UGANDA BUREAU OF STATISTICS

System of Environmental Economic Accounting

2015-2018 Water Accounts Report

November 2019

FOREWORD

The Uganda Bureau of Statistics with support from United Nations Statistics Division (UNSD), has compiled the 2015-2018 pilot System of Environmental-Economic Accounts for Water (SEEA-Water accounts) based on the water resource management structure and the UN SEEA-Water Accounts. This work is part of the priority activities as spelt out in the National Plan for Advancing Environment Economic Accounting (NP-AEEA). Compilation of SEEA-Water Accounts is key given the important role water plays in the production and consumption process of all activities. Thus, effective utilisation of the available water resources triggers increased productivity across all sectors and enhances economic growth as well as other development outcomes. It is against this background that Uganda took the initiative to implement the water resource accounts development.

There has been increasing competition for freshwater use in agricultural and industrial sectors as well as urban areas, through population growth, which resulted in unprecedented pressures on water resources.This has created water scarcity and limited economic development. Furthermore, water quality continues to deteriorate hence limiting the availability of freshwater resources. Also, increasing variability in the climatic pattern and its adverse effects on the Ugandan economy has become a major development challenge. A case in point is the agriculture sector of Uganda which is a climate sensitive key sector that is increasingly experiencing severe disruptions as a result of its reliance on rainfall and has increasingly become unpredictable.

To measure such concerns and report on the several policy targets for both national and international frameworks with regard to the water sector, the SEEA-Water methodology is recommended for the development of the relevant key indicators. For example, Goal 6 of the SDGs focuses specifically on water and includes calls for improving water quality by reducing pollution, eliminating dumping and the release of hazardous materials, reducing the proportion of untreated wastewater and increasing recycling and safe reuse of water which are all computed from the SEEA-Water Accounts.

I, therefore, highly anticipate that the development and dissemination of the Water Accounts for Uganda will spur policy formulation and decision making in water resource management.

Imelda Atai Musana
Ag. EXECUTIVE DIRECTOR

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List of Acronyms

DWD	Directorate for Water Development
DWRM	Directorate for Water Resource Management
GDP	Gross Domestic Product
HEP	Hydro Electricity Power
UBOS	Uganda Bureau of Statistics
MDA	Ministries, Departments and Agencies
MWE	Ministry of Water and Environment
NFA	National Forestry Authority
NP-AEEA	National Plan for Advancing Environmental Economic Accounting
NPISH	Non Profit Institutions Serving Households
NWSC	National Water and Sewerage Corporation
RWS	Rural Water Supply
SEEA	System of Environment-Economic Accounting
UNSD	United Nations Statistics Division
UNSC	United Nations Statistical Commission
WUE	Water Use Efficiency

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We wish to acknowledge the support of the United Nations Statistics Division (UNSD) in compiling the pilot 2015-2018 water accounts for Uganda. We also grateful to Jackie Crawford, an independent consultant on water accounts from South Africa. The staff of the (Uganda Bureau of Statistics) UBOS, the National Environment Management Authority (NEMA), the Directorate of Water Resources Management(DWRM), the Directorate of Water Development (DWD) and National Water and Sewerage Corporation(NWSC) are equally acknowledged for their tremendous contribution in regard to provision of input data and assumptions that led to improvements in the estimates.

Executive summary

Uganda's economy is to a great extent nature dependent driven mainly by agricultural production and agricultural related industrial activities. The primary agricultural production is mostly rain-fed dependent and any delay in the rain fall or drought spells doom for the country. In addition, many other economic activities are dependent on water availability. For instance the energy sector is almost exclusively dependent on hydro-power generation on River Nile. Therefore, when there is reduced precipitation in the country, the volumes of water in the hydro-electric dams reduces and this mostly results in power shortages. All these justify the crucial priority that Uganda attaches to the water sector and this is the reason for prioritising the water accounts among all accounts.

Compiling the priority water accounts for Uganda benefited from combined efforts of staff from a number of Ministries, Departments and Agencies (MDAs). Of particular relevance, were the contributions of Uganda Bureau of Statistics) UBOS, the National Environment Management Authority (NEMA), the Directorate of Water Resources Management(DWRM), the Directorate of Water Development (DWD) and National Water and Sewerage Corporation(NWSC). These provided the data that were used to populate the different tables in the accounts. However, in other instances data were not readily available and other estimation procedures were used to fill the gaps. The compilation proceeded by estimating and populating three important tables:i) the Water-data input Table, ii) the physical water supply table, and iii) the physical water use table.

Over the reporting period, the highest Gross Water Input of 236,994,550 million cubic metres was reported in 2015 while the lowest 201,859,425 was abstracted in 2016. In 2018, water consumption dropped to 29,599,369 million cubic metres, thereby leading to an increase of water productivity to 3.43 Ushs/m^3. The highest water consumption (33, 044,846 million cubic metres)and the lowest water productivity (2.26 Ushs/m^3)were registered in 2015.

Furthermore, the highest overall Water Use Efficiency (WUE) of 112,448 Ushs was registered in 2017 while the lowest, (86,901 Ushs) was registered in 2015. The highest annual water use per capita (6,760 cubic metres) was registered in 2015 while the lowest, 5,538 cubic metres was

registered in 2018. Consequently, the highest annual water consumption per capita (937 cubic metres) was registered in 2015 and the lowest annual water consumption per capita (772 cubic metres) was registered in 2018.Average water use per household per day was 45.2 litres while the average water consumption per household per day was 27.5 litres.

Whereas this is a pilot and work in progress on water accounts development in Uganda, important insights can been drawn that will direct the future steps in the water accounts compilation. In order to ease the process of reporting of water indicators in the National Standard Indicator and SDG frameworks, it is important that we improve and expand data collection for water activities. Thus, all the Ministries Departments and Agencies (MDAs) that have the mandate to collect water statistics should be incentivised to produce and share these crucial statistics with UBOS at agreed reporting intervals.

1.0 BACKROUND

High quality statistics and integrated information are important inputs into evidence-based policy and decision-making. They are also keys to monitoring internationally agreed goals, sustainable development, and Agenda 2030 given the critical role of high quality environment statistics, and their integration with socio-economic statistics. The overall objective is to strengthen national capacities of developing countries for the sustained, regular production of a priority set of environment statistics, environment-economic accounts, and the resulting indicators, in order to measure progress towards sustainable development. Therefore, the United Nations Statistical Commission (UNSC) at its 43rd session in 2012 adopted the System of Environmental-Economic Accounting 2012 Central Framework (SEEA Central Framework) as the international statistical standard for environmental-economic accounting. SEEA is a multipurpose conceptual framework with internationally agreed concepts and definitions that is used for understanding the interactions between the environment and the economy. The UNSC has since then encouraged countries to implement the SEEA Central Framework in a flexible and modular fashion.

The United Nations (UN) Member States have since then had the quest to implement SEEA and a number of developing countries have had challenges especially, in regard to national capacities for the sustained, regular production of a priority set of environmental statistics, environmental-economic accounts, and the resulting indicators. Therefore, the United Nations Statistics Division (UNSD) started work on a Development Account Project titled “Supporting Member States in developing and strengthening environment statistics and integrated environmental-economic accounting for improved monitoring of sustainable development”. The project had two modules: Module A was on capacity building in support of SEEA while Module B provided both statistical and institutional capacity building, based on the SEEA Central Framework, and built on existing technical cooperation work carried out by the UNSD in developing countries. The Project initially expected to be carried out until the end of 2017, was concluded in January 2018 and was fully funded by UNSD.

Uganda hasbeen a beneficiary for the project and the execution was through a set of activities including a national assessment of MDAs, developing a National Plan for Advancing Environmental-Economic Accounting (NP-AEEA) in Uganda, enhancement of national capacities and the compilation of provisional tables and accounts for selected SEEA. Uganda chose to compile the SEEA-Water as part of the project. SEEA- Water was chosen as the pilot account due to the high demand for information to support the current priority interventions about water for national and international frameworks, that is, the National Development Plan (NDP) II, Sustainable Development Goals (SDGs) and Uganda's Green Growth Development Strategy. This report presents a summary of the steps and procedures undertaken to compile the 2015-2018 Pilot Water Accounts.

2.0 INTRODUCTION

Fresh water is a finite resource essential for life, development and the environment[1]. In Uganda, it is a key component in agricultural activities, generation of hydroelectricity and production of industrial goods and services. Uganda's economy is directly and indirectly driven by the water sector, with about 24% of its GDP coming directly from agriculture activities. Nearly all its electricity is generated from hydro resources and most of the manufacturing sector is for food processing from the agricultural produce. Uganda's demand for fresh wateris likely to increase rapidly because of population growth and consequent economic and agricultural development[2].

Uganda's water resources are quite abundant and include surface, ground and soil water. They are mainly and regularly recharged through precipitation that averages 1200 mm. The country is endowed with the River Nile which has a flow exceeding 25 km^3 per year[3], and large combined active storage capacity in Lakes Victoria, Albert, Edward, and Kyoga. Despite this endowment, there is a growing concern that future water scarcity may affect economic development and food security. In addition, Uganda has suffered severe droughts. For example the recent one(2016), resulted invisible water stress in many parts of the country, with wide crop failures and death of livestock. The effects from such droughts usually manifest in food shortages and inadequate supply of pastures and water to livestock.Furthermore, many times there is reduced hydro electricity production during the period of droughts due to reduced volumes of water in Lake Victoria. Therefore, it is clear that water plays a critical role in Uganda's development process and should therefore be of priority in the national development agenda.

The Government of Uganda has recognised the integral role of the environment to the country's development process and thus prepared "***Uganda's Green Growth Development Strategy***" which was launched in November, 2017. This strategy re-affirms government's commitment towards Vision 2040 and the NDPII. It adopts a win-win

[1,2&3] Ministry of Water and Environment-Directorate for Water Resource Management: *National Water Resources Management, 2013.*

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approach, that is,*Economic Growth with Environmental Sustainability.* It therefore placeshuman well-being at the centre while ensuring that natural resources are protected. It stipulates the interventions that will ensure that extraction of natural resources by the present and future generations is in a sustainable manner.The Strategy has five priority areas:

i) Agriculture;ii) Energy;iii) Natural capital;iv) Planned urbanization (green cities); and v) Transport.

The first three areas entail activities that are highly water intense and also determine the state of the ecosystem within the country. In order to guide and measure the direction and effects of the interventions for these areas, there is need to provide water statistics that are relevant for monitoring purposes.However, the water statistics need to be accompanied with aggregates that are produced from combining the water statistics in an integrated framework, that is, SEEA-Water.

The SDGs is a global initiative and Uganda cannot claim to be partakers of the global drive without measuring the natural resources using the SEEA Central Framework. Goal 6 of the SDGs, that is, "Ensure availability and sustainable management of water and sanitation for all" has seven targets and 10 indicators most of which require water statistics that are compiled from a comprehensive integrated framework.Therefore, Uganda requires an integrated comprehensive framework to monitor and report the progress towards the selected indicators on goal 6. Notably, the SEEA-Water framework was designed for such purposes.

2.1 OVERVIEW OF THE ACCOUTING SYSTEM

The System of Environmental Economic Accounting for Water (SEEA-Water)provides a conceptual framework for organizing hydrological and economic information in a coherent and consistent manner. It therefore, enables a consistent analysis of the contribution of water to the economy and the impact of the economy on water resources[4]. The framework is discussed in detail in the SEEA-water Manual which was

[4] United Nations: System of Environmental-Economic Accounting for Water (SEEA-Water)

developed by UNSD. It describes water flows through the economy (industries, households, and government) and stocks by water resources. It consists of:

A. Flow accounts which furnish information on the contribution of water to the economy and the pressure exerted by the economy on the environment in terms of abstraction and emissions. Flow accounts include Physicaland Monetary Supply and Use Tables, Emissions accounts,Economic and Hybridaccounts.
B. Asset accounts which describe the volume of water resources in the various asset categories at the beginning of the accounting period, and at the end of the accounting period and all changes therein that are due to natural causes. They include produced assets, water resources and quality accounts.

Therefore, SEEA-Water includes, as part of its standard presentation, information on the following[5]:

- Stocks and flows of water resources within the environment;
- Pressures imposed on the environment by the economy in terms of water abstraction and emissions added to wastewater and those released into the environment or those removed from wastewater;
- The supply of water and its use as an input in the production and consumption activities by the institutional units;
- The reuse of water within the economy;
- The costs of collection, purification, distribution and treatment of water, as well as the service charges paid by its users;
- The financing of these costs, that is, who is to pay for the water supply and sanitation services;
- The payment of permits for access to abstract water or to use it as a sink for the discharge of wastewater;
- The hydraulic stock in place, as well as investments in hydraulic infrastructure made during the accounting period.

[5] United Nations: System of Environmental-Economic Accounting for Water (SEEA-Water)

2.2 APPLICATIONS OF SEEA-WATER ACCOUNTS

As presented in the SEEA-Water Manual, most water statistics focus on hydrology and water quality, but not much attention has been paid to the economic and social aspects of water.Some critical policy issues require the linking of data on water with economic data, such as:

- The consequences on water resources for economic growth and the patterns of household consumption and international trade;
- The social and economic impacts of water policy instruments, such as regulation, water pricing and property rights; and
- The contribution of specific economic activities to the pressure on water resources and the options for reducing that pressure.

In addition, water accounts comprise a unique tool for improving water management because they integrate data on both the environmental and economic aspects of water supply and use. Thus, the descriptive statistics and indicators from the accounts furnish information on:

- Sources of pressure on water resources: determining how much each sector contributes to particular environmental problems, such as overexploitation of groundwater or water pollution;
- Opportunities for improving water productivity: determining if water is being allocated to the highest value users; identifying what opportunities exist to increase water use efficiency and productivity; assessing the extent of the losses;
- Water pricing policies: determining if water providers are achieving full cost recovery; finding out if pricing is equitable across different users; assessing whether pricing policies provide incentives for water conservation and pollution prevention, or whether they encourage excessive use of water resources; and
- Sustainability of water use: comparing water resources and water use.

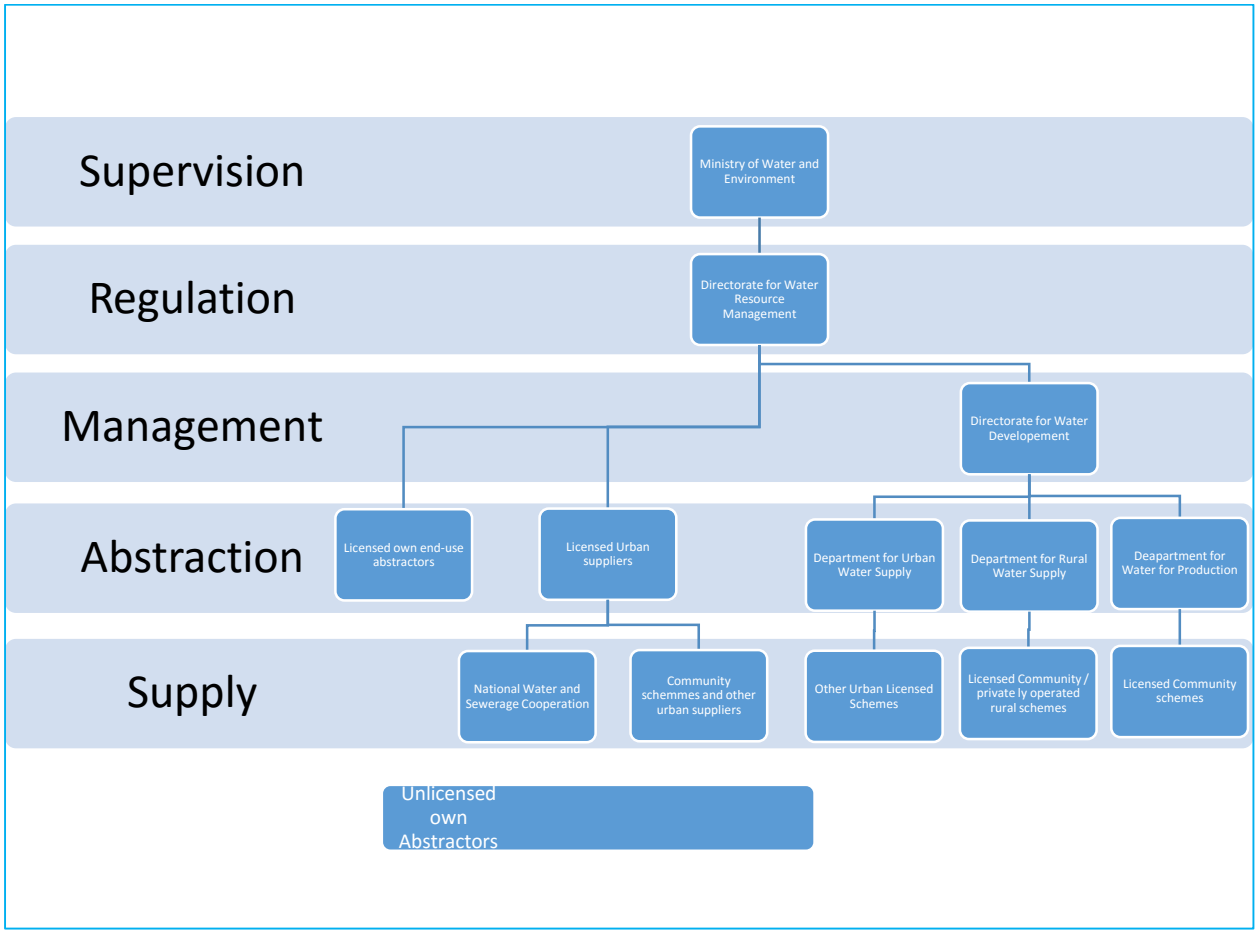
3.0 UGANDA'S WATER RESOURCE SYSTEM

The water resource management system of Uganda is spearheaded by the Ministry of Water and Environment (MW) which is mandated to supervise, regulate and manage the country's water resources. The Ministry has two directorates which are responsible for the regulation and management of the water resource system. These are the; Directorate for Water Resource Management (DWRM) and the Directorate for Water Development (DWD)see Figure 1:

The DWRMis responsible for regulating and managing the country's water resources which include open surface and ground water bodies. The DWRM regulates the abstraction of water by licensing water abstractors across the country. The abstractors include, private companies, households and government departments. The water abstraction at this level is for supply and own consumption. The DWRM also licenses waste water discharge. Both the water abstraction and water discharge licenses are usually for a specified amount of water to be abstracted or dischargeddaily from or to a stipulated point for a specified water body. They refer to a specific period and are renewable after the expiry of the stipulated period.The DWRM has the power to cancel a water abstraction or waste water discharge license in case of breach of contract or due to any emerging environmental concerns.

The number of licenses that were offered in 2016/17 were 297, of which 43 were for waste water discharge. For the same period, 165 of these licenses were new while 132 were renewals. Note that the cumulative total should include the new and renewed licenses from previous years, that had not yet expired or been cancelled.

Figure 1: The Water Resource Management System



Source: Uganda Bureau of Statistics

Note: By nature of the structure of MWE, DWD and DWRM are at the same level but for purposes of operations for the water resource system and its consistency with the SEEA-Water framework, these directorates are at different level. There are other departments within MWE that are not represented here.

The DWD manages water supply and distribution within the country. This function stems from government's commitment of ensuring access to safe water foralland other targets under SDG 6. DWD achieves this through establishment of schemes aimed at providing water for production and water to urban and rural areas. As of June 2017, the national safe water coverage in rural areas was estimated at 70%, up from 67% in June 2016. The functionality for rural water supplies on the other hand reduced to 85%, from 86% in June 2016 and 88% in June 2015[6].

[6&6] Ministry of Water and Environment: *Sector Performance Report, 2016/17*

Currently, the main technology options used for water supply improvements in rural areas include deep boreholes (44%), shallow wells (24%), protected springs (21%), tapstands posts (11%), and rainwater harvest tanks (0.4%). This implies that the rural population is predominantly served by the deep boreholes technology as shown in Table 4.1.

Table 1: ***Main categories of safe water supply technology as of June 2018***

Source of water	Number	No. of persons served	Percentage
Deep boreholes	40,233	12,069,900	44%
Shallow wells	21,567	6,470,100	23.6%
Protected springs	28,908	5,781,600	21%
Tapstands	19,885	2,982,750	11%
Rainwater Harvest Tanks	20,187	121,122	0.4%
Total	**130,780**	**27,425,472**	**100%**

Source: MWE, Sector Performance Report 2018/19

At the level of Management, the DWD usually constructs and manages schemes for the sources listed above and passes them on to suppliers and distributors. It may pass on some schemes to the national water supplier, that is, National Water and Sewerage Cooperation (NWSC) and others to private companies. These schemes supply water to urban and rural areas and are managed by its departments. In case of urban areas, it is the Department for Urban Water Supply (DUWS) and in the case of rural areas they are the Department for Rural Water Supply (DRWS) and the Department for Water for Production (DWfP). DWD may pass on the schemes to NWSC for selected urban areas or private enterprise for selected urban and rural areas. Alternatively, DWD may operate the scheme for a specified period before it is passed over or operate the scheme permanently, especially the schemes that provide water for production and those that are in remote rural areas. In this case then the scheme operators become abstractors and are obliged to obtained abstraction licenses from DWRM.

The level of abstraction constitutes licensed own end-use abstractors who majorly are the hydro-electricity generation entities, private enterprises and a few households (private individuals).Other private enterprises include schools, health facilities and manufacturing companies. This level also includes the NWSC.It also includes schemes that are operated by the departments under DWD and those that DWD passes on to private operators. All schemes at this level must be licensed by DWRM. Therefore, all operators at this level are abstractors. However, not all are suppliers and distributors.

At the supply and distribution level of the water resource management system, there is basically NWSC and private enterprises. They supply water to final consumers who include households, private enterprises/industries and government departments.NWSC is a government parastatals which is mandated to supply and distribute watercountrywide but currently serves mainly urban areas. There are also operators of schemes under rural water supply and other urban supply who supply water to areas that are not served by NWSC.

Notably, there is abstraction of water outside the regulated and managed water resource system. This is the category of unlicensed water abstractors which is comprised of mainly households who abstract water from unprotected springs, wells, fountains, riversand lakes as well as from rain water harvest.

4.0 THE SEEA WATER FRAMEWORK FOR UGANDA

4.1 WATER ACCOUNT COMPILTION PROCESS FOR UGANDA

The following are the steps that were followed in compiling the water accounts for Uganda:

1. Understanding the hydrological cycle, water supply, distribution and consumption patterns for Uganda enabled us to come-up with the system architecture for the water compilation as indicated in section 4.2.
2. Obtaining source data as required in the system architecture. For each of the cells in the Tables described in the systems architecture, all possible source of data were listed along with the institutions mandated to compile the data.
3. The generic UN-water data collection tools was customised to suit our requirements.
4. Importance was attached to each of the source data and classification of priority and non-priority source data was done. However, at the stage of constructing the systems architecture, it was established that some important source data were unavailable and therefore estimations were made as described in section 4.3 on source data. All efforts were made to ensure that 75% of priority data were available.
5. Sensitisation and awareness visits to respective institutions about the use of water accounts were made. During the visits, data requests were made.Some institutions were able to immediately provide databases making the predesigned data collection templates redundant.
6. Follow-up were made to obtain the required source data from each of the prioritised institutions.
7. Verification of source data provided was done with other related datasets to ensure accuracy and consistency. After verification of the data, populating of the respective Tables, starting with the water-datainput Table was started. At the stage of filling the Tables, there were a number of emerging issues that necessitated modifications of the tables described in the systems architecture.
8. Second stage verification based on consistence and coherence within and across the tables was done. For example if the outcome indicator on water consumption per day was not realistic, then it necessitated adjustment of the source data. Some adjustments were done together with the data providers while others were done independently by UBOS.
9. The results were then shared with technical officers from selected institutions and some further adjustments were done based on their comments, giving us the prototype 2015 water accounts for Uganda.
10. The system for the prototype 2015 water accounts was used to compile the accounts for 2016, 2017 and 2018. During the compilation, methodological and data updates were made basing on the nature of issues that arose.

4.2WATER ACCOUNT SYSTEM ARCHITECTURE FOR UGANDA

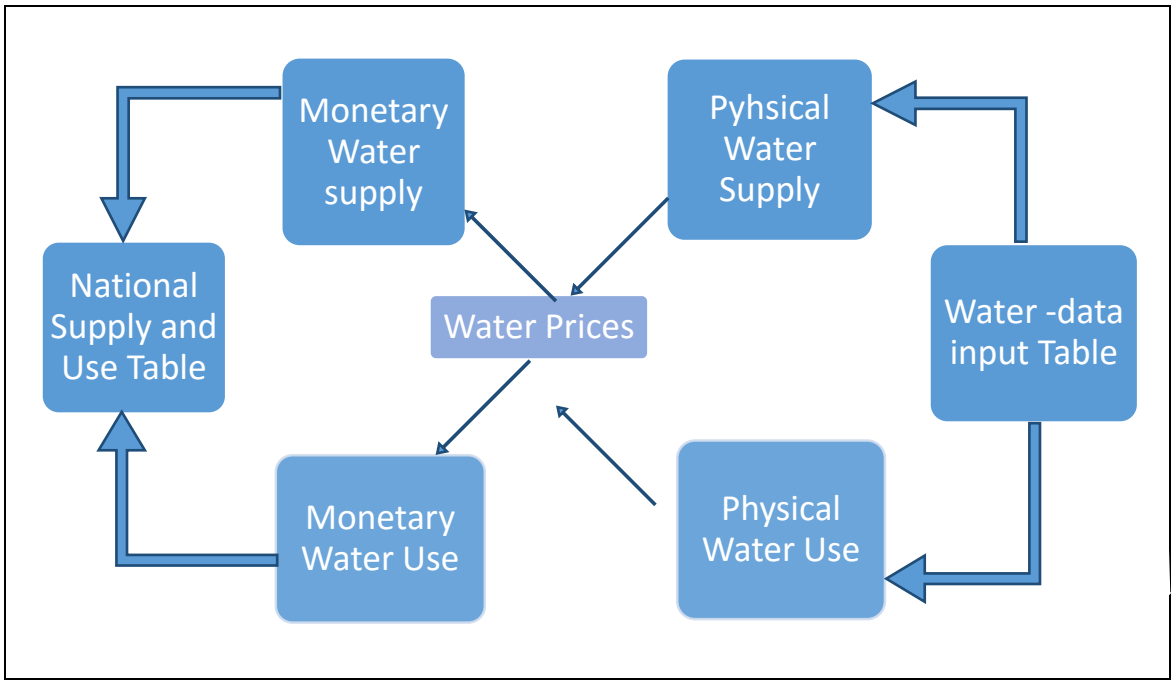
Designing a system architecture to support the production of any type of statistical accounts, especially those that will be produced routinely, is a perquisite for any statistical office. It was therefore prudent to design a framework with a simplified system architecture that can support the production of the pilot accounts. However, considerations were made for its expansion to support the production of other tables for the asset accounts, quality accounts, expenditure and financing accounts. The system has been designed in Microsoft Excel with simplified links. The architecture as presented in Figure 2 below is for the priority tables for which most of the source data are available but are also critical for planning purposes. The architecture so far only supports the production of six core tables, however, the dissemination of the monetary supply and use tables will be done in the subsequent release. The core tables are;

1. The **Water-Data Input Table,** which captures the three flows of water in physical units.These are, (i) from the environment to the economy (ii) within the economy and (iii) back to the environment. It has the structure of the input-output tables, and therefore, has the power to capture the flow of all water that is abstracted from the environment and its final flow back to the environment, thereby creating a balance for the abstracted volumes and returned volumes. It was compiled by water resource type for economic units (15 industrial groups and households) and for the three flows of water. The data in this table was captured in physical units.
2. The **Physical Supply Table,** which captures the flows of water from the environment to the economic units and with the rest of the world, and the flows of water from the economic units back to the environment. The data in this table was captured in physical units.
3. The **Physical Water Use Table,** which also captures the flows of water from the environment to the economic units and flows of water within the economy and the rest of the world. The data in this table was captured in physical units.
4. The **Water Prices Table,** which captures the prices of water at all levels, that is abstraction, supply and distribution. The prices are for the three flows and are estimated separately for each economic unit. They follow the structure of the supply

Table and include taxes.The valuation follows the principles of the System of National Accounts.

5. The **Monetary Water Supply Table,** which takes the same structure as the physical supply table. Data from the physical supply table and the water prices table are combined to provide estimates for this table.
6. The **Monetary Water Use Table** which takes the same structure as the physical use table. Data from the physical use table and the water prices table, that is, prices at distribution level for final use are combined to provide estimates for this table.

Figure 2: Flow diagram for SEEA water-accounts framework



The order of presentation of the priority tables above follows the logical order for compiling the accounts. Although it is intuitive to start with the Water-Data Input Table, it is easier to estimate some variables in the PSUTs first and then transfer them to the Water-data input Table. Production of the six tables above avails estimates for the National Supply and Use Table for the National Accounts. The first three tables, namely the Water-data input Table, Physical Supply and Physical Use table were compiled for 2015 Pilot Water Accounts.

4.2 SOURCE DATA

Production of the entire set of water accounts requires a comprehensive data set on water and other related statistics like energy, agriculture, construction, manufacturing, government finance, and population distribution, among others. Some of the data that is required is already available within UBOS and other government agencies. However, some other information especially that from scientific experiments is available in universities and research institutions. This data is scanty and in some cases it is limited in coverage and therefore it is not fit for use without adjustments.

The data requirements for the water accounts follow the flow of water from the environment to the economy, within the economy and from the economy, back to the environment, that is the return flows.Note that these accounts only consider water has been abstracted from the environment into the economy. This section presents a discussion about the source data that is used to compile the Water-data input Tableand the physical supply and use tables (Details of these are provided in Appendix 1). Below is the graphical presentation of the data source requirements in regard to the flows of water.

(A) lows from the Environment to the Economy

This section links the structure of the water management system presented in Section 3 above to the system architecture that is used to compile the accounts. As illustrated in Figure 3 above, the first section "***From the Environment***" captures the water abstractedfrom the environment by type of water resourcefor licensed and unlicensed abstractors. The abstractors have been classified as per the water resource management system described in Figure 1.They are: NWSC, Other urban suppliers, RWS, Community schemes and Own end-users. Own end-users include the licensed and unlicensed abstractors. NWSC has been separated from other urban suppliers because of itsprominence in urban areas. RWS includes water for production and rural water schemes that are operated by government, while the community schemes include the rural schemes that are operated by private individuals or enterprises.

It is also important to classify the water resources in order to have complete coverage without duplication, and these were classified following the SEEA-Water Asset Classification. Water resource assets are defined as water found in freshwater, brackish surface water and

groundwater bodies within the national territory that provide direct use benefits, presently or in the future, through the provision of raw materials, and may be subject to quantitative depletion or qualitative degradation through human use[7]. Below is Uganda's customised classification of water resources:

- Surface water resources
    - Lakes
    - Rivers and streams
    - Artificial reservoirs- Hydroelectric dams, valley dams and Earth tanks
- Ground water resources, which is discharged through;
    - Springs
    - Fountains
    - Wells
- Soil Water, which is discharged through vegetation absorption, evaporation and evapotranspiration

The categorisation above follows the recommended classification. However, given the critical role in the hydrological system and recommendations, precipitation forms another fresh water source. It provides water to support rain-fed crops production which constitute the biggest share of agricultural production activities in Uganda. Precipitation also provides a sourceof water tohouseholds thatharvest rain water for final consumption.

Therefore, the system has been built to capture volumes of water abstracted by water resource type and category of abstractors. The DWRM maintains a database for the licenses it offers every year and also monitors the period of validity of the licenses. This database indicates the water resource from which the abstraction is done, the daily volumes of water to be abstracted, the purpose for abstraction (activity classification) and the period of validity of the license. However, it lacks the volumes for the actual abstraction and how the volumes of the licenses are determined. This data base was used to provide data for the flows of water from the environment for the three water resources and the licensed volumes were taken as proxy for actual abstraction volumes.

[7] UN: *System of Environmental Economic Accounts for Water*

A component of the volume of water abstracted for own final use (own supply) was obtained from the DWRMdatabase while the other component of water abstracted by unlicensed own end-use abstractors was estimated from the Uganda National Household Survey results (UNHS) and the 2014 census estimates, since it is expected that most of these are households.

Flows of water from the environment through precipitation were estimated by UBOS using the annual average precipitationand the total surface area of Uganda. Decomposition of precipitation to estimate the evapotranspiration, absorption by vegetation (including cultivated and forests), urban runoff etc., was done using the data on land cover type from the 2015 Biomass Study that was conducted by National Forestry Authority (NFA).

(B) Flows of water within the Economy

The flows of water within the economy, that is, the supply and distribution of the water are between abstractors and suppliers to the final consumers. The final consumers are usually broadly categorised into institutional units, that is, corporations, government, Non Profit Institutions Serving Households(NPISH). For purposes of being objective and sensitive to the water resource system and the economy of Uganda, the classification of final water users has been customised.However, considerations were taken to classify the categories of final consumers using the classification procedures that are used in the National Accounts forconsistency. Therefore, the framework for compilation of the water accounts follows the International Industrial Classification (ISIC, Rev 4) which is used for the National Accounts. However, industries that are water intensive were singled-out while those that are less water intense were grouped together and named *other industries*.

At this level, the volumes of water produced and supplied by NWSC and DWD were extracted from databases and reports. Additional work on reclassifications was done for the data for NWSC while abstraction volumes were taken as distributed volumes for the water supplied by DWD. The data for water supplied from community schemes was estimated from Uganda National Household Survey(UNHS) results and the 2014 National Population and Housing Census (NPHC) estimates.

Note that the framework considers the losses during the distribution operations and therefore, the volumes of water abstracted may not necessarily equal to the volumes of water distributed or billed and the volumes of water used. The framework has estimated losses at all levels of the water production, supply and use chain.

This section also includes the flows of waste water and reused water. In the absence of data on waste water to treatment plants, 10 percent of the billed water was estimated as the volume for the flows of waste water to treatment plants for the component under NWSC. Literature revealed supply and use of reused water by some manufacturing establishments and households but baseline data was not available to produce an estimate for this. Thus, this component was not estimated for the 2015 pilot water accounts.

(C) Return flows from the Economy back to the Environment

The return flows consist of discharges by the economy into the environment and are known as residual flows. The flows are discharged (supplied) by the economic units, the households, corporations, NPISH and government to the environment which receives the flows as a user. Return flows also include discharges that do not go through any economic interactions, like precipitation that is returned back to the environment. The return flows were classified according to the water resource assets described above. However, the discharges by non- resident units were not estimated due to lack of information. A component for the licensed waste water discharges was estimated from the DWRM database while the other components were estimated from scanty information from UBOS and are therefore are weak in terms of data quality (C-questionable statistics).

Emerging issues

Details on the status, adjustments, ranking and remarks of the source data for the sections described above are presented in Appendix 1. The emerging issues about the source data for the three water tables are:

- Licensed volumes by company were used as proxy for actual abstraction[8].

[8] The estimated abstraction volumes are based on the database of DWRM and the UBOS estimates for abstractors who are not licensed by DWRM thus the total estimates is a national representation of the abstracted volumes by 2015.

- Detailed classification of the data base for water abstractors and the NWSC customer data base using four digit level of ISIC Rev 4.
- Volumes for electricity generation overstated by volumes for construction of dams for phased out dam construction projects.
- Annual total precipitation for 12 weather stations used to compute total precipitation.
- Industry breakdown for water distributed was not aligned to ISIC Rev. 4. Therefore, the 2009/10 SUT water consumption was used to breakdown the water supplied by utilities sector.
- Missing estimates on reused water; very negligible in the case of Uganda
- Used literature from other countries to estimate evaporation and transpiration with similar environment, social and economic set up. Onward compilation of accounts may exclude this components because they estimates are so theoretical and need baseline data which is not available.
- Wastewater sent to treatment was estimated as a percentage of billed water by the distributors.
- Data mostly obtained from sector performance reports. Databases not update, they are not consistent for instance DWRM and NWSC corporation databases have some variations on the same indicators. Need for harmonization
- Information from different sources that is not aligned and not consistent and yet it has to be combined to give one data point/variable. The SEEA CF gives just a guideline but does not demonstrate pertinent issues using relevant examples.

For any statistical compilation system, there will always be emerging issues. It is, therefore, necessary to quality assess each of the input indicators to guide the data improvement process and also guide the users. The derived indicators as computed from the SEEA-Water framework were ranked basing on the quality and status of the input/source data. Appendix Table1 indicates the quality ranking for each of the derived indicators. The categories of ranking used to qualify the indicators in the 2015 water accounts are;

A. Quality statistics- which is official
B. Acceptable statistic - has potential to be a quality statistics but is not official,

C. Questionable statistic - which is lacking adequate coverage, and
D. Poor statistics - not meeting any of the above

5.0 THE PILOT WATER ACCOUNTS

The compilation of the pilot SEEA-Water Accounts was based on the water resource management structure and the framework that was presented above (in Figure 1). The Water-Data Input Table, the Physical Supply and Use Table (PSUT) were compiled. The data for these tables refers to calendar years 2015-2018.The write-up section below presents summarized tables whose details are presented in the Appendix.

5.1 PHYSICAL WATER SUPPLY AND USE, 2015-2018

Summary

During 2018, the amount of water abstracted from the environment rose to an estimated 212,318,007million cubic metres from 226,067,193million cubic metres that was abstracted in 2017. This represented a reduction of 6.1 percent. Similarly, the amount of water supplied dropped by 6.1 percent, from194,550,006million cubic metres in 2017 to 182,718,819 million cubic metres in 2018. Furthermore, the total amount water used in the economy dropped to 212,318,188 million cubic metres in 2018 from the estimated amount of 226,067,371 million cubic metres in 2017.

Ultimately, total water consumption also dropped by 6.1 percent from 31,517,331 million cubic metres in 2017 to 29,599,363 million cubic metres in 2018. Total water return flows to the environment in 2018 reduced by 6.1 percent to 182,718,819 million metres from 194,550,006 million cubic metres in 2017. See Table 2 below.

Table 2:Summary of Physical Supply and Use of Water (thousandcubic metres)

	2015	2016	2017	2018
Total Abstracted Water	236,994,549,748	201,859,424,827	226,067,193,112	212,318,006,328
Total Supply of Water	203,975,603,267	173,717,042,540	194,550,006,468	182,718,819,482
Total Use of Water	236,994,725,487	201,859,610,402	226,067,371,321	212,318,188,419
Total WaterConsumption	33,044,798,027	28,142,567,862	31,517,364,853	29,599,368,937
Return Water flows to	203,949,915,219	173,717,042,540	194,550,006,468	182,718,819,482

Source: Uganda Bureau of Statistics

The annual average amount of water returned to the environment constituted 86.1 percent of the total water abstracted. Notably, on average, about 99.9 percent of the water abstracted for hydro electricity generation is returned to the environment. It is worthwhile to mention that although nearly all the water that is abstracted is returned to the environment, the characteristics of the water are not the same. Specifically, it is usually returned at a higher temperature, which can have important implications for the environment.

5.1.1Water Abstraction by Water Source

Over the period 2015-2018 precipitation was the main source of water abstracted with an annual average share of 99.99 percent. However, water abstracted from surface water bodies increased from 74,941 million cubic metres in 2015 to 100,727 million cubic metres in 2018, representing an annual average growth of 10.5 percent. It is important to note that most of the surface water bodies from which the water is abstracted are shared as they lie along River Nile, thus investment in alternative strategies must be exploited in case the allocations from such shared resources become more restricted in the future. In particular, as discussed below, Hydro-Electricity Generation (HEP) activity is the dominant source of pressure on river Nile and its catchment basins/lakes in Uganda. However, with the abundant other natural resources for energy, other options for electricity could be exploited. The options include solar and biomass.

Water abstracted from ground water resources also increased over the period, with the highest growth (69.9 percent) registered in 2018.This trend could continue given the increasing level of industrialization and urban settlement, which is matched withincreasing pollution of surface water bodies. This has increased costs of treatment of water and to some extent affected the reproduction of fish in surface water bodies. Thus, exploitation of ground water sources could be an alternative, however, the stock and rate of recharge of the ground water resources should be established and monitored. Probably, investment should shift to ground water sources because of the low costs of treatment that is required.

Table 3: Summary of Water abstracted by water resource and purpose (thousand cubic metres)

Water Resource and purpose	2015	2016	2017	2018
Surface Water	**74,941,117**	**87,807,626**	**97,738,064**	**100,727,282**
Supply and distribution	50,120	93,435	116,303	118,354
Own Use	74,890,997	87,714,191	97,621,761	100,608,928
Groundwater	**173,581**	**181,349**	**185,576**	**315,308**
Supply and distribution	3,759	5,346	6,134	9,025
Own Use	169,822	176,003	179,442	306,283
Precipitation	**236,919,435,050**	**201,771,435,852**	**225,969,269,472**	**212,216,963,738**
Supply and distribution	-	-	-	-
Own Use	236,919,435,050	201,771,435,852	225,969,269,472	212,216,963,738
Total Abstracted Water	**236,994,549,748**	**201,859,424,827**	**226,067,193,112**	**212,318,006,328**
Supply and distribution	53,879	98,781	122,437	127,379
Own Use	236,994,495,869	201,859,326,046	226,067,070,674	212,317,878,949

Source: Uganda Bureau of Statistics

5.1.2 Water abstraction by purpose

This sections describes abstraction of water for two purposes, namely; own end use and supply & distribution. As indicated in Table 3 above nearly all (99.9 percent) water abstraction is directly by own-users while less than one percent is abstracted for supply and distribution purposes. Estimates further indicate that total water abstracted for supply and distribution purposes grew by 83.3 percent, 24.0 percent and 4.0 percent in 2016, 2017 and 2018, respectively. Water abstracted for own use reduced by 14.8 percent in 2016, then grew by 12.0 percent and in 2017 then reduced by 6.1 percent in 2018. The changes in the water abstracted for own use are driven by the levels of precipitation which is the dominant source of this water for rain-fed agriculture activities.Thus, volumes of precipitation have been excluded in the discussion below.

Over the reporting period, an annual average of about 90,313 million cubic metres of water representing an annual average share of 99.8 percent was abstracted from surface water bodies.Hydro-Electricity Power (HEP) generators abstracted the largest volumes with an annual average of 99.5 percent of water from surface water bodies. However, for better understanding of the composition of own-use abstractors, HEP generators were excluded, thereby allowing for the study of the composition of the other own-use abstractors. The results from this analysis indicated that water abstracted by own-users reduced from 92.1

percent in 2015 to 80.7 percent in 2018;implying that the volume of water abstracted for supply and distribution purpose rose to 19.3 percent in 2018. Furthermore, about an annual average of 12.6 percent of water abstracted for own-use was abstracted by households. Notable many of these households are not licensed. Other major own-use abstractors are activities of manufacturing of food and beverages, mining & quarrying and construction.

However, having 12.6 percent of water abstracted by households as own-use abstractors (excluding HEP generators) incapacitates Uganda from being able to assess the social and economic impacts of its water policy instruments, especially on; provision of safe water, regulation, pricing and property rights . This is because majority of these abstractors are not licensed and therefore not monitored. Leaving the composition this way calls for more capacity for monitoring these abstractors who are scattered all over the country. The option could be having investment strategies to support the expansion of the supply and the distribution networks to all households but also issues of affordability and cost efficiency would rise. GOU is still committed to ensuring access to safe drinking water by all households, therefore, the strategies for this initiative are likely to overcome the challenges in regulation of the many scattered unlicensed water abstractors.

5.1.3Water Abstraction by Economic Activity

The Agriculture sector continuously recorded the largest volumes of water abstracted averaging 99.42 percent of the total water abstracted annually between 2015 and 2018. However, there was a 6.1 percent decline in the amount of water abstracted in 2018 from a 12.0 percent increase registered in 2017. Furthermore, 2017 had registered a 14.8 percent reduction. The main driver for the movements of water abstraction in the sector during this period was agriculture rain-fed crop growing activities. See Table 4.

The industry sector averaged at 0.58 percent of the total share of annual abstraction in the period 2015-2018. There was a 5.4 percent decline in the amount of water abstracted by the sector during 2018 following an increase of 11.9 percent that was registered in 2017 after a reduction of 13.0 percent in 2016. The major driver to the movements was the Water supply, Sewerage and management activities that averaged a total share of 92.9 percent within this sector annually.

Table 4 indicates that the services sector, continued to have a negligible share of the total water abstracted annually for the period under review. However, water abstraction by this sector grew by 27.6 percent in 2018 following a 14.3 percent increase in 2017. However, there was an 11.4 percent decrease registered during 2016. Healthactivities were the main driver of the changes with an average share of 10.4 percent of the sector.

Table 4:Water Abstraction by Economic Activity(thousand cubic metres)

Activity	2015	2016	2017	2018
Agriculture	**235,644,690,254**	**200,685,705,362**	**224,753,290,157**	**211,074,963,831**
Agriculture (Irrigation)	391,240	190,532	186,263	155,288
Agriculture (Rainfed crop)	141,076,765,937	120,147,377,700	134,555,524,293	126,366,584,630
Agriculture (Livestock)	68,385,716,194	58,240,397,484	65,224,613,859	61,255,099,092
Agriculture Support Services				
Agriculture (Forestry)	26,168,346,978	22,286,152,634	24,958,721,198	23,439,753,953
Agriculture (Fishing)	13,469,905	11,587,014	14,244,544	13,370,868
Industry	1,349,856,743	1,173,717,026	1,313,900,169	1,243,038,944
Crude oil and Mining	4,852	4,116	4,990	15,719
Manufacturing (Food and	6,260	8,350	8,469	8,167
Manufacturing (Other)	7,081	9,696	9,894	10,655
Electricity	74,432,837	87,453,206	97,363,550	100,381,976
Water Supply; Sewerage and	1,275,389,871	1,086,227,942	1,216,498,125	1,142,476,634
Construction	15,842	13,717	15,142	145,793
Services	2,752	2,438	2,785	3,553
Accommodation	149	159	161	146
Public Administration	15	15	15	15
Education	85	154	166	176
Health	11	56	254	1,063
Other	2,493	2,054	2,189	2,153
Households				
Total	**236,994,549,748**	**201,859,424,827**	**226,067,193,112**	**212,318,006,328**

Source: Uganda Bureau of Statistics

5.1.4Water Supply by Economic Activity

The water supply pattern across economic activities is similar to that of water abstraction and therefore, agriculture activities dominated water supply followed by the industrial activities with annual average shares of 99.34 percent and 0.66 percent, respectively. Similar to the abstraction pattern, agriculture rain-fed crop growing activities dominated the water supply category with an average share of 62.3 percent over of the total water supplied annually over the period 2015-1018.Apart from non-food manufacturing water

supply, sewerage and waste management, construction, accommodation and health activities, all the other economic activities registered declines in water supply during 2018.Consequently, the amount of water supplied reduced by 6.1 percent in 2018 contrary to an increases of 11.3 percent in 2017 and a decrease of 16.6 percent in 2016.Within the industrial sector, Water Supply, Sewerage and Waste Management activities dominated with an average 92.8 percent.

Table 5: Water Supply by Economic Activity(thousand cubic metres)

Activity	2015	2016	2017	2018
Agriculture	**202,625,698,450**	**172,565,232,881**	**193,260,640,487**	**181,498,940,201**
Agriculture (Irrigation)	195,620	95,266	93,132	77,644
Agriculture (Rain-fed crop)	126,969,089,343	108,132,639,930	121,099,971,864	113,729,926,167
Agriculture (Livestock)	54,708,556,618	46,592,288,291	52,179,663,835	49,004,051,975
Agriculture Support Services				
Agriculture (Forestry)	20,934,674,936	17,828,919,453	19,966,974,315	18,751,800,514
Agriculture (Fishing)	13,181,934	11,289,942	13,937,341	13,083,901
Industry	**1,349,842,088**	**1,151,754,676**	**1,289,308,993**	**1,219,825,499**
Crude oil and Mining	3,500	2,881	3,493	11,004
Manufacturing (Food and Beverages)	6,276	7,032	7,352	6,679
Manufacturing (Other)	6,058	7,550	7,826	7,966
Electricity	74,432,934	87,365,857	97,266,300	100,281,688
Water Supply; Sewerage and Waste	1,275,389,871	1,064,368,422	1,192,020,801	1,119,488,842
Construction	3,448	2,934	3,222	29,321
Services	**62,729**	**54,983**	**56,988**	**53,782**
Accommodation	454	341	327	507
Public Administration	4,929	3,806	4,123	3,765
Education	270	262	215	191
Health	489	388	392	501
Other	1,841	1,307	1,359	1,207
Households	54,744	48,879	50,573	47,610
Total	**203,975,603,267**	**173,717,042,540**	**194,550,006,468**	**182,718,819,482**

Source: Uganda Bureau of Statistics

5.1.5Water Use by Economic Activity

Annually, total water used by agriculture sector activities on average accounted for a 99.4 percent annual average share between 2015 and 2018. The water use by agriculture activities declined by 6.1 percent in 2018 from anincrease of 12.0 percent in 2017. However, there was a decline of 14.8 percent in 2016. For the period under review, water use in the agriculture sector was dominated (annual average) by rain-fed crop growing activities with 59.5 percent share of the total water use for the sector, followed by livestock activities (28.9 percent share) and forestry (11.0 percent).

The total share of water use by the industry sector averaged 0.58 percent annually for the period under review. Water use by this sector declined by 5.4 percent in 2018 after an 11.9 percent increase in 2017 and a decline of a 13.1 percent during 2016. Water Supply, Sewerage and Waste Management Activities dominated the use of water in this sector with an annual average share of 92.9 percent share of the total water use within the sector over the period 2015-2018.

Water use by services activities declined by 5.2 percent in 2017 following prior increases of 4.1 percent and 3.4 percent in 2017 and 2016, respectively.Notably, within the service activities, water use by Households activities declined by 6.0 percent in 2018 following a prior increase of 3.7 percent in 2017 and a decrease of 0.4 percent in 2016.Water use within services activities was dominated by householdsfollowed by public administration activities with annual average shares 79.8 percent and 12.7 percent, respectively of over the period 2015 to 2018. See Table 6.

Table 6: Water Use by Economic Activity (thousand cubic metres)

Activity	2015	2016	2017	2018
Agriculture	**235,644,702,537**	**200,685,720,017**	**224,753,290,195**	**211,074,978,408**
Agriculture (Irrigation)	391,240	190,532	186,263	155,288
Agriculture (Rain-fed crop)	141,076,765,937	120,147,377,700	134,555,524,293	126,366,584,630
Agriculture (Livestock)	68,385,728,478	58,240,412,138	65,224,613,896	61,255,113,669
Agriculture Support Services				
Agriculture (Forestry)	26,168,346,978	22,286,152,634	24,958,721,198	23,439,753,953
Agriculture (Fishing)	13,469,905	11,587,014	14,244,544	13,370,868
Industry	**1,349,866,259**	**1,173,728,439**	**1,313,912,547**	**1,243,050,255**
Crude oil and Mining	5,430	4,806	5,742	16,406
Manufacturing (Food and Beverages)	11,594	14,699	15,395	14,495
Manufacturing (Other)	9,775	12,903	13,393	13,851
Electricity	74,432,934	87,453,322	97,363,676	100,382,091
Water Supply; Sewerage and Waste	1,275,389,871	1,086,227,942	1,216,498,125	1,142,476,634
Construction	16,655	14,767	16,217	146,778
Services	**156,690**	**161,947**	**168,579**	**159,756**
Accommodation	1,400	1,848	1,792	2,796
Public Administration	17,616	21,126	22,899	20,913
Education	846	1,392	1,164	1,104
Health	1,455	2,106	2,139	2,802
Other	6,421	6,995	7,298	6,859
Households	128,951	128,480	133,287	125,283
Total	**236,994,725,487**	**201,859,610,402**	**226,067,371,321**	**212,318,188,419**

Source: Uganda Bureau of Statistics

5.1.6 Water Consumption

Water consumption is that part of water which is not distributed to other economic units and does not return to the environment, because it is either incorporated in products, or consumed by households and livestock.Total water consumption in 2018 was 29,599,369 million cubic metres from 31, 517,365 million cubic metres in 2017, representing a decline of 6.1 percent. On a contrary, there was a 12.0 percent increase in 2017 that had followed a 14.8 percent decrease in 2016 as derived from Table 7.

Over the period 2015-2018, agriculture activities commanded an annual average share of 99.92 percent of the total volumes of water consumption, this was dominated by agriculture rain-fed crop and livestock rearing activities with an average share of 42.7 percent and 41.4 percent, respectively. However, water consumption by agriculture activities declined by 6.1 percent in 2018 after a 12.0 percent growth in 2017 and 14.8 percent decline in 2016. Indicating that agriculture rain-fed crop and pasture growing activities drive water consumption in the economy.

Water consumption by industrial activities had an annual average share of 0.08 percent that was dominated by activities of Water supply; Sewerage and Water Management activities (99.4 percent share of industry) over the period 2015-2018. Water consumption by industrial activities declined by 5.6 percent in 2018 after a 12.0 percent growth in 2017 and 14.5 percent decline in 2016.

Water consumption by service activities continues to be negligible compared to water consumption by agriculture and industrial activities. Water consumption by service activities declined by 5.0 percent in 2018 following prior increases of 4.3 percent and 13.8 percent in 2017 and 2016, respectively. Household activities dominated water consumption with an annual average share of 75.2 percent within services over the period 2015 to 2018. Notably, Water consumption by Households activities declined by 6.1 percent in 2018 after a 3.9 percent and 7.3 percent increases in 2017 and 2016, respectively. See Table 7.

Table 7: Water Consumption by Economic Activity(thousand cubic metres)

Activity	2015	2016	2017	2018
Agriculture	**33,019,004,087**		**31,492,649,708**	**29,576,038,207**
Agriculture (Irrigation)	195,620	95,266	93,132	77,644
Agriculture (Rain-fed crop)	14,107,676,594		13,455,552,429	12,636,658,463
Agriculture (Livestock)	13,677,171,860		13,044,950,061	12,251,061,694
Agriculture Support Services				
Agriculture (Forestry)	5,233,672,043	4,457,233,181	4,991,746,883	4,687,953,439
Agriculture (Fishing)	287,971	297,072	307,203	286,967
Industry	**25,699,979**	**21,973,763**	**24,603,554**	**23,224,756**
Crude oil and Mining	1,930	1,925	2,249	5,402
Manufacturing (Food and Beverages)	5,318	7,666	8,043	7,816
Manufacturing (Other)	3,716	5,353	5,567	5,885
Electricity	74,433	87,465	97,376	100,403
Water Supply; Sewerage and Waste	25,601,374	21,859,520	24,477,325	22,987,792
Construction	13,207	11,833	12,995	117,457
Services	**93,961**	**106,963**	**111,591**	**105,974**
Accommodation	946	1,507	1,465	2,288
Public Administration	12,687	17,319	18,776	17,147
Education	577	1,130	949	913
Health	966	1,718	1,747	2,300
Other	4,579	5,688	5,939	5,653
Households	74,206	79,601	82,714	77,673
Total	**33,044,798,027**	**28,142,567,862**	**31,517,364,853**	**29,599,368,937**

Source: Uganda Bureau of Statistics

5.2 Economic profiles for Water

It is important to compare the environmental performance of industries among each other and overtime. This is achieved through use environmental-economic profiles which compare direct economic benefits (share of value added) and environmental burden/costs (share of water use). The economic water profiles may be used for benchmarking industrial performance in order to promote water use efficiency and water conservation. They can also be used to guide the country on which industrial activities to expand. However, considerations about the natural resource availability, sustainability and the secondary contributions of the activity to the other activities must be considered. Economic profiles of water productivity and Water Use Efficiency for the pilot water accounts are presented below.

5.2.1Water Productivity

Water productivity is an indicator that combines two elements, that is economic contribution and environmental burden into a single indicator. Water productivity furnishes the potential gains and losses from a reallocation of water. It is interpreted as a rough approximation of the socio-economic benefits generated by allocating water to a particular industry. It is, therefore, calculated by dividing the value added for a particular industry by the volume of water consumed by that industry; giving the value added per cubic metre of water consumed.

Over the period2015 to 2018, water productivity rose from 2.26 Ushs/m3 in 2015 to 3.43 Ushs/m3 in 2018 representing an annual average growth of 15.4 percent.The activities with greater burden on water resources are, Livestock rearing with the lowest value (0.31 Ushs/m3), agriculture rain-fed crop growing (0.98 Ushs/m3), forestry (0.69 Ushs/m3) and Water Supply, Sewerage and Waste Management Activities (108.4 Ushs/m3).

Activities with greater economic contribution and less environmental burden were mainly services activities with an annual average water productivity of (430,239Ushs/m3) value added per cubic metre of water consumed. Specifically, education activities had the greatest economic benefit and less environmental burden with water productivity of 8,326,331 Ushs/m3 of value added per cubic metre of water consumed. Table 8 illustrates the above findings at detailed industrial activities level.

Table 8: Water productivity by Economic Activity - UShs

Activity	2015	2016	2017	2018
Agriculture	**0.59**	**0.72**	**0.78**	**0.82**
Agriculture (Irrigation)	2,924	6,286	11,681	9,333
Agriculture (Rainfed crop)	0.77	0.95	1.10	1.09
Agriculture (Livestock)	0.25	0.32	0.30	0.38
Agriculture Support Services				
Agriculture (Forestry)	0.61	0.72	0.67	0.78
Agriculture (Fishing)	4,384	4,600	5,036	5,304
Industry	**644**	**827**	**799**	**1,018**
Crude oil and Mining	276,704	323,841	248,263	74,963
Manufacturing (Food and Beverages)	586,288	426,553	477,077	644,476
Manufacturing (Other)	1,135,788	851,297	847,054	884,097
Electricity	9,526	9,406	10,116	11,412
Water Supply; Sewerage and Waste Management Activities	79.69	109.93	113.05	130.92
Construction	451,248	548,693	522,132	75,232
Services	**414,235**	**388,606**	**411,797**	**506,318**
Accommodation	2,168,736	1,566,883	1,850,610	1,399,867
Public Administration	150,507	113,387	104,922	116,519
Education	8,908,412	5,816,642	8,399,672	10,180,600
Health	2,643,875	1,608,630	1,705,378	1,433,461
Other	5,885,221	4,842,968	5,039,307	6,269,507
Households	4,280	4,477	4,705	5,498
Total	**2.26**	**2.84**	**2.86**	**3.43**

Source: Uganda Bureau of Statistics

5.2.2Water Use Efficiency (WUE)

SDG indicator 6.4.1, Water Use Efficiency (WUE) is defined as the value added divided by the volume of water used for a given industrial activity. It is important to note that only run-off water and groundwater (so called blue water) are considered when computing this indicator, (FAO, 2018). Therefore, the amount of water of agricultural production carried out in rain-fed conditions is excluded. Furthermore, the amount of water abstracted for hydro-power generation (except evaporation at the dam) is excluded.

In 2015, WUE was estimated at 86,901 Ushs of value added per cubic metre of water used, equivalent to 26.8 US$ per cubic metre. Service activities emerged as the most water use efficient activities with an estimate of 470,164 Ushs of value added per cubic metre of water used yet imposing a burden of less than one percent to the water resources while taking a value added share of 52.0 percent to Gross Domestic Product (GDP). Education services

emerged as the most efficient water use activity (Table 9), this was followed by health, accommodation then manufacturing. On the other hand, WUE irrigated crop growing activities emerged as the least efficient water use activities with 1,462 Ushs of value added per cubic metre of water.

In 2016, WUE was estimated at 101,000 Ushs of value added per cubic metre of water used, equivalent to 29.5 US$ per cubic metre in 2016. Again, service activities emerged as the most water use efficient activities with lower estimate of 400,195 Ushs of value added per cubic metre of water used value added share of 51.9 percent to GDP. Similarly, Education services emerged as the most efficient water use activity (Table 10), this was followed by health, accommodation then manufacturing. On the other hand, WUE irrigated crop growing activities emerged as the least efficient water use activities with a higher estimate of 3,143 Ushs of value added per cubic metre of water compared to the estimate of 2015.

In 2017, WUE was estimated at 112,488 Ushs of value added per cubic metre of water used, equivalent to 31.1 US$ per cubic metre. Similarly, service activities emerged as the most water use efficient activities with an estimate of 432,391 Ushs of value added per cubic metre of water used. Education services emerged as the most efficient water use activity (Table9), this was followed by accommodation, health then manufacturing. WUE activities of households emerged as the least efficient water use activities with 4,172 Ushs of value added per cubic metre of water.

WUE was estimated at 109,291 Ushs of value added per cubic metre of water used, equivalent to 29.3 US$ per cubic metre in 2018. Similar to 2015-2017, service activities emerged as the most water use efficient activities with an estimate of 536,332 Ushs of value added per cubic metre of water. Education services again emerged as the most efficient water use activity (Table9), this was followed by health, accommodation, then manufacturing. On the other hand, WUE irrigated crop growing activities emerged as the least efficient water use activities with 4,666 Ushs of value added per cubic metre of water used.

Table 9: Water Use Efficiency (WUE) by Economic Activity - UShs

Activity	2015	2016	2017	2018
Agriculture	**33,708**	**52,279**	**66,044**	**72,005**
Agriculture (Irrigated crop)	1,462	3,143	4,172	4,666
Agriculture (Rainfed crop)				
Agriculture (Livestock)	95,285	72,476	116,624	94,597
Agriculture Support Services				
Agriculture (Forestry)				
Agriculture (Fishing)	8,619	9,328	10,337	11,376
Industry	**80,866**	**60,559**	**60,564**	**48,048**
Crude oil and Mining	98,338	129,702	97,238	24,684
Manufacturing (Food and Beverages)	268,919	222,476	249,258	347,515
Manufacturing (Other)	431,823	353,196	352,082	375,632
Electricity	6,139	5,159	6,308	6,591
Water Supply; Sewerage and Waste	44,283	25,730	23,542	23,774
Construction	357,830	439,673	418,385	60,204
Services	**470,164**	**400,195**	**432,391**	**536,332**
Accommodation	1,464,897	1,277,975	1,512,999	1,145,802
Public Administration	108,393	92,957	86,032	95,539
Education	6,071,204	4,722,640	6,850,388	8,418,956
Health	1,754,558	1,311,978	1,392,863	1,176,892
Other	4,197,470	3,938,195	4,100,900	5,166,702
Activities of Households	5,770	5,062	5,483	6,512
Total, Ushs	**86,901**	**101,000**	**112,448**	**109,292**
Total, US$	**26.8**	**29.5**	**33.4**	**29.3**

Source: Uganda Bureau of Statistics

5.3 The Derived Aggregates and Indicators

This section presents the social and economic aspects of water with discussions on some implications of the state of the water sector. The purpose is to provide an insight into the outcomes of the current water management and regulation in order to improve water management for sustainability.

Over the reporting period, the highest Gross Water Input of 236,994,550 million cubic metres was estimated in 2015 while the lowest 201,859,425 was estimated in 2016. Similarly, the highest Net Domestic Water of 236,994,550 million cubic metres was reported in 2015 while the lowest 201,859,425 was reported in 2016. Due to lack of estimates of imported water, Gross Water Input is equal to Net Domestic Water.

Table 10: Summary of derived Aggregates and Indicators

Indicator	2015	2016	2017	2018
Gross Water Input '000 cubic metres[1]	236,994,549,748	201,859,424,827	226,067,193,112	212,318,006,328
Net Domestic Water use '000 cubic	236,994,549,748	201,859,424,827	226,067,193,112	212,318,006,328
Water Consumption '000 cubic metres	33,044,798,027	28,142,567,862	31,517,364,853	29,599,368,937
Water productivity, shs	2.264	2.845	2.857	3.433
Water Use Efficiency -shs	86,901	101,000	112,448	109,292
Annual Water use per capita, Litres	6,760,134	5,566,368	6,062,396	5,538,451
Annual Water consumption per capita,	937,244	776,044	845,194	772,118
Water use per HH per day, Litres	47.1	45.6	46.0	42.1
Water Consumption per HH per day,	27.1	28.3	28.6	26.1
% of losses in the supply and distribution chain	10.67	6.65	19.37	27.22

Note 1: Volume of imported water is not included.

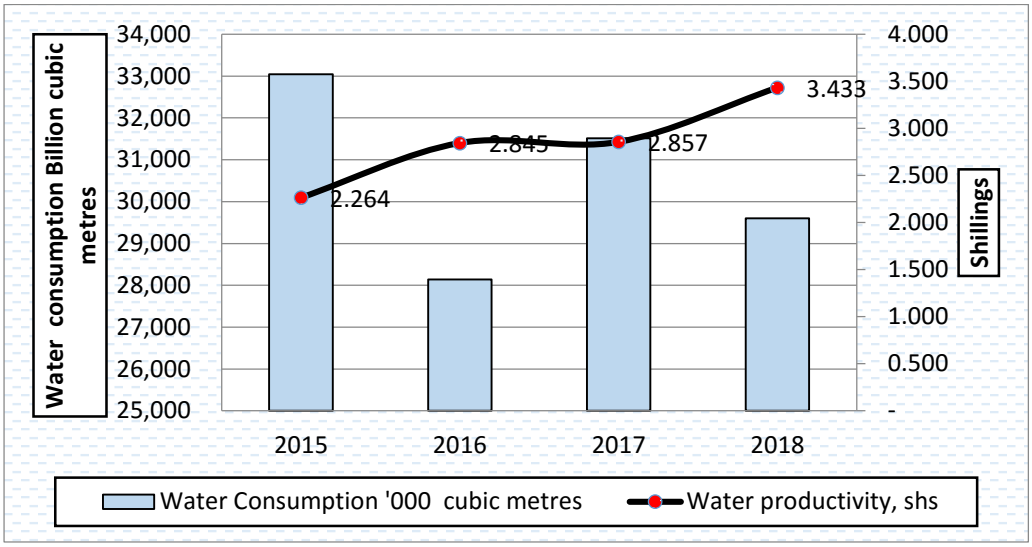
Source: Uganda Bureau of Statistics

Water Consumption and Water Productivity

Water consumption dropped to 29,599,369 million cubic metres, thereby leading to an increase of water productivity to 3.43 Ushs/m^3. As indicated in Figure 3, 2015 registered the highest water consumption of 33, 044,798 million cubic metres and the lowest water productivity of 2.26 Ushs/m^3. Agriculture and household activities which are composed of majorly own-use abstractors, outside the regulated and managed water system registered the highest amount of water consumption with corresponding lowest water productivity. Thus, in order to increase on water productivity for these economic units, the opportunities for improving water productivity should be identified and implemented. In addition, the

extent of the water losses for these economic units should be assessed with the aim of reducing these losses. Such opportunities include investing in additional drip irrigation schemes in order to reduce irrigation run-off and evaporation. Consequently, irrigation will recharge the underground sources.

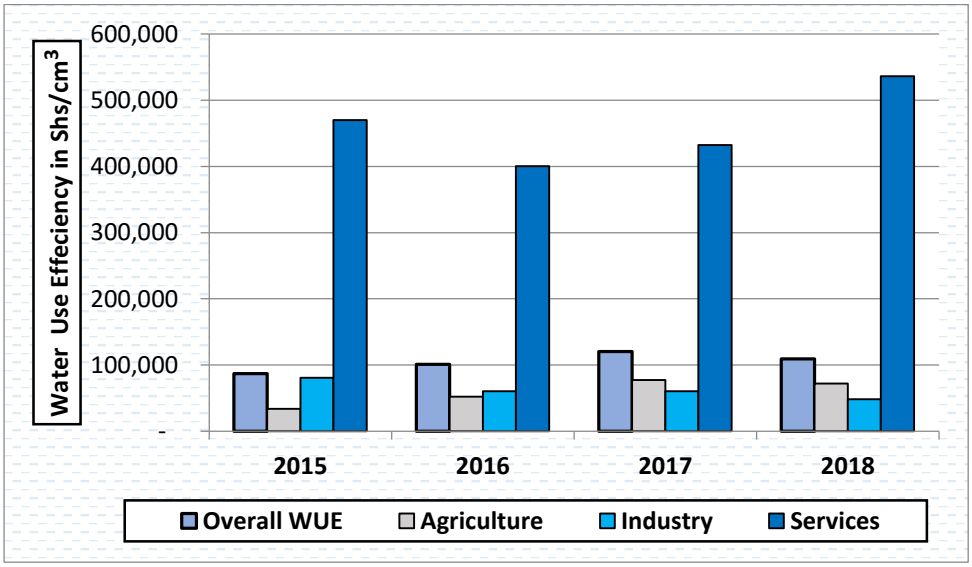
*Figure 3: **Water Consumption and Water Productivity***



Water Use Efficiency

The highest overall WUE of 112,448 Ushs was registered in 2017 while the lowest, 86,901 Ushs was registered in 2015. Service activities registered the highest WUE while agriculture activities registered the lowest WUE as shown in the Figure 4.

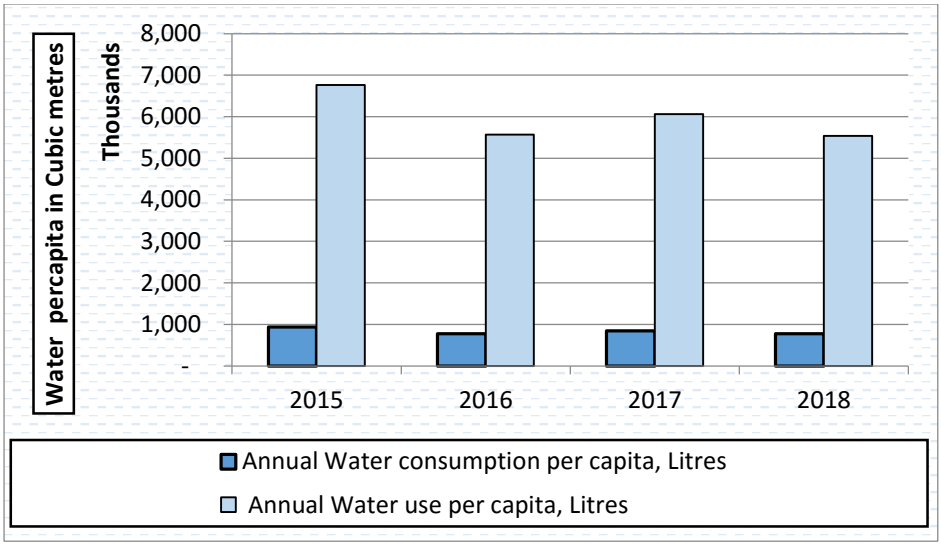
*Figure 4:**Water Use Efficiency (WUE)***



Water Consumption per capita and Use Per Capita

The highest annual water use per capita of 6,760 cubic metres was registered in 2015 while the lowest, 5,538 cubic metres was registered in 2018. Similarly, the highest annual water consumption per capita of 937 cubic metres was registered in 2015 and the lowest annual water consumption per capita of 772 cubic metres was registered in 2018 as shown in the Figure 5.

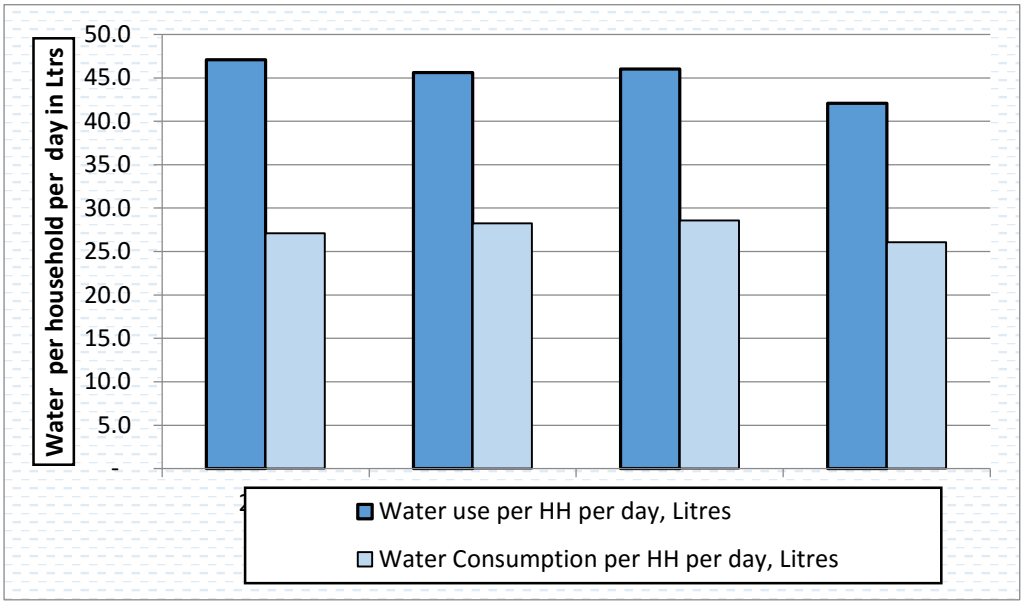
Figure 5:Water Consumption per capita and Use Per Capita



Water Consumption and Use per Household per Day

Over the period 2015-2018, the average water use per household per day was 45.2 litres while the average water consumption per household per day was 27.5 litres as shown in the Figure below. It should be noted that a number of household in rural areas carry out their bathing and washing of clothes at open water resources. However, this amount of water has not included in these estimates due to absence of adequate information. Furthermore, water for livestock rearing has been deducted from household activities and added to livestock rearing activities.

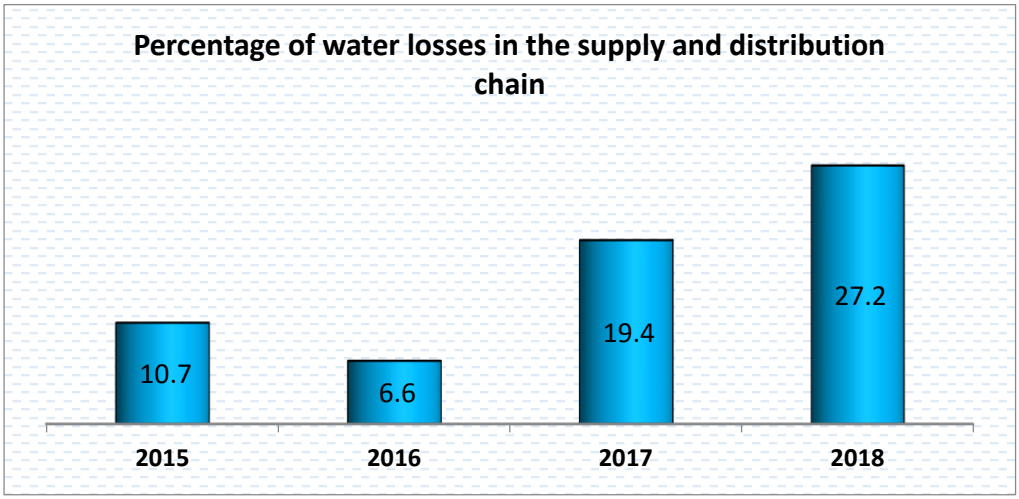
Figure 6:Water Consumption and Use per Household per Day



Water Loss in the supply and distribution chain

The highest derived water losses in the supply and distribution chain from these SEEA-Water Accounts have been estimated at 27.2 percent in 2018 and the lowest at 6.6 percent in 2016 as shown in the Figure 7.

Figure 7:Derived Water Loss in the supply and distribution chain



6.0 RECCOMENDATIONS AND WAY FORWARD

The initial production of the 2015-2018 pilot accounts has been supported by UNSD. It is expected that onward production of the accounts will continue because UBOS had already integrated the production of satellite accounts, including SEEA in its Plan for National Statistical Development 2013/14-2020/21. However, UBOS should ensure that the Sector Strategic Plans for Statistics (SPSSs)for all MDAs mainstream the production of data that is required for the regular production of the water accounts. UBOS should further request MDAs and the academia in the water sector to conduct regular studies on water absorption, transpiration by crops and trees, waste water discharges to open water bodies from precipitation and human activity, and water evaporation which are critical but missing.Thus, UBOS should come-up with a plan on how tofill the data gaps for the water accounts.

The next steps for UBOS include disseminatingwidely these accounts in a user-friendly manner for both policy and non-policy makers to ensure their uptake in decision making processes especially, the implementation and monitoring of the interventions of Uganda Green Development strategy 2016/17-2030/31. The uptake process should begin with application of the indicators from the water accounts to monitor in the National Standard Indicator framework.

The first three tables described in Section 4, namely the Water-Data Input Table, Physical Supply and Physical Use Table were compiled for 2015-2018 Pilot Water Accounts. It is expected that another set for tables 1-6 will be compiled and produced in series from 2015-2018. Production and dissemination of the accounts will be annually with a release date of 30th June of every year. The set of accounts will thereafter be expanded to include the expenditure and financing accounts, quality accounts, emission accounts and asset accounts in the subsequent years in a modular approach.

It is good practice in statistics to continuously improve a statistical system in regard to technical capacity, input data and system software to enhance the quality of the information compiled. It is therefore prudent for UBOS to implement the strategies on improving the institutional arrangements for the entire SEEA framework, increase and promote staff in the section responsible for SEEA and also seek for further training of staff. Another critical strategies is constituting a Water Accounts Technical Committee to peer

review the water accounts, 2015-2018. However, it is also important that UBOS develops a live metadata dictionary and a data quality assessment framework for the water accounts. This will help to keep track of the changes evolving around the water sector and also devise mechanisms for continuous improvement of in-put data.

Appendix 1: STATUS OF SOURCE DATA FOR THE PILOT WATER ACCOUNTS

Section	Source type	Type of flow	Required data	Responsible MDA	Status	UBOS estimate
From the environment	Surface water bodies	Supply	Abstraction by households and industries	DWRM	Licensed volumes by company are available. Actual abstraction by company is not available	Licensed volumes taken as proxy for actual abstraction.
			Abstraction by households	DWD	Abstraction by community schemes is available.	
			Abstraction by households	UBOS	Own account abstraction from surveys (UHNS) and Census	
	Ground water bodies	Supply	Abstraction by households and industries	DWRM	Licensed volumes by company are available. Actual abstraction by company is not available	Licensed volumes taken as proxy for actual abstraction.
			Abstraction by households	DWD	Abstraction by community schemes is available	
			Abstraction by households	UBOS	Extracted from UNHS and Census	
	Soil water	Supply	Soil moisture	UNMA	Not availed	Absorption by crop, pasture and trees taken as proxy.
	Precipitation	Supply	Total precipitation for the entire country	UNMA	Only annual precipitation for 12 stations is available.	Annual average precipitation for 12 stations grossed up for the entire country.
Section	**Source type**	**Type of flow**	**Required data**	**Responsible MDA**	**Status**	**UBOS estimate**
Distribution and use of abstracted water across industries and households	Distribution	Supply	Distributed volumes by company/ household	NWSC	Industry breakdown not aligned to ISIC, Rev.4	UBOS is re-classifying the National Water and Sewerage customer database
		Supply		DWD	Not available	Abstraction volumes taken as proxy for distribution volumes
		Use	Billed volume	NWSC	Industry breakdown not aligned to ISIC, Rev.4	UBOS is re-classifying the National Water and Sewerage customer database
		Use		DWD	Not available	Abstraction volumes taken as proxy for distribution

Appendix 1: STATUS OF SOURCE DATA FOR THE PILOT WATER ACCOUNTS

						volumes
	Own supply	Use	Abstracted volumes for own use	UBOS	Not available	Own supply % from UNHS and Census used.
		Use	Abstracted volumes for tree absorption	MAAIF	Not available	% Precipitation for agriculture crop land taken as proxy.
		Use	Abstraction by trees	NFA	Not available	% Precipitation for forested land taken as proxy.
		Use	Abstraction for livestock rearing		Not available	Proxy for valley tanks/dams from DWD used
		Use	Abstraction for fish farming		Not available	FAO-fish farming statistics
Flows of waste water and reused water	Waste water to treatment	Supply	Volume of waste water supplied by industry to NWSC	NWSC	Not available	% of distributed water assumed
		Use	Volume of waste water received for treatment	NWSC	Not available	% of distributed water assumed
	Own treatment		Volume of waste water treated by owner	DWRM	Not available	Work in progress to compile waste water statistics
			Volume of treated waste water used	DWRM	Not available	Work in progress to compile waste water statistics.
Section	**Source type**	**Type of flow**	**Required data**	**Responsible MDA**	**Status**	**UBOS estimate**
Return flows of water to the environment	Surface water bodies		Precipitation over water bodies	DWRM	Not available	% assumed for precipitation
			Untreated waste water returns	DWRM	Not available	Work in progress to compile waste water statistics.
			Treated wastewater returns	NWSC	Not available	Assumed % of used water
	Ground water bodies		Percolation of precipitation	DWRM	Not available	% assumed for waste water, treated water and precipitation
			Percolation from other sources	DWRM	Not available	Work in progress
	Losses in distribution		Volume of losses	NWSC	Available but not decomposed	Used water distribution % for industry breakdown
			Volume of losses	DWD	Not available	Assumed zero

Appendix 1: STATUS OF SOURCE DATA FOR THE PILOT WATER ACCOUNTS

	Other					
Losses through evaporation, transpiration and water incorporated in products	Evaporation	Supply	Evaporation from surface water bodies	DWRM	Not available	Average national rate for evapotranspiration for 1960-1990 used.
			Evaporation during precipitation, irrigation and other evaporation	UNMA	Not available	Average national rate for evapotranspiration for 1960-1990 used.
	Transpiration	Supply	General transpiration	UNMA	Not available	Average national rate for evapotranspiration for 1960-1990 used.
			Transpiration from agriculture land/activities	MAAIF	Not available	Average national rate for evapotranspiration for 1960-1990 used. Industry breakdown not done.
			Transpiration from forested land	NFA	Not available	Average national rate for evapotranspiration for 1960-1990 used. Industry breakdown not done.
	Water incorporated in products	Use	Volume of water in "bottled" drinks		Not available	Work in progress

Key: Quality statistics- which is official, Acceptable statistic - has potential to be a quality statistics but is not official, Questionable statistic - which is lacking adequate coverage, and Poor statistics - not meeting any of the above

Appendix 2A: 2015 PYHSICAL SUPPLY TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

Industries by ISIC	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construct-ion	Accommodation	Public Administra-tion	Educati-on	Health	Other	Household-s	Accumul-ation	Rest of the World	Flows from the environment	Tot
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water																				74,941,117	
Groundwater																				173,581	
Soil Water																					
Total																				75,114,699	
Other water sources																					
Precipitation																				23,691,943,550	23,
Total																				23,691,943,550	23,
Total Supply Abstracted Water																				236,994,549,748	236,
(II) Abstracted water																					
For distribution-NWSC										99,245											
For distribution- Other distributors										2,587											
For own use	391,240	14,176,765,937	68,385,716,194	26,168,346,978	1,346,995	4,852	626	79	74,432,837	1,275,335,992	15,842	149	15	85	2	2,493					236,
Total	391,240	14,176,765,937	68,385,716,194	26,168,346,978	1,346,995	4,852	626	79	74,432,837	1,275,437,825	15,842	149	15	85	2	2,493					23,
(III) Supply of water to other economic unitsof which:																					
Wastewater																					
Wastewater to treatment			2,211			14	959	484	17		146	218	1,758	125	249	696	5,273				
Own treatment																					
Reused water																					
For distribution																					
For own use																					
Total			2,211			14	959	484	17		146	218	1,758	125	249	696	5,273				
(IV) Return flows of water																					
To inland water resources																					
Surface Water		423,232,979	1,257,853,951	2,616,834,367	13,181,934		320	2,787	74,358,484	12,219,594											
Groundwater	195,620	28,215,353,187	1,796,423,252	5,233,668,734			164			21,728											5,
Other sources		564,376,375	2,735,427,723	1,384,171,835		3,396	164	2,787			332	236	3,172	144	241	1,145	4,948				9,
Total returns flows	195,620	12,696,989,343	547,855,447	2,934,674,936	13,181,934	3,396	5,318	5,574	74,358,484	12,241,321	332	236	3,172	144	241	1,145	4,948				
of which: Losses in distribution										1,864											
(V) Evaporation of abstracted water, transpiration and water incorporated into products	195,620	1,417,676,594	13,677,171,860	523,367,243	287,971	1,930	5,318	3,716	74,433	25,498,552	1,327	946	12,687	577	966	4,579	7,426				3,
Evapotranspiration of abstracted water	67	218,893,144	1,616,519	462,517	4,148	8	10	2	115,489	1,978,767	25	0.23	0.24	0.13	0.16	4	115				
Transpiration																					
Water incorporated into products																					
Total supply	782,479	282,153,531,873	136,771,444,672	52,336,693,956	2,693,990	1,282	17,854	16,856	14,886,578	255,664,198	32,497	1,549	17,632	931	1,466	8,914	12,896			236,994,549,748	7,

Appendix 2B: 2015 PYHSICAL USE TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows to the environment	Total Use
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water	391,136		7	3,295	37,712	1,255	4,792	5,576	74,432,832	5,718	672	18		17		739					74,941,117
Groundwater	14		23,178	13	18,779	3,597	1,469	155	5	23,833	9,122	13	15	67	2	1,754					173,581
Soil Water																					
Total	391,240		23,186	339	146,492	4,852	626	79	74,432,837	885	15,842	149	15	85	2	2,493					75,114,699
Other water sources																					
Collection of Precipitation		14,176,765,937	683,856,939	26,168,343,670	13,323,414					1,275,393											23,691,943,550
Total		14,176,765,937	683,856,939	26,168,343,670	13,323,414					1,275,393											23,691,943,550
Total Use of Abstracted Water	391,240	14,176,765,937	68,385,716,194	26,168,346,978	1,346,995	4,852	626	79	74,432,837	1,275,389,871	15,842	149	15	85	2	2,493					###############
(II) Abstracted water																					
Distributed Water-NWSC			12,284			578	5,322	2,688	97		813	122	17,575	696	1,378	3,869	52,734				99,245
Distributed Water-other Water supply industry							11	6	0		2	5	26	65	67	59	2,311				2,587
For own use	391,240	14,176,765,937	68,385,716,194	26,168,346,978	1,346,995	4,852	626	79	74,432,837	127,526,287	15,842	149	15	85	2	2,493	7,396				###############
Total	391,240	14,176,765,937	68,385,728,478	26,168,346,978	1,346,995	543	11,594	9,775	74,432,934	127,526,287	16,655	14	17,616	846	1,455	643	12,896				23,699,459,772
(III) Wastewater and reused water																					
Wastewater																					
Wastewater received from other units										1,225											1,225
Own treatment																					
Reused water																					
Distributed reused																					
Own use																					
Total										1,225											1,225
(IV) Return flows of water																					
Return flows of water to the environment																					
To inland water resources																					
Surface Water																				563,548,488	563,548,488
Groundwater																				5,545,663,584	5,545,663,584
To other sources																				9,686,922,371	9,686,922,371
Total returns flows																				237,236,844	237,236,844
(V) Evaporation of abstracted water, transpiration and water incorporated into products																				3,327,418,174	3,327,418,174
Evapotranspiration of abstracted water																					
Transpiration																					
Water incorporated into products																					
Total use	782,479	282,153,531,873	136,771,444,672	52,336,693,956	2,693,990	1,282	17,854	16,856	14,886,578	255,664,198	32,497	1,549	17,632	931	1,466	8,914	12,896			236,994,549,748	7,198,379,439

Appendix 3A: 2016 PYHSICAL USE TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

Industries by SIC	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows from the environment	Total Supply
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water																				8,787,626	8,787,626
Groundwater																				181,349	181,349
Soil Water																					
Total																				87,988,975	87,988,975
Other water sources																					
Precipitation																				21,771,435,852	21,771,435,852
Total																				21,771,435,852	21,771,435,852
Total Supply Abstracted Water																				21,859,424,827	21,859,424,827
(II) Abstracted water																					
For distribution-NWSC										118,230											118,230
For distribution- Other distributors										9,265											9,265
For own use	19,532	12,147,377,700	5,824,397,484	22,286,152,634	1,158,714	4,116	8,350	9,696	8,745,326	186,129,161	13,717	159	15	154	56	254					2,185,932,646
Total	19,532	12,147,377,700	5,824,397,484	22,286,152,634	1,158,714	4,116	8,350	9,696	8,745,326	186,256,656	13,717	159	15	154	56	254					2,185,945,355
(III) Supply of water to other economic unitsof which:																					
Wastewater																					
Wastewater to treatment							634	32	12		97	144	294	83	164	47	6,282				130
Own treatment																					
Reused water																					
For distribution																					
For own use																					
Total																					130
(IV) Return flows of water																					
To inland water resources																					
Surface Water		364,421,340	87,365,455	2,228,614,932	11,289,942		4,219	3,775	87,365,857	164,359,949											481,719,638
Groundwater	95,266	2,429,475,540	1,456,991	4,457,229,863			146			8,472											43,469,639
Other sources		485,895,180	23,296,144,146	1,114,374,658		2,882	146	3,775			2,934	35	386	262	388	137	48,879				82,498,235,863
Total returns flows	95,266	18,132,639,930	46,592,288,291	17,828,919,453	11,289,942	2,882	732	7,550	87,365,857	164,368,422	2,934	35	386	262	388	137	48,879				17,371,742,540
of which: Losses in distribution										8,472											8,472
(V) Evaporation of abstracted water, transpiration and water incorporated into products	95,266	1,214,737,770	11,648,123,847	4,457,233,181	29,772	1,925	7,666	5,353	87,465	21,684,235	11,833	157	17,319	113	1,718	5,688	797				28,142,392,578
Evapotranspiration of abstracted water	347	21,967,122	1,619,884	4,634,789	41,866	8	15	18	159,455	198,435	25	0.29	0.28	0.28	0.11	4	16				
Transpiration																					

Water incorporated into products																				
Total supply	38,163	24,294,755,399	1,164,889,622	4,457,235,268	2,317,428	8,922	2,349	22,599	17,496,527	217,239,313	28,485	26	2,115	1,547	2,162	949	12,848			21,859,424,827	65,578,323,775

Appendix 3B: 2016 PYHSICAL USE TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows to the environment	Total Use
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water	1,945			335	3,773	1,748	73	8,281	8,745,381	98,855	6,444	18		66		672					8,787,626
Groundwater	127		37,119	13	18,779	2,368	1,319	1,415	124	21,129	7,273	15	15	89	56	1,381					181,349
Soil Water																					
Total	19,532		37,119	3,318	1,465	4,116	8,350	9,696	8,745,326	119,983	13,717	159	15	154	56	254					87,988,975
Other water sources																					
Collection of Precipitation		12,147,377,700	582,436,364	22,286,149,316	1,144,513					18,617,959											21,771,435,852
Total		12,147,377,700	582,436,364	22,286,149,316	1,144,513					18,617,959											21,771,435,852
Total Use of Abstracted Water	19,532	12,147,377,700	5,824,397,484	22,286,152,634	1,158,714	4,116	8,350	9,696	8,745,326	186,227,942	13,717	159	15	154	56	254					21,859,424,827
(II) Abstracted water																					
Distributed Water-NWSC			14,633			690	634	322	116		967	1,443	2,937	830	1,642	469	62,821				118,230
Distributed Water- other Water supply industry			21			1	9	5	0		83	246	173	48	49	332	7,578				9,265
For own use	19,532	12,147,377,700	5,824,397,484	22,286,152,634	1,158,714	4,116	8,350	9,696	8,745,326	186,718	13,717	159	15	154	56	254	589				2,185,932,646
Total	19,532	12,147,377,700	5,824,412,138	22,286,152,634	1,158,714	486	14,699	1,293	87,453,322	186,718	14,767	1,848	21,126	1,392	216	6,995	12,848				2,185,945,355
(III) Wastewater and reused water																					
Wastewater																					
Wastewater received from other units										130											130
Own treatment																					
Reused water																					
Distributed reused																					
Own use																					
Total										130											130
(IV) Return flows of water																					
Return flows of water to the environment																					
To inland water resources																					
Surface Water																				481,719,638	481,719,638
Groundwater																				43,469,639	43,469,639
To other sources																				82,498,235,863	82,498,235,863
Total returns flows																				17,371,742,540	17,371,742,540
(V) Evaporation of abstracted water, transpiration and water incorporated into products																				28,142,392,578	28,142,392,578
Evapotranspiration of abstracted water																					

Transpiration																					
Water incorporated into products																					
Total use	38,163	24,294,755,399	1,164,889,622	4,457,235,268	2,317,428	8,922	2,349	22,599	17,496,527	217,239,313	28,485	26	2,115	1,547	2,162	949	12,848			21,859,435,117	65,578,323,775

Appendix 4A: 2017 PYHSICAL SUPPLY TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

Industries by SIC	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows from the environment	Total Supply
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water																				97,684,846	97,684,846
Groundwater																				185,576	185,576
Soil Water																					
Total																				9,787,422	9,787,422
Other water sources																					
Precipitation																				225,969,269,472	225,969,269,472
Total																				225,969,269,472	225,969,269,472
Total Supply Abstracted Water																				22,667,139,894	22,667,139,894
(II) Abstracted water																					
For distribution-NWSC										11,361											11,361
For distribution- Other distributors										2,845											2,845
For own use	13,345	134,555,524,293	65,224,613,859	24,958,721,198	14,244,544	4,990	8,469	9,894	97,363,550	1,216,375,688	15,142	161	15	166	254	2,189					2,266,717,456
Total	13,345	134,555,524,293	65,224,613,859	24,958,721,198	14,244,544	4,990	8,469	9,894	97,363,550	1,216,491,594	15,142	161	15	166	254	2,189					22,667,133,362
(III) Supply of water to other economic unitsof which:																					
Wastewater																					
Wastewater to treatment							692	349	13		16	157	2,285	10	179	53	6,855				11,230
Own treatment																					
Reused water																					
For distribution																					
For own use																					
Total																					11,230
(IV) Return flows of water																					
To inland water resources																					
Surface Water		4,366,657,289	9,783,686,969	2,495,871,789	13,937,341		442	3,913	97,266,300	1,191,998,346											53,949,426,357
Groundwater	66,523	2,691,114,859	1,636,144,949	4,991,743,579			147			22,455											482,983,833
Other sources		5,382,229,717	2,689,831,918	12,479,358,947		3,493	147	3,913			3,222	327	4,123	215	392	1,359	5,573				92,391,469,668
Total returns flows	66,523	12,199,971,864	52,179,663,835	19,966,974,315	13,937,341	3,493	7,352	7,826	97,266,300	119,229	3,222	327	4,123	215	392	1,359	5,573				194,549,979,859
of which: Losses in distribution										22,455											22,455
(V) Evaporation of abstracted water, transpiration and water incorporated into products	66,523	13,455,552,429	13,449,561	4,991,746,883	3,723	2,249	843	5,567	97,376	2,431,345	12,995	1,465	18,776	949	1,748	5,939	82,714				31,517,171,263
Evapotranspiration of abstracted water	213	215,791,874	1,463,224	427,262	45,368	8	14	16	156,146	195,845	24	0.26	0.25	0.27	0.47	4	100				
Transpiration																					
Water incorporated into products																					

Total supply	2,670	26,911,148,587	13,449,227,755	49,917,442,395	2,848,988	1,732	23,863	23,287	194,727,226	2,432,822,739	31,359	1,953	22,914	1,330	2,393	9,487	133,287			22,667,139,894	6,782,143,568

Appendix 4B: 2017 PYHSICAL USE TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows to the environment	Total Use
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water	132,722		67	3,296	37,422	2,515	7,175	867	97,363,426	122,123	773	2		66	168	79					97,684,846
Groundwater	324		33,999	8	112,244	2,475	1,293	1,827	124	2,340	869	15	15	1	86	149					185,576
Soil Water																					
Total	13,345		3,465	334	149,665	4,990	8,469	9,894	97,363,550	145,514	15,142	161	15	166	254	2,189					9,787,422
Other water sources																					
Collection of Precipitation		134,555,524,293	65,224,579,794	24,958,717,894	1,494,879					1,216,352,612											225,969,269,472
Total		134,555,524,293	65,224,579,794	24,958,717,894	1,494,879					1,216,352,612											225,969,269,472
Total Use of Abstracted Water	13,345	134,555,524,293	65,224,613,859	24,958,721,198	14,244,544	4,990	8,469	9,894	97,363,550	1,216,498,125	15,142	161	15	166	254	2,189					22,667,139,894
(II) Abstracted water																					
Distributed Water-NWSC			19			752	6,918	3,494	127		156	1,574	22,847	95	1,791	529	68,550				11,361
Distributed Water- other Water supply industry			19				8	5	0		20	57	37	93	94	79	2,434				2,845
For own use	13,345	134,555,524,293	65,224,613,859	24,958,721,198	14,244,544	4,990	8,469	9,894	97,363,550	1,216,313,385	15,142	161	15	166	254	2,189	6,233				2,266,717,456
Total	13,345	134,555,524,293	65,224,613,896	24,958,721,198	14,244,544	5,742	15,395	13,393	97,363,676	1,216,313,385	16,217	1,792	22,899	1,164	2,140	7,298	133,287				22,667,133,362
(III) Wastewater and reused water																					
Wastewater																					
Wastewater received from other units										11,230											11,230
Own treatment																					
Reused water																					
Distributed reused																					
Own use																					
Total										11,230											11,230
(IV) Return flows of water																					
Return flows of water to the environment																					
To inland water resources																					
Surface Water																				53,949,426,357	53,949,426,357
Groundwater																				482,983,833	482,983,833
To other sources																				92,391,469,668	92,391,469,668
Total returns flows																				194,549,979,859	194,549,979,859
(V) Evaporation of abstracted water, transpiration and water incorporated into products																				31,517,171,263	31,517,171,263
Evapotranspiration of abstracted water																					
Transpiration																					
Water incorporated into products																					
Total use	2,670	26,911,148,587	13,449,227,755	49,917,442,395	2,848,988	1,732	23,863	23,287	194,727,226	2,432,822,739	31,359	1,953	22,914	1,330	2,393	9,487	133,287			22,667,151,123	6,782,143,568

Appendix 5A: 2018 PYHSICAL SUPPLY TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

Industries by SIC	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows from the environment	Total Supply
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water																				1,727,286	1,727,286
Groundwater																				31,538	31,538
Soil Water																					
Total																				1,142,594	1,142,594
Other water sources																					
Precipitation																				21,223,726,662	21,223,726,662
Total																				21,223,726,662	21,223,726,662
Total Supply Abstracted Water																				21,234,769,256	21,234,769,256
(II) Abstracted water																					
For distribution-NWSC										118,927											118,927
For distribution- Other distributors										3,452											3,452
For own use	155,288	126,366,584,630	612,559,992	23,439,753,953	1,337,868	15,719	8,167	1,655	1,381,976	1,142,349,254	145,793	146	15	176	163	2,153					212,317,878,949
Total	155,288	126,366,584,630	612,559,992	23,439,753,953	1,337,868	15,719	8,167	1,655	1,381,976	1,142,471,633	145,793	146	15	176	163	2,153					2,123,181,327
(III) Supply of water to other economic unitsof which:																					
Wastewater																					
Wastewater to treatment			1,458				1,137	574	3		173	259	286	149	294	827	6,259				13,235
Own treatment																					
Reused water																					
For distribution																					
For own use																					
Total																					13,235
(IV) Return flows of water																					
To inland water resources																					
Surface Water		3,799,975,389	9,188,259,745	234,397,564	138,391		47	3,983	1,281,688	1,119,455,529											56,753,938
Groundwater	77,644	25,273,316,926	15,313,766,242	468,795,128			1,336			33,312											45,275,145,589
Other sources		5,546,633,852	245,225,988	11,719,875,321		114	1,336	3,983			2,933	57	3,765	20	51	127	4,770				86,768,634,586
Total returns flows	77,644	113,729,926,167	49,451,976	187,518,514	138,391	114	6,679	7,966	1,281,688	1,119,488,842	2,933	57	3,765	20	51	127	4,770				182,718,819,482
of which: Losses in distribution										33,312											33,312
(V) Evaporation of abstracted water, transpiration and water incorporated into products	77,644	12,636,658,463	1,225,161,694	4,687,953,439	(129,519)	542	7,816	5,885	143	22,818,937	117,462	2,288	17,147	913	23	5,653	77,673				295,859,639
Evapotranspiration of abstracted water	269	218,833,654	167,774	4,591,483	45,950	27	14	18	173,835	1,978,365	252	0.25	0.27	0.35	1.84	4	13				
Transpiration																					
Water incorporated into products																					
Total supply	**31,577**	**252,733,169,260**	**1,225,121,277**	**468,795,795**	**135,466**	**32,125**	**22,662**	**2,457**	**276,467**	**2,284,779,412**	**292,576**	**2,942**	**2,928**	**1,279**	**3,865**	**912**	**125,283**			**21,234,769,256**	**63,692,756,631**

Appendix 5B: 2018 PYHSICAL USE TABLE FOR PILOT WATER ACCOUNTS, '000 cubic metres

	Agriculture (Irrigation)	Agriculture (Rainfed crop)	Agriculture (Livestock)	Agriculture (Forestry)	Agriculture (Fishing)	Crude oil and Mining	Manufacturing (Food and Beverages)	Manufacturing (Other)	Electricity	Water Supply; Sewerage and Waste Management Activities	Construction	Accommodation	Public Administration	Education	Health	Other	Households	Accumulation	Rest of the World	Flows to the environment	Total Use
(I) Sources of Abstracted Water																					
Inland Water Resources																					
Surface Water	154,876		20	3,296	26,545	13,216	6,536	8,684	1,381,799	124,226	6,228	8		66	989	78					1,727,286
Groundwater	413		3,413	15	17,247	254	164	198	177	25,987	139,569	138	15	20	74	1,445					31,538
Soil Water																					
Total	155,288		34,123	332	133,792	15,719	8,167	1,655	1,381,976	15,213	145,797	146	15	176	163	2,153					1,142,594
Other water sources																					
Collection of Precipitation		126,366,584,630	6,125,564,969	2,343,975,643						114,232,643											21,223,726,662
Total		126,366,584,630	6,125,564,969	2,343,975,643						114,232,643											21,223,726,662
Total Use of Abstracted Water	155,288	126,366,584,630	612,559,992	23,439,753,953	133,792	15,719	8,167	1,655	1,381,976	1,142,476,634	145,797	146	15	176	163	2,153					21,234,769,256
(II) Abstracted water																					
Distributed Water-NWSC			14,578			686	6,316	319	116		964	2,587	2,857	826	1,635	4,591	6,259				118,927
Distributed Water- other Water supply industry							12	6	0		22	63	4	12	13	116	2,990				3,452
For own use	155,288	126,366,584,630	612,559,992	23,439,753,953	1,337,868	15,719	8,167	1,655	1,381,976	1,142,289,542	145,793	146	15	176	163	2,153	59,713				212,317,878,949
Total	155,288	126,366,584,630	61,255,113,669	23,439,753,953	1,337,868	1,646	14,495	13,851	138,292	1,142,289,542	146,778	2,796	2,913	114	282	6,859	125,283				2,123,181,327
(III) Wastewater and reused water																					
Wastewater																					
Wastewater received from other units										13,235											13,235
Own treatment																					
Reused water																					
Distributed reused																					
Own use																					
Total										13,235											13,235
(IV) Return flows of water																					
Return flows of water to the environment																					
To inland water resources																					
Surface Water																				56,753,938	56,753,938
Groundwater																				45,275,145,589	45,275,145,589
To other sources																				86,768,634,586	86,768,634,586
Total returns flows																				182,718,819,482	182,718,819,482
(V) Evaporation of abstracted water, transpiration and water incorporated into products																				295,859,639	295,859,639
Evapotranspiration of abstracted water																					
Transpiration																					
Water incorporated into products																					
Total use	31,577	252,733,169,260	1,225,121,277	468,795,795	135,466	32,125	22,662	2,457	276,467	2,284,779,412	292,576	2,942	2,928	1,279	3,865	912	125,283			21,234,782,491	63,692,756,631