the Water Authority and other relevant local regulators to ensure that responsibilities or on-going implementation, monitoring and regulation of water source protection are clear and agreed upon.

Step 7: Monitoring and Regulation

Step 7.1 NEW - Ensure that an evaluation of the Water Source Protection is included in the follow-up evaluation of the scheme

Agreed indicators for water source protection are included in scheme monitoring. This will depend on the project procedures of the Implementer.

Step 7.1 EXISTING – Undertake monitoring of agreed indicators

Good monitoring is essential to find out what is working and what is not working so that the WSPP can be updated and changed to suit the circumstances.

A) Direct monitoring

- Ensure that data is collected for the indicators and targets agreed in Part B of the WSPP template.

B) Indirect Monitoring

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

Step 7: Monitoring and Regulation

- Where monitoring is being done by a Contributor, as defined in Part B of the WSPP template, ensure that they are performing this role and collate the information and data that they are collecting.

Step 7.2 EXISTING - Compliance with regulations and bye-laws

Ensure on-going compliance with Water Permit conditions, relevant regulations and bye-laws.

- Maintain regular (at least annual) communications with WMZ team and regulators defined in Part D of the WSPP template.
- If there is political interference with the enforcement of the protection zones or other legal mechanisms, then host a stakeholder meeting to determine the causes and get consensus on how to re-establish compliance and enforcement processes.

Step 7.3 EXISTING - Annual Review of progress

On-going communication and co-ordination is critical to the success of water source protection. Producing the WSPP is the beginning of the water source protection process, not the end. Good monitoring and reporting is essential to make sure that partners stay on board and continue to make financial and in-kind contributions.

- Hold quarterly or bi-annual meeting of the WSPC to review progress on implementing Control Measures, to review the data emerging from the monitoring and to agree the way forward.
- Hold an annual public meeting to present progress to the wider public and stakeholders.
- Adjust and reissue the WSPP in accordance with events and changing stakeholder needs.
- Organise public celebration events when Control Measure schemes are completed or targets are reached.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX A: Relevant Ugandan Policy, Legislation and Regulations

3 General Annexes

ANNEX A: Relevant Ugandan Policy, Legislation and Regulations

Document
Water And Sanitation Sector Sectoral Specific Schedules/ Guidelines 2009/10
Water & Waste Discharge Regulations, 1998
The Water Resources Regulations, 1998
The Uganda Water Act, Cap 152
The National Environment Impact Assessment Regulations, 1998
The National Environment Hilly And Mountainous Areas Regulations
The National Environment Forestry And Tree Planting Act
The National Environment Act, 1998
The National Environment (Wetlands, Riverbanks And Lakeshores Management)Regulations
The National Environment (Minimum Standards For Management Of Soil Quality) Regulations
The National Environment (Minimum Standards For Discharge Of Effluents Into Water Or Land) Regulations
National Water Policy 1999
Ministry of Water and Environment Gender Strategy 2010-2015
Lake Victoria Policy Harmonization - Draft Report

ANNEX B: Further Information

Annex B1: International Guidance and Resources

Title	Reference	Web Link
<i>Groundwater Protection: Guidelines for Protecting Springs</i>	Department of Water Affairs and Forestry, Government of South Africa (2004)	http://www.dwaf.gov.za/groundwater/NORADToolkit/3.2%20Guide%20or%20protecting%20springs.pdf
<i>Healthy wetlands, healthy people A review of wetlands and human health interactions</i>	Horwitz, P., Finlayson, M. and Weinstein, P. 2012. Ramsar Technical Report No. 6. Secretariat of the Ramsar Convention on Wetlands, Gland, Switzerland, & The World Health Organization, Geneva, Switzerland.	http://www.ramsar.org/pdf/lib/rtr6-health.pdf
<i>Information Products for Nile Basin Water Resources</i>	Food and Agriculture Organisation (FAO) (2011)	http://www.fao.org/nr/water/faonile/products/index.html
<i>Water Safety Plan Manual: Step-by-step risk management for drinking water supplies.</i>	Bartram J, Corrales L, Davison A, Deere D, Drury D, Gordon B, Howard G, Rinehold A, Stevens M. (2009) WHO, Geneva	http://www.who.int/water_sanitation_health/publication_9789241562638/en/index.html
<i>Protecting Groundwater For Health: Managing the Quality of Drinking-water Sources</i>	World Health Organisation (2006)	http://www.who.int/water_sanitation_health/publications/protecting_groundwater/en/
<i>Water Safety Plans Managing drinking-water quality from catchment to consumer</i>	World Health Organisation (2005)	http://www.who.int/water_sanitation_health/dwq/wsp0506/en/index.html
<i>Groundwater Quality Protection: defining strategy and setting priorities</i>	World Bank (2004). GW-MATE Briefing Note 8	

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX C: Ugandan Standards

Annex B2: Sources of Information for Uganda

Title	Reference	Web Link
<i>Assessment of the Utilisation of Groundwater Resources Maps at National and District levels</i>	Government of Uganda, Ministry of Water and Environment, January 2012	n/a
<i>Groundwater potential maps</i>	Government of Uganda, MWE, Directorate of Water Resource Management	n/a
<i>Hydrochemical maps</i>		n/a
<i>Water Quality maps</i>		n/a
<i>Groundwater supply</i>		n/a
<i>Technology options maps</i>		n/a
<i>Water sources location and Water supply coverage maps</i>		n/a
<i>Hydrogeological characteristic maps</i>		n/a
<i>District Environmental Policies</i>	Districts currently available: Buteleja, Masindi, Nakasongola	http://www.nemaug.org/environment_policies.php
<i>District State of the Environment Reports</i>	Districts currently available: Arua, Bugiri, Busia, Butalejja, Iganga, Jinja, Kabale, Kalangala, Kamwenge, Kapchorwa, Kisoro, Kotido, Kumi, Luwero, Mayuge, Moroto, Moyo, Mpigi, Mubende, Nebbi, Palisa, Sironko, Soroti, Yumbe	http://www.nemaug.org/district_s_o_reports.php
<i>Sector Performance Reports</i>	MWE (Annual)	http://www.mwe.go.ug/index.php?option=com_docman&task=cat_view&gid=62&Itemid=122
<i>Water Supply Atlas 2010</i>	MWE (2011)	http://www.mwe.go.ug/index.php?option=com_docman&task=cat_view&gid=59&Itemid=122
<i>Uganda: Atlas of Our Changing Environment</i>	NEMA (2009)	http://www.grida.no/files/publications/uganda-atlas-2009.pdf
<i>Operationalising Catchment Based WRM Report</i>	COWI/DWRM (2011)	http://www.mwe.go.ug/index.php?option=com_docman&task=doc_download&gid=153&Itemid=122
<i>Small Towns Water Supply Data</i>	MWE	http://www.mwe.go.ug/index.php?option=com_docman&task=cat_view&gid=78&Itemid=122

ANNEX C: Ugandan Standards

Annex C1: Urban Drinking Water Standards²²

Parameter	Requirements	Parameter	Requirements
Colour	10 (Platinum scale)	Selenium (Se)	0.01 mg/l
Odour	Unobjectionable	Chromium (Cr ⁶⁺)	0.05 mg/l
Taste	Acceptable	Cadmium (Cd)	0.01 mg/l
Turbidity	10 NTU	Mercury (Hg)	0.001 mg/l
Dissolved solids	500 mg/l	Nitrates (NO ³⁻)	10 mg/l
		Chloride (Cl)	250 mg/l
PH	6.5 – 8.5	Fluoride (Fe)	1.0 mg/l
Total hardness (CaCo ₃)	500 mg/l	Phenolic substances (e.g C ₆ H ₅ OH)	0.001 mg/l
Calcium (Ca)	75 mg/l	Cyanide	0.01
Sodium (Na)	200 mg/l	Poly Nuclear Aromatic Carbons	Nil mg/l
Magnesium (Mg)	50 mg/l	Residual, free chlorine	0.2 mg/l

²² MWE (2007) DISTRICT IMPLEMENTATION MANUAL, Version 1, 31 March 2007, Annex 9.2

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection
ANNEX C: Ugandan Standards

Parameter	Requirements	Parameter	Requirements
Barium (Ba)	1.0 mg/l	Mineral oil	0.01 mg/l
Iron (Fe)	0.3 mg/l	Anionic detergents	0.2 mg/l
Copper (Cu)	1.0 mg/l	Sulphate	200 mg/l
Aluminium (Al)	0.1 mg/l	Pesticides	Trace
Manganese (Mn)	0.1 mg/l	Carbon chloroform (CCE, org. pollutants)	0.2 mg/l
Zinc (Zn)	5.0 mg/l	Microscopic organisms (algae, parasites, toxin producing org. etc.)	Nil
Arsenic (As)	0.05 mg/l	Coliforms	0 / 100 ml
Lead (Pb)	0.05 mg/l		

Annex C2: Rural Drinking Water Standards²³

Parameter	Guideline Values/Acceptable Values	Maximum Acceptable Concentration (MAC)
Hardness (CaCo ₃)	600 mg/l	800 mg/l
Iron total (Fe)	1 mg/l	2 mg/l
Manganese (Mn)	1 mg/l	2 mg/l
Chloride (Cl)	250 mg/l	500 mg/l
Fluoride (Fe)	2 mg/l	4 mg/l
Sulphate	250 mg/l	500 mg/l
Nitrate (NO ₃)	20 mg/l	50 mg/l
Nitrite (NO ₂)	0 mg/l	3 mg/l
TDS – Total Dissolved Solids	1000 mg/l	1500 mg/l
Turbidity	10 NTU	30 NTU
pH	5.5 – 8.5	5.0 – 9.5
E. Coli	0 / 100 ml	50 / 100 ml

Annex C3: Effluent Discharge Water Quality Standards²⁴

Substance	Max concentration	Substance	Max concentration
1,1,1, -trichloroethane	3.0 mg/l	1,1,2,- dichloroethylene	0.2 mg/l
1,1, 2,- Trichloroethane	1.06 mg/l	1,2- Dichloroethane	0.04 mg/l
1,3- dichloropropene	0.2 mg/l	Aluminum	0.5 mg/l
Ammonia Nitrogen	10 mg/l	Arsenic	0.2 mg/l
Barium	10 mg/l	Benzene	0.2 mg/l
BOD ₅	50 mg/l	Boron	5 mg/l
Cadmium	0.1 mg/l	Calcium	100 mg/l
Chloride	500 mg/l	Chlorine	1 mg/l
Chromium (total)	1.0 mg/l	Chromium (VI)	0.05 mg/l
Cirrus- 1,2 - dichloroethylene	-- mg/l	Cobalt	-- mg/l
COD	100	Clifford Organisms	10,000 counts/100 ml
Color	300 TCU	Copper	1.0 mg/l
Cyanide	0.1 mg/l	Detergents	10 mg/l
Dichloromethane	0.2 mg/l	Iron	10 mg/l
Lead	0.1 mg/l	Magnesium	100mg/l
Manganese	1.0 mg/l	Mercury	0.01 mg/l
Nickel	1.0 mg/l	Nitrite – N	20 mg/l
Nitrite - N	2.0 mg/l	Nitrogen total	10 mg/l
Oil and Grease	10 mg/l	pH	6.0-8.0
Phenols	0.2 mg/l	Phosphate (total)	10 mg/l
Phosphate (soluble)	5.0 mg/l	Selenium	1.0 mg/l
Silver	0.5 mg/l	Sulfate	500 mg/l
Sulfide	1.0 mg/l	TDS	1200 mg/l
Temperature	20-35°C	Tetra Cholera ethylene	0.1 mg/l
Tetrachloromethane	0.02 mg/l	Tin	5 mg/l
Total Suspended Solids	100 mg/l	Trichloroethylene	0.3 mg/l
Turbidity	300 NTU	Zinc	5 mg/l

²³ MWE (2007) *DISTRICT IMPLEMENTATION MANUAL*, Version 1, 31 March 2007, Annex 9.2

²⁴ The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, S.I. No 5/1999

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

Annex C4: Prescribed Substances (requiring a Waste Discharge Permit)²⁵

<ul style="list-style-type: none"> ▪ Aldrin ▪ Atrazine ▪ Arsenic ▪ Azinphos-methyl ▪ Boron ▪ Cadmium and its compounds ▪ Carbon tetrachloride ▪ Chloroform ▪ Chromium ▪ Cyanide ▪ Cyfluthrin ▪ DDT ▪ 1,2-Dichloroethane ▪ Dichlorvos ▪ Dioxins ▪ Endosulfan ▪ Endrin ▪ Fenitrothion 	<ul style="list-style-type: none"> ▪ Fethionlsodrin ▪ Flucofuran ▪ Hexachlorobenzene (HCB) ▪ Hexachlorobutadiene (HCBD) ▪ Hexachlorocyclohexane (Lindane and related compounds) ▪ Iron ▪ Lead ▪ Malathion ▪ Mercury and its compounds ▪ Nickel ▪ Parathion ▪ Parathion methyl ▪ PCD's ▪ Pentachlorophenol (PCP) and its compounds ▪ Perchloroethylene ▪ Permethrin 	<ul style="list-style-type: none"> ▪ Polychlorinated biphenyls ▪ Simaxine ▪ Copper ▪ Tetrachloroethylene ▪ Tributyltin compounds ▪ Trichlorobenzene ▪ Trichloroethane ▪ Trichloroethylene ▪ Trifluralin ▪ Triphenyltin compounds ▪ Vanadium ▪ Zinc ▪ Sulcofuron ▪ Azinphos-ethyl ▪ Substances prescribed by other law in force
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Annex C5: Prescribed Trades and Premises (requiring a Waste Discharge Permit)²⁶

<ul style="list-style-type: none"> ▪ Airports ▪ Breweries ▪ Mines and processors ▪ Coffee factories ▪ Commercial fish farms ▪ Fish processing factories ▪ Fruit and vegetable processing factories 	<ul style="list-style-type: none"> ▪ Hospitals ▪ Leather tanning factories ▪ Meat processing factories Mineral extraction and processing ▪ Oil factories Plastic manufacturers ▪ Sewerage treatment plants 	<ul style="list-style-type: none"> ▪ Slaughtering Works (as may be identified by the Director) ▪ Soap factories ▪ Soft drink manufacturers ▪ Steel rolling mills ▪ Sugar factories ▪ Textile factories
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ANNEX D: Water Source Protection Communications Strategy

What is Water Source Protection?

A woman turns on the tap, water flows and it is safe to drink. An engineer flicks a switch and his factory whirs into life, thanks to electricity generated by hydropower. A farmer has fertile soil that does not wash away and plentiful water for his crops and livestock. This is what Water Source Protection does.

Water Authorities, farmers, communities, business and local and national government work together to produce a water source protection plan which sets out realistic, practical steps to improve catchment management, reduce pollution and prevent catchment degradation. As a result, water infrastructure works more reliably and the land and water are used more productively. This is how Water Source Protection works.

Introduction

Water Source Protection Guidelines have been developed as part of a wider programme of operationalizing Integrate Water Resource Management (IWRM) throughout Uganda. The aim is to reduce degradation of surface and groundwater resources, which is impacting the health and livelihoods of millions of Ugandans and damaging the economy and biodiversity of the country as a whole, as well as creating

²⁵ Second Schedule, The Water (Waste Discharge) Regulations, No. 32/1998.

²⁶ Third Schedule, The Water (Waste Discharge) Regulations, No. 32/1998.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

risks of conflict with neighbouring countries who share transboundary water resources. Water Source Protection is a localised solution that builds partnerships between water users and surrounding activities that are impacting them. It is intended that this approach be replicated across the country, within a wider framework of catchment planning and Water Management Zones.

From the piloting in River Manafwa basin in Mbale, Bududa and Manafwa districts, the Guidelines will be rolled out nationwide and to be successful there needs to be wide level of awareness, but the depth of understanding will vary depending on how individuals want, or need, to be involved with the process of Water Source Protection planning and protection.

The purpose of this annex is to propose ways to raise awareness of Water Source Protection Guidelines, and the issues that they are addressing and engaging the right audiences to get involved.

Aims & Objectives

Aims

- To raise the level of public awareness about and rationale of the Water Source Protection Guidelines and the need to protect water sources such as water catchments/watershed, wetlands, open waters (rivers, lakes), for their own benefit as well as everyone else's.
- To ensure that Water Management Zone Teams are aware their mandates (roles and responsibilities) in regard to enforcement and compliance monitoring of the Guidelines and to facilitating stakeholder engagement in implementing the guidelines.
- To raise awareness and develop ownership and use of the Water Source Protection Guidelines within the Ministry of Water & Environment and other government institutions.
- To raise awareness and promote participation in Water Source Protection planning and protection by relevant government, private sector, civil and NGO/Community organisations.
- To promote Water Source Protection within the context of the DWRM using Communication as a tool.

Objectives

- That all MWE staff are aware of the existence of the Water Source Protection Guidelines by the end of 2013, or earlier.
- That all MWE offices, including subsidiary directorates and parastatal organisations, have Water Source Protection poster displayed in a prominent place in the building (reception area, meeting room or manager's office) by the end of 2013, or earlier.
- That all four Water Management Zone (WMZ) offices have been fully familiarised and trained on the Guidelines and have the skills, confidence and resources to enforce and monitor compliance of the Guidelines.
- That there is evidence that the public and water users are aware of the Water Source Protection Guidelines.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

Audiences & Messages

The table below outlines the main audience segments, the minimum level of awareness and expected behaviour changes. The overall message should be hopeful and aspirational.

Audience Group	Minimum Level of Awareness & Understanding to achieve	Desired outcome from sensitisation	Key Messages / What's in it for me?
MWE staff (including DWD, DWRM, DEA, NEMA, NFA, NWSC, WMZ, WSDF, TSU, WMD, FSSD, DESS)	Awareness of the Water Source Protection Guidelines and that they are there for their use to facilitate their mandates in relation to environmental protection and water infrastructure development.	The Guidelines become used (enforcement, compliance and compliance monitoring) on a regular basis by all the relevant MWE functions. Contribute human and financial resources and expertise to implement source protection measures.	These are your Guidelines They are here to help you do your job.
Ministry of Energy and Mineral Development (including Electricity and hydropower development agencies, Petroleum agencies)	Awareness of the Guidelines as a tool to protect the yield and performance of hydroelectric schemes. Awareness of the Guidelines as a tool to protect the yield and performance of abstraction and discharge schemes associated with Oil and Gas industry	Active involvement with piloting and uptake of Vol. 5 - Guidelines for Protecting Hydroelectric Power Plants Awareness with all aspects of the energy sector that they both rely on well managed water resources and have a mandate and responsibility for water source protection.	Protecting water resources is critical to successful hydropower. Guideline Volume 5 is yours and MWE wants to help you make it as useful and used as possible. Protecting water resource is critical to the sustainability and reputation of the oil and gas industry
Ministry of Works and transport	Awareness of the Guidelines as a tool and the issue as something that concerns them and their stakeholders.	Recognition that uncontrolled road runoff is a major, and increasing, source of soil erosion, silt, pollution and flooding.	Better road design and construction can reduce long term maintenance costs.
Ministry of Agriculture, animal Industry and Fisheries	Awareness of the Guidelines as a tool and that water management and land management strongly linked.	A desire to make their family of government organisations aware of the guidelines and using them.	WSP guidelines are a mechanism to push for local initiatives to improve agricultural practices and productivity and to protect and enhance fisheries.
National political leaders	Water source protection is critical to safeguarding the life and productivity of water and energy infrastructure, and hence the national and local economies.	Support for all relevant government bodies to be involved with Water Source Protection. Ensure that sufficient budget and human resources are allocated to water source protection measures.	People, water and land are Uganda's greatest resources; strong management will create a strong society and economy. The Guidelines are a pragmatic and cost-effective way of delivering real results.
District Local Government	Awareness of the Guidelines as a tool to support their mandates for environmental protection, water development	Cooperation and support of local (LC1-5) political leaders. Active input from District Water, Environment, Forestry, Wetland, Agricultural and Natural	These Guidelines are to help you deliver your mandates for better water supply, environmental protection, forestry and agriculture. The Guidelines are built

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

Audience Group	Minimum Level of Awareness & Understanding to achieve	Desired outcome from sensitisation	Key Messages / What's in it for me?
		Resources Officers, District Engineer and Water Authorities. Contribute human and financial resources and expertise to implement source protection measures.	around local decision-making and collaboration to resolve conflicts and incentivise win-win partnerships.
Private Sector (including NWSC)	Awareness of Guidelines as a tool to protect their assets, if they use water; or as something that they should engage with positively if they discharge effluent, abstract large volumes of water, or substantially modify land use in catchment areas.	To see the opportunities in supporting Water Source Protection and not as a threat.	Bad water management costs your business money, directly and indirectly. Being involved in Water Source Protection means investing in your business and your local community for the benefit of everyone, and this will be visible to your customers and local shareholders.
Residents living in hotspot areas near Water Activities (pumping stations, boreholes, springs, reservoirs, hydroelectric schemes)	Awareness that everyday activities (such as open defecation, uncontrolled waste disposal, sand mining, river bank encroachment, deforestation for firewood and charcoal)	To actively engage with water source protection planning and in the implementation of resulting protection measures, such as river bank rehabilitation.	You wouldn't shit in your own well: this is your problem. There are alternatives: better ways of farming, forestry, waste disposal or mining sand that don't harm the water supplies of yourself or others.
Non-governmental, community-based, faith-based organisations	Awareness of the Guidelines and their scope.	Engagement in the water source protection process. Assist with community sensitisation and mobilisation. Contribute human and financial resources and expertise to implement source protection measures.	These is what the Water Source Protection Guidelines are about, is there overlap with what your organisation is trying to achieve? By collaborating with others through the framework of Water Source Protection your efforts can be more effective and long-lasting.
General Public	Awareness that protecting water resources, and catchments, is important because otherwise food, water, fuel wood and electricity supplies become more scarce, expensive and unreliable.	Support government and community actions to protect water sources and water catchment areas. To reflect and modify their own activities that may be harming water bodies.	Degradation of water resources and catchment is a problem you need to know about and care about. A healthy environment is good for you, good for everyone.

Story Telling

The human dimension

People respond to stories; it is how we share and learn. Readers are more likely to understand empathise if a situation is being explained by someone affected by it directly. Emphasising water quality as well as availability is also important. This can be done with images that shock or present facts and figures.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

To help with future communication activities it is worthwhile for WMZ officers to take a camera and take photos of people and situations they encounter and record quotes from those individuals (with their permission) that can be used to explain their situation to wider audiences. Photos or videos of areas affected by catchment degradation, or water sources that have been damaged or polluted by upstream activities are powerful tools in communicating. An example from the River Manafwa is shown below:

1. Threat	2. Pathway	3a. Water Source: Infrastructure
		
<p>One of many sand-mining operations that is speeding up river bank erosion and stirring up sediment.</p> <p>Quote* from “William” Sand Miner: <i>“We make Sh50,000 for every truck load of sand. It’s hard work, and people want to buy the sand for building. I know it causes problems, but I am poor, this is our land and we need to feed our families. What choice do we have?”</i></p>	<p>River Manafwa choked with high levels of sand and silt.</p> <p>Quote* from “Sarah” WMZ officer: <i>“Measurements of river flow and quality have shown a steady decline, with increasing problems with both low flows and flooding since 1995.”</i></p>	<p>Staff at Manafwa Water Works struggle to keep clarifiers from silting up.</p> <p>Quote* from “Charles” NWSC maintenance engineer: <i>“Over the last five years, the situation has got much worse and it is getting harder and harder to clean the water. Sometimes it is too bad to treat or the river levels are too low and we have to stop the supply to Mbale.”</i></p>

* Fictitious names and quotes for the sake of illustrating the point

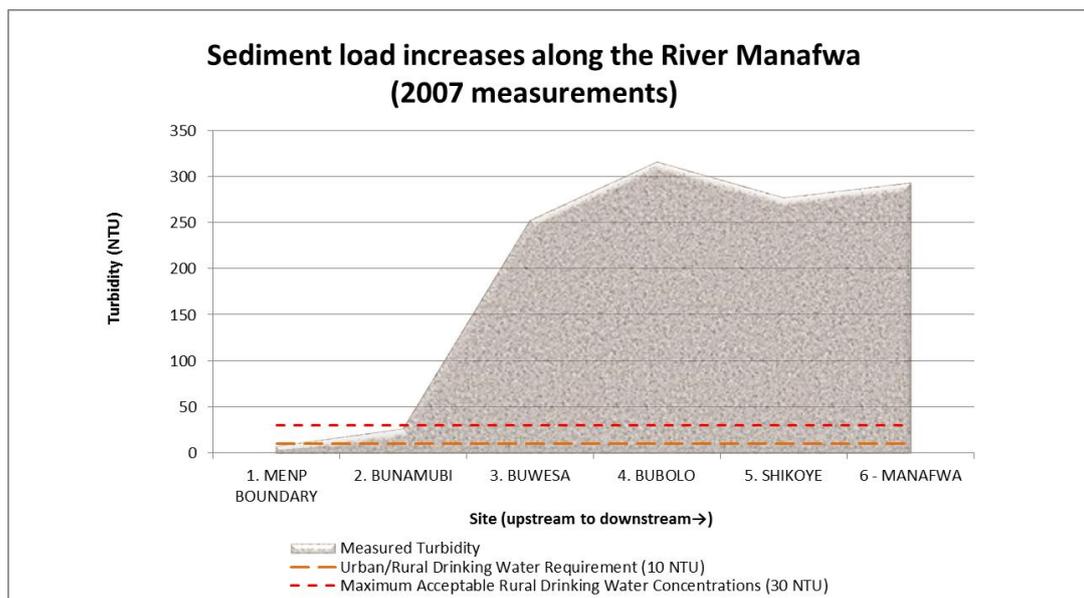
Evidence

Stories are essential for *getting attention* and *stimulating desire*, but often to *reinforce with reason* it is necessary present more objective evidence, often in the form of data. Presenting raw data can be overwhelming, but a good graph can be illustrative, an example below shows turbidity increases along the Manafwa, but could be about availability, scarcity, number of and type of water sources impacted, number of people affected, financial cost of blockages and infrastructure damage and downtime.

What is important to note from this is that data suggests that the biggest increases in sediment load is not caused by the Sand Miners immediately upstream of the intake, but happens much further upstream. This illustrates the importance of matching the story to the evidence (but not the other way around!). In this example, it would be good to visit the river between Bunamubi and Buwesi, find out what is going on an interview people in that area to capture what the issues are, for example is there a particular polluted tributary that enters the Manafwa between these points.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy



Dissemination, Uptake and Communications Options

The Guideline Documents (Hard and Soft copies)

The Guideline Documents themselves are the main way to communicate the detail about what Water Source Protection is about and how to undertake it. While this is suitable for MWE staff, District Technical Officers, other agencies (e.g. NWSC, UWA, NFA, NEMA) other audiences are unlikely to take the time to read them. Even technical staff need to be encouraged to read them, first by having access (being sent a copy – preferably a hard copy, but a soft copy sent by email is better than nothing), secondly by making the document attractive and easy to read and follow. Workshops and training are important ways of reinforcing the importance of the Guidelines and embedding the understanding how to apply them.

Meetings and Training Workshops

Bringing the target audiences together to present the guidelines and give an opportunity for questions and discussions is a powerful tool for raising awareness, stimulating interest and desire and embedding key messages. This has already begun for the Water Source Protection Guidelines with workshops in Kampala and in the pilot area.

A variation is to have a more structured training session with a smaller group (10-20 people) at a time. This would give an opportunity for participants to work through a case study to help them internalise the process, to ask questions that may not have occurred to them in listening passively to a presentation, and to feel confident in being able to take the Guidelines back to their workplace and start using them.

Newsletter

Once Government staff have been sensitised and trained in the use of the Guidelines then their uptake and use will be more likely but not guaranteed. The messages will need regular reinforcement so that the Guidelines are not left collecting dust on the shelf. One way of doing this would be through a simple quarterly or bi-annual newsletter that gives an updates on what Water Source Protection and Catchment Planning activities are happening and what is being learned. This will help create a

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

greater sense of community and peer pressure that encourages the use of the Guidelines.

Technical Support/ Helpline

An officer may feel enthused and keen to use the Guidelines but when they get back to their workplace and try and use them they may encounter difficulties or questions. A way to help them would be for the Guidelines document / Newsletter to include helpline phone numbers and email addresses so that the officer can contact their local WMZ team and get the answers they need.

Annual Water Source Protection Award

Creating an award scheme for the best Water Source Protection Plan, and best Water Source Protection implementation would be an effective way to reinforce the importance of the issue, and to reward the officers and communities who have made the most creative commitments to making it successful.

Posters, Flyers and Advertising

Posters and flyers can be a bright visual way to get interest and raise awareness. Because there are more than 50 languages in Uganda and literacy is not guaranteed, it is essential to have clear pictures that are in a visual language that a wide range of audiences understand. On a large scale, this is done by mobile phone and drinks companies with their large road-side adverts and paying to have shops painted in their corporate branding. Some development partners, such as USAID, also sponsor large adverts to raise awareness of key issues, such as domestic violence and immunisation.

Clearly, MWE does not have the resources to do something similar, but an ambitious but an achievable objective would be develop a poster that goes on the wall of every District, WMZ, MWE, NFA, WSDF, TSU, NWSC office in the country. This would increase visibility not just among staff, but also among visitors.

A simple flyer, using similar branding and style to the posters could be developed so that Ministry staff can hand it out at meetings. To keep printing costs down, the design needs to be attractive in black and white as well as colour.

Bi-lateral Meetings and Telephone Calls

Although time consuming, bi-lateral meetings, reinforced by telephone calls, are the most effective way to sensitise other people, get their buy-in and ensure that they remain interested and engaged in the water source protection process.

Because of the time and logistics costs involved, this level of intensive interaction should be reserved for the highest priority stakeholders that have been identified and mapped in Step 4 of the Guidelines. Ideally, the people who are targeted should be 'connectors', who have a wide social network, or 'salesmen' who are good at persuading others. Often these will be political leaders, so care should be taken to ensure that this does not get become the victim of competing political rivalries – this is a lesson learned from a reservoir proposed near Mbale. NGOs, CBOs and FBOs can be worthwhile sensitising and involving so that they can be encouraged to cascade information to their members and contacts.

Email and Text Messages (SMS)

Email and SMS are increasing common options to communicating, even in rural areas of Uganda. This has the advantage of being able to communicate with

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

individuals and groups quickly and at relatively low cost. However, experience shows that electronic communication is much more successful after a face-to-face meeting has taken place between the two parties involved so that a measure of rapport and trust is built up.

Television

NTV Uganda produces short 'Eco Talk' segments that go out on national television, and can reach an even wider audience through YouTube. A good example of where this has been done before is a segment in river bank restoration in Mbale District - Eco Talk: River Manafwa restoration: <http://youtu.be/Zk6DIIvHEiY> and Eco Talk: Lubigi restoration: <http://youtu.be/mQivEsl3j-o>

Radio Slots

Uganda is served by numerous FM radio stations, which may provide an effective way to reaching a wide audience, including rural communities where access to television and newspapers is more restricted. Short news items or adverts can be prepared for music radio stations, whereas talk stations, such as BBC World Service Kampala and Mbarara may accept longer radio discussions or documentaries.

Press releases for Newspapers and Radio

Uganda has several newspapers, such as New Vision, RedPepper and the Daily Monitor. While they can be effective at reaching a wide audience, the audience needs to be literate and have access to buying the newspapers. This creates an urban bias and the rural population directly exposed to, and involved in, catchment degradation, are not reached. Journalists generally look for human stories and conflicts. This can mean that a published story may have a different angle from that intended when issuing a press-release. It may also cause embarrassment in a situation where efforts are being made to manage conflicts between different stakeholders in a source protection area. Taking out an advert ensures that the message is as you want it presented, but this costs and may not be seen as neutral or credible by the reader.

Actions

The point of communication, advocacy and dissemination to promote action that creates change. Below are some different types of actions that we would like audiences to take up:

- **Champions:** MWE staff at all levels become users and champions of the Water Source Protection Guidelines and their use to achieve the wider goals of IWRM.
- **Citizen-Consumer:** make decisions in your daily life when it comes to where and how to go to the toilet, where to dispose of waste, how to go about small-scale farming, forestry or mining in a way that is more productive and causes less harm.
- **Activist:** Join a local council, NGO, CBO or FBO and champion issues around improving rural livelihoods while reducing land and water degradation. Be actively involved in Water Source Protection consultation processes and contribute time and ideas to being part of the solution.
- **Employer:** look at your business: what is its impact on the water environment and what are the opportunities to both reduce this and reduce costs or increase public profile.

Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX D: Water Source Protection Communications Strategy

Mandates

While the Guidelines will be a Ministry of Water & Environment document, it is for DWRM and the Water Management Zones to take a leadership role into their uptake and on-going development. This already falls, implicitly, within the scope of the team mandates, as illustrated below:

Water Management Zone mandate

In the document “Operationalisation of Catchment-based Water Resources Management” (DWRM/COWI 2010) the role of the WMZ Co-ordinator Includes:

- Increased public and community awareness and participation in water resources management.
- Development and implementation of strategies for social marketing of Catchment-based Water Resources Management (CbWRM); data and information management; and dissemination; and stakeholder awareness, sensitisation and engagement.
- Facilitate, inter-Zone Offices; and co-ordinate, inter-CMOs, mechanisms for collaboration, communication and information exchange for activities in areas of mismatched borders.
- Liaise with other regional actors; and co-ordinate and provide leadership in implementing WR Management activities including regional ecological monitoring systems and procedures.

- The role of the Senior Social Scientist /Communications Officer includes the following communication responsibilities and outputs:
 - Implementation of the DWRM Communications Strategy at WMZ and catchment level.
 - Development and implementation of feedback and follow-up mechanisms linking the WMZ officers, CMOs, partner institutions and agencies and other stakeholders.
 - Social marketing of CbWRM and resultant increased public and community awareness and participation in water resources management.
 - Design and supervise production, in relevant regional languages if necessary, of information and communication materials to support WMZ Office activities
 - Leadership in planning and coordination and of communication and public awareness activities.
 - Provide technical assistance to relevant catchment bodies and stakeholder on assuring gender mainstreaming and equitable stakeholder participation.
 - Advise on relevant capacity-building activities information dissemination and communication for WMZ office staff activities.
 - Liaise with other organisations implementing IWRM related activities within the WMZ to develop and disseminate a single message as well as implement coordinated and complementing activities geared towards raising public awareness, sensitisation and public participation.

Framework and Guidelines for Water Source Protection
Volume 1: Framework for Water Source Protection

ANNEX E: People/Institutions consulted during formulation of the Guidelines

Conclusion

Challenges and Risks

The process of communicating the important of Water Source Protection and the role the Guidelines is likely to encounter a number of challenges:

- Changes in administration can change priorities for communication
- Consistency between words and actions is key
- Using jargon will not interest the public
- Lack of funds is a constraint
- The public can want opposing things at the same time
- Different departments may put out conflicting messages

Solutions

There may be no easy answers, but ways to tackle these challenges include:

- Be clear, consistent, avoid jargon, be interesting, be relevant to the target audiences immediate needs. Test the messages within your personal circles – if you're friends don't understand it, then others probably won't either.
- Identify champions (connectors/mavens/salesmen – see Section 2) in MWE and District Local Government organisations who are interested in water source protection and catchment management, and support them to enthuse others and change attitudes.
- Low cost communication solutions can be highly effective if done regularly – phone calls, face-to-face bi-lateral meetings, emails. Informal evaluation of how successfully the Guidelines are being taken up and used can be done by picking up the phone and talking to colleagues around the country.
- Rolling out the Water Source Protection Guidelines across Uganda will be an exciting and challenging process, but if done with enthusiasm and commitment it can lead to better protection and management of Uganda's incredible natural wealth, and a strong society and economy for all.

ANNEX E: People/Institutions consulted during formulation of the Guidelines

Name	Organisation
John Baptist Nambeshe	Bududa District Local Gov.
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Barbara Nakangu Bugembe	IUCN
Sarah Bisikwa	Manafwa District Local Gov.
James Baanabe	Ministry of Energy and Mineral Development
Bernard Mujasi	Mbale District Local Government
Anna Nakayenze	Mbale District Local Government
Fred Ddeme	Mbale District Local Government
Opio Henry Ogenyi	Mbale District Local Government
Willy Nangosyah	Mbale District Local Government
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Framework and Guidelines for Water Source Protection

Volume 1: Framework for Water Source Protection

ANNEX E: People/Institutions consulted during formulation of the Guidelines

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