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CLIMATE FOCUS

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Uganda's Sugar Industry Wastewater Standardized Baseline

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List of Abbreviations

ABR	Anaerobic Baffle Reactor
BOD	Biochemical Oxygen Demand
BTC	Belgian Development Agency
CDM	Clean Development Mechanism
COD	Chemical Oxygen Demand
CWWTP	Conventional Wastewater Treatment Plant
DNA	Designated National Authority
DOE	Designated Operational Entity
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
EIA	Environmental Impact Assessment
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
KCC	Kampala City Council
KCCA	Kampala City Council Authority
LECB	Low Emission Capacity Building
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MWE	Ministry of Water and Environment
NAMA	Nationally Appropriate Mitigation Actions
NEMA	National Environment Management Authority
NWSC	National Water & Sewerage Corporation
PDD	Project Design Document
PoA	Programme of Activities
PE	Population Equivalents
PRC	Performance Review Committee
QA/QC	Quality Assurance/Quality Control
RUWASS	Rural Water Supply and Sanitation
SBL	Standardized Baseline
SSP	Sewage Stabilisation Ponds
TBOD	Total Biochemical Oxygen Demand
TCOD	Total Chemical Oxygen Demand
TN	Total Nitrogen
UASB	Up-flow Anaerobic Sludge Blanket
UIRI	Uganda Industrial Research Institute
UCPC	Uganda Cleaner Production Centre
UWASNET	Uganda Water and Sanitation NGO Network
UNBS	Uganda National Bureau of Standards
UNIDO	United Nations Industrial Development Organization
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organisation
WWT	Wastewater Treatment
WWTP	Wastewater Treatment Plant

1.

Executive summary

This report offers a Standardized Baseline (SBL) value for sugar industry wastewater treatment (WWT) projects in Uganda. The SBL will provide standardised parameters for the calculation of baseline emissions in methane abatement projects. An SBL is a vital tool towards reducing the transaction costs and time needed to develop a carbon emission reduction project, as well as providing a platform for international climate finance. Since an SBL has national endorsement it can also support the development of and participation in future mechanisms under the United Nation's Framework Convention on Climate Change (UNFCCC), such as Nationally Appropriate Mitigation Actions (NAMAs).

The main parameters for establishing a standardized baseline for methane recovery or avoidance in WWT are the Chemical Oxygen Demand (COD) of influent, COD removal efficiency and the volume or discharge rate of wastewater treated at each installation. The sugar industry sector has been intensively scrutinised for the availability of data for these WWT performance indicators.

For the sugar industry sector, data on influent COD (COD_{inflow}) and amount of wastewater discharged per treatment facility have been obtained from active sugar factories. The COD removal efficiency was calculated based on Uganda's national standard value for wastewater effluent (100 mg/l). Although the national effluent standard is supposed to be enforced according to the Directorate of Water Resources Management (DWRM), there is no strict legislation to penalize those facilities that surpass this value. However, for the purpose of this SBL development, the national standard value is considered as the baseline COD outflow, since this is the value all facilities should in practice match their effluent with. In addition, a CDM project must be in compliance with national environmental requirements, thus the national COD outflow value of 100mg/l shall be met by all CDM projects.

Although the data provided reflects activities within the past most recent years, they are not all covering the exact time period due to several reasons, such as interruption with sugar production and/or lab operation, server back up break down and loss of data, and lack of testing due to the installation of wastewater treatment facilities. A number of sugar factories have also only recently installed wastewater treatment facilities. Acquiring the most up to date and complete datasets from the sugar factories was therefore not always possible. Where this occurred, conservative extrapolation was employed in order to fill the data gaps.

It was also noticed that most of the stakeholders have lack of capacity in the area of methane avoidance. Testing of sugar industry wastewater quality during this assignment was neither practical nor possible due to several reasons. Challenges included a lack of response to official data collection requests, as well as the inability to test the average COD inflow and annual wastewater discharge values at only one fixed point in time. Short term or single measurement campaigns for indicators that are either expressed in annual aggregations or change by season (sugar cultivation months) is not appropriate and will not lead to a credible result. The most appropriate, credible, available and traceable manner for data collection was to acquire test results of COD_{inflow} and wastewater discharge from sugar factories' laboratories.

Despite the complexity with historic data availability in such an underrepresented sector, the final SBL result is still valid since the sector has not experienced any major changes in the past years. Furthermore, the data vintages can be considered current as they relate to the past most recent years and the available data represents around 93% of the country's total sugar production in the sector.

The sector-based SBL for the sugar industry sector is established according to the UNFCCC *Guidelines*. The visualized SBL demonstrates where the aggregated methane emission generation meets the 90% baseline threshold defined by the *Guidelines*. The calculation suggests that the Standardized Baseline for the sugar industry wastewater treatment sector in Uganda can be set at COD_{inflow} = 1,500 mg/l.

2.

Background

The Climate Change Department of the Ugandan Ministry of Water and Environment (MWE), which serves as the Uganda Designated National Authority (DNA) secretariat, is hosting a Clean Development Mechanism (CDM) Capacity Development and Projects Support Project, supported by the Belgian Development Agency (BTC). The project aims to support the identification, development, implementation, registration and monitoring of CDM projects and programmes in Uganda.

In a Standardized Baseline (SBL) stakeholder workshop organised by GIZ and held in August 2013 the WWT sector was recommended as a key sector to develop SBLs, in addition to institutional cook stoves that GIZ has since supported. It was proposed that an SBL be developed for methane destruction¹ or avoidance from municipal wastewater and another for an industrial wastewater sector with a high potential for emission reductions. The proposed SBLs would also be beneficial to any proposed Nationally Appropriate Mitigation Actions (NAMAs).

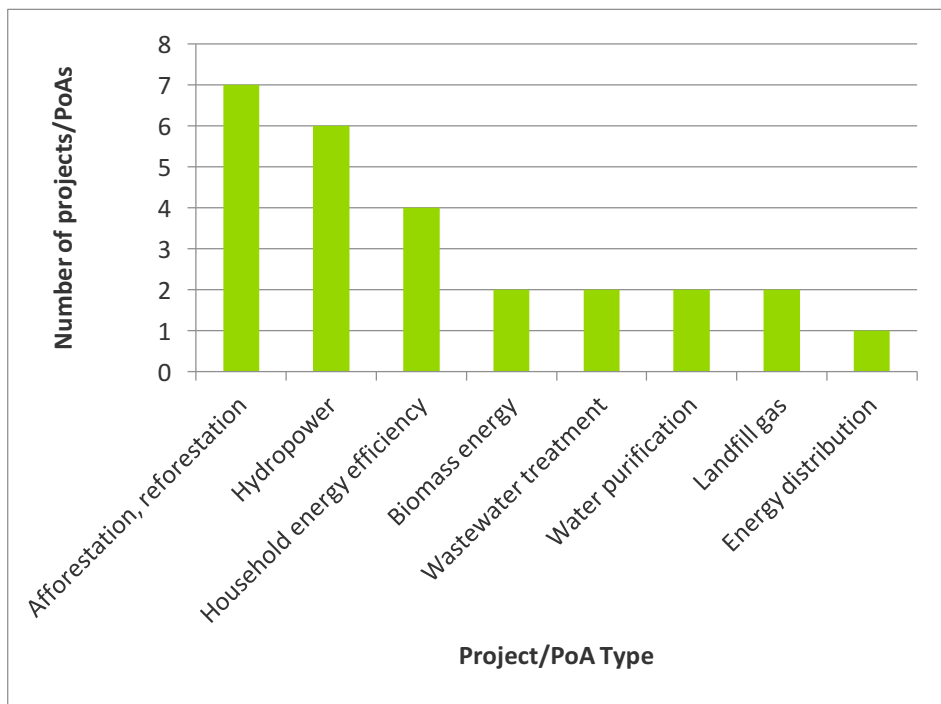
The current assignment to develop SBLs in the WWT sector contributes to this ambition. It is expected that SBLs will help to increase the number of CDM projects in Uganda. The country currently hosts 26 CDM projects/programmes across a range of sectors (Figure 1). Projects in afforestation/reforestation, hydropower and household energy efficiency are most common. There are two registered WWT projects: one focuses on methane avoidance and heat generation at the Sugar Corporation of Uganda Limited's² premises and the other involves methane capture and utilisation at Nakivubo Wastewater Treatment Plant (WWTP).³

¹ Note that methane destruction includes the recovery and re-use of any methane generated and includes all methane abatement activities.

² Entitled 'Anaerobic digestion and heat generation at Sugar Corporation of Uganda Limited'. More details available from the UNFCCC at <http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1367560620.84/view>

³ Entitled 'Nakivubo Wastewater Treatment Plant Methane Capture and Utilisation Project'. More details available from the UNFCCC at <http://cdm.unfccc.int/Projects/Validation/DB/2IA6NSZ8MXWY1RN2K16H47J74MZOY2/view.html>

Figure 1: Number of CDM projects or Programme of Activities (PoAs) in Uganda. Includes both registered projects/PoAs and those at validation. ⁴



This report is prepared following the findings from the assignment's first deliverable, "Feasibility Study for the Development of Standardized Baselines for Methane Recovery from Wastewater Treatment Projects in Uganda – January 2015". The feasibility study suggested the establishment of two SBLs, one for the municipal sector and one for the sugar industry sector. The study suggests establishing the SBLs using the sectoral approach provided in the *Guidelines for the Establishment of a sector specific standardized baseline*, hereafter referred to as the *Guidelines*,⁵ of the UNFCCC. The SBLs would be developed in combination with the CDM methodologies AMS-III.H. 'Methane recovery in wastewater treatment projects' and/or AMS-III.I. 'Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems'.

Since AMS-III-H. is the most prevalent methodology applied to wastewater treatment projects it was chosen to be the foundation for this SBL development. However, since most of the baseline indicators between AMS-III.H. and AMS-III.I. are the same, future applicants using methodology AMS-III.I. may still be able to use the approved SBL for AMS-III.H.

⁴ From the UNEP Risoe CDM Pipeline overview and PoA Pipeline overview, April 2015, available from <http://www.cdmpipeline.org/>

⁵ [Guidelines for the establishment of sector specific Standardized Baseline, Version 02.0](#)

3.

Standardized Baseline Methodology

An SBL is a single, standardized estimation of the greenhouse gases that would be emitted if a certain activity was not implemented. Determination of baseline emissions is one of the core tasks under any carbon project. SBLs are useful since they reduce the time, costs and complexity associated with project development. This is especially so when there is not enough historic data to reliably establish a baseline for the project.

3.1 Approach

The sugar industry WWT SBL can be adopted by the UNFCCC as an SBL for the CDM. As of May 2015 voluntary carbon standards such as the Verified Carbon Standard and The Gold Standard do not have any guidance on the use of SBLs.

According to the procedures for development, revision, clarification and update of standardized baselines⁶, an SBL can be developed on the basis of either an approved or a newly submitted methodology, an approved tool, and/or on the basis of the *Guidelines for the Establishment of a sector specific standardized baseline*, hereafter referred to as the *Guidelines*.⁷ The main difference between the approaches is that the tools and methodologies usually offer procedures specifically designed for the wastewater sector and widely used by non-Annex I countries for the determination of the baseline, while the *Guidelines* offer a generic methodology applicable to one or more sectors including the WWT sector. For this assignment we propose to use a method that involves the generic approach from the *Guidelines* in combination with an approved methodology designed for WWT projects.

For the development of a standardized baseline, the following elements must be defined:

- **Host country:** Determine the host country to develop a standardized baseline, mainly based on data availability;
- **Sector, output and measure:** Identify the target sectors, output and measures;

⁶ [Development, revision, clarification and update of standardized baselines, Version 4.0](#)

⁷ [Guidelines for the establishment of sector specific Standardized Baseline, Version 02.0](#)

- **Positive list and additionality:** Establish additionality criteria for the identified measures (e.g. positive lists of methane abatement technologies);
- **Data requirement:** Identify the baseline for the measures (e.g. Chemical Oxygen Demand (COD) for inflow and COD removal efficiency, volume of wastewater treated, among others);
- **Standardized baseline determination:** Determine the baseline emissions where relevant.

These are defined in the following section.

3.1.1 Host country

The selected host country is Uganda. Data availability is an important condition for standardized baseline development. The identified stakeholders in the wastewater sector (listed in Annex) have been screened on data availability. Further analysis on data availability is included in the feasibility study report that is used as a base for the preparation of this SBL document.

3.1.2 Sector, output and measure

Specific features of the standardized baseline need to be defined when following the *Guidelines*. These are sector, output and measure.

Sector: is a segment of a national economy that delivers defined output(s) (e.g. clinker manufacturing, domestic / household energy supply). The sector is characterised by the output(s) it generates; the specific sector in this standardized baseline assessment is the sugar industry wastewater treatment sector that treats industrial wastewater and sludge, and disposes wastewater and sludge with lower Chemical Oxygen Demand (COD) amounts in accordance with national standard(s), i.e. Effluent standards for wastewater in Uganda.⁸

Output: are goods or services with comparable quality, properties, and application areas (e.g. clinker, lighting, residential cooking). The output for this specific sector is treated/safer sugar industry wastewater with lower COD that meets national effluent standards and has less potential for methane emissions generation in anaerobic conditions. The output could also include captured methane gas to be either flared or used to generate power/heat. Therefore depending on the wastewater treatment technology, the output could be as well electricity and/or heat.

Measure: For emission reduction activities, a broad class of greenhouse gas emission reduction activities possessing common features exists. Four types of measures are currently covered by the standardized baseline framework:

- Fuel and feedstock switch;
- Switch of technology with or without change of energy source (including energy efficiency improvement);
- Methane destruction;
- Methane formation avoidance.

⁸ The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, S.I. No 5/1999

The measures for this assessment are defined as “Methane destruction”. Methane destruction includes all types of technologies that abate methane emissions through control, capture and destruction of methane in the wastewater treatment facilities (i.e. AMS-III.H.). Methane destruction can take place in a methane flare facility or in power and/or heat generation systems. Applicable methodologies are further discussed under “Data requirements” section.

3.1.3 Positive list and additionality

A positive list defines a set of criteria that allows any project with a technology that fits into those criteria to be considered as additional. As a rule of thumb, those projects that abate methane in accordance with national legal mandates and requirements cannot be deemed as additional and thus cannot be included in the positive list in the SBL document. Those projects within the WWT sector that act beyond the baseline and national legal mandates and requirements can be divided into two main categories:

- Category I: Projects that control, capture and destruct methane through flare systems;
- Category II: Projects that capture and destruct methane through power and/or heat generation;

Under the additionality guidelines⁹ (and after fulfilling basic additionality checks such as the CDM prior consideration test) category I projects automatically qualify as additional and can be included in the positive list. This is due to the fact that methane formation avoidance and/or methane capture and destruction through flare systems do not bring any additional income to the project proponent without the CDM. The only income for such projects is known to be the revenue from selling the carbon credits.

Additionality of category II projects is assessed using the additionality tool and the result is dependent on the size of the power/heat generator as well as the local power tariff or cost of the fuel that is displaced. Our review of the wastewater treatment projects applying AMS-III.H. shows that power generators in WWT facilities cannot be of large capacity. In most cases they are less than 5 MW in capacity and almost all were deemed as additional through investment analysis.¹⁰ In addition, according to the methodological tool “Demonstrating additionality of microscale project activities”¹¹, if a wastewater treatment project is in a Least Developed Country (LDC) and reduces less than 20,000 tCO₂/yr under the Type III methodology (e.g. AMS-III.H.) and includes a power generation unit of less than 5MW capacity, it can be deemed as additional. Therefore our suggestion will be to consider these types of projects as automatically additional as well.

The *Guidelines* state that “If the level of methane destruction undertaken by a measure is higher than what is mandatory and enforced in the area defined under paragraph 34 above, then that measure of methane destruction is

⁹ [Guidelines on the Demonstration of Additionality of Small-Scale Project Activities](#)

¹⁰ Review of wastewater treatment systems available on UNEP DTU pipeline database, last visited 10 October 2015.

¹¹ [Demonstrating additionality of microscale project activities, version 06.0](#)

additional" (paragraph 36). This means that the *Guidelines* already offer more lenient criteria for methane abatement projects within the wastewater treatment sector.

Methodological analysis

Besides the above assessment, the latest version of methodology AMS-III.H. "Methane recovery in wastewater treatment --- Version 17.0"¹² has recently included additional notes on automatic additionality.

It states that projects using the methodology may be deemed as additional if they can demonstrate that:

- a. The existing treatment system is an anaerobic lagoon and waste water discharged meets the host country legislation; and
- b. There is no regulation in the host country, applicable to the project site that requires the management of biogas from domestic, industrial and agricultural sites;

However, the methodology also states that the above conditions do not apply to greenfield projects (a greenfield project is a new project that involves the implementation of a new waste water treatment facility). Greenfield projects may still demonstrate their additionality using the latest version of approved additionality tools.

For project activities applying AMS-III.H in combination with a Type I methodology, which has an energy component whose installed capacity is less than 5MW, the procedure for additionality demonstration also applies to that component.

This simplified additionality procedure under AMS-III.H. is valid for three years from the date of entry into force of Version 17.0 of AMS-III.H. (i.e. 28 November 2017).

Conclusion

Following the *Guidelines*, and according to the simplified additionality procedures indicated in the latest version of AMS-III.H. explained above, the positive list under this SBL document can be summarized as follows:

According to the microscale additionality tool, *Guidelines*, and AMS-III.H., all projects within the sugar industry wastewater treatment in Uganda can be automatically be deemed additional if the existing treatment is an anaerobic lagoon and the wastewater discharged meets the host country legislation, or if the project reduces less than 20,000 tCO₂/yr under AMS-III.H., with a power generation capacity of less than 5MW. The following table summarizes the suggested positive list under this SBL document.

Table 1. Positive list additionality conditions for the sugar industry wastewater SBL

¹² [AMS-III.H. "Methane recovery in wastewater treatment --- Version 17.0"](#)

POSITIVE LIST	LEGAL REQUIREMENTS	GHG MITIGATION CAPACITY	TECHNICAL CAPACITY	OTHER RELEVANT ISSUES
The existing treatment system is an anaerobic lagoon and the waste water discharged meets the host country legislation	There is no regulation in the host country that requires the management of biogas from domestic, industrial and agricultural sites. The CDM project however, shall follow national standards in regards to the COD effluent.	Total GHG mitigation capacity of the project under the methane abatement methodology shall be below 60k CO ₂ per year.	Projects (with power/heat generation units) shall be below 5MW (power load). ¹³	According to AMS-III.H., Greenfield projects are exempt from the SBL positive list (they may still demonstrate additionality through other additionality tools, e.g. microscale additionality tool)
All other projects using AMS-III.H., that meet other applicability and eligibility criteria under AMS-III.H. and that destruct methane through a flare system.	There is no regulation in the host country that requires the management of biogas from domestic, industrial and agricultural sites. The CDM project however, shall follow national standards in regards to the COD effluent.	Total GHG mitigation capacity of the project under the methane abatement methodology shall be below 60k CO ₂ per year.	n/a	n/a
All wastewater treatment projects in Uganda that reduce less than 20,000 tCO ₂ /yr under AMS-III.H. are considered as automatically additional according to the Microscale additionality tool (version 6). If the project includes a power generation component of less than 5MW capacity, that component can also be deemed as additional.	The CDM project however, shall follow national standards in regards to the COD effluent.	Total GHG mitigation capacity of the project under the methodology shall be below 20k CO ₂ per year.	Projects with power generation component can also be deemed additional as long as the power generation capacity is below 5MW.	Greenfield projects may also be included in this category of positive list under this SBL.

The additionality criteria is developed as part of the development of the SBL and will be assessed by a Designated Operational Entity (DOE) and the UNFCCC Secretariat prior to approval of the SBL.

¹³ For project activities applying the AMS-III.H. methodology in combination with a Type I methodology, which has an energy component whose installed capacity is less than 5MW.

3.1.4 Data requirements

To determine the methane generated in the sugar industry WWT systems, specific methodological approaches and equations are required. Paragraph 38 of the *Guidelines* refers to monitoring practices for the determination of baseline emissions: “*Baseline emissions may be determined based on the monitoring of the actual amount of methane captured*”, this requires the use of approved methodologies in combination with the *Guidelines*. For the establishment of the SBL for the sugar industry wastewater sector in Uganda a combination of the most suitable methodologies and the *Guidelines* is proposed.

The AMS-III.H. methodology allows the application of different baseline scenarios and offers a straight forward approach for the calculation of baseline emissions. It is crucial in any SBL development to identify the exact parameters that the proposed SBL is going to replace in a methodology.

Table 2 presents different sources of baseline emissions in a WWT system based on methodologies AMS-III.H. and AMS-III.I., and the possibilities for SBL development for each emission source and parameter.

Table 2. Sources of baseline emissions according to AMS-III.H.

BASILINE SOURCE	PARAMETER	FIXED PARAMETERS	PARAMETERS TO BE DETERMINED	RELEVANCE TO SBL DEVELOPMENT
Baseline emissions of the wastewater treatment system	$BE_{ww.treatment}$	Methane Conversion Factor (MCF= IPCC values as per Table III.H.1 of AMS-III.H.);	Chemical Oxygen Demand of wastewater inflow (COD_{inflow})	By determining the COD_{inflow} , η_{COD} can also be standardised per m^3 of wastewater inflow.
		Methane Producing Capacity ($B_0=0.25 \text{ kg CH}_4/\text{kg COD}$);	COD removal efficiency of the baseline system (η_{COD})	The reason only COD_{inflow} is needed here is because there is an established national standard for wastewater effluent COD
		Model Correction Factor (UF=0.89);		($COD_{outflow}$) in Uganda set at 100mg/l. Since any potential CDM project must be in compliance with national environmental requirements, it must be assumed that the baseline $COD_{outflow}$ for all wastewater treatment projects in Uganda is 100mg/l. This is conservative since the treatment facilities can have effluents below 100mg/l as well.
		Global Warming Potential (GWP=25)		Thus η_{COD} can be calculated once the

BASELINE SOURCE	PARAMETER	FIXED PARAMETERS	PARAMETERS TO BE DETERMINED	RELEVANCE TO SBL DEVELOPMENT
Baseline emissions of the sludge treatment system	$BE_{s,treatment}$	<p>Methane Conversion Factor (MCF= IPCC values as per Table III.H.1 of AMS-III.H.);</p> <p>Degradable Organic Content ($DOC_s=0.5$ for domestic sludge and 0.25 for industrial sludge)</p> <p>Model Correction Factor ($UF=0.89$);</p> <p>Fraction of DOC dissimilated to biogas ($DOC_F=0.5$)</p> <p>Fraction of CH_4 in biogas ($F=0.5$)</p> <p>Global Warming Potential (GWP=25)</p>	None	<p>COD_{inflow} data is available.</p> <p>Not relevant for SBL development. This source of emissions can be directly calculated at the project stage with no significant effort as there is no unknown parameter to be determined;</p>
Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake	$BE_{ww,discharge}$	<p>Methane Conversion Factor (MCF= IPCC values as per Table III.H.1 of AMS-III.H.);</p> <p>Methane Producing Capacity ($B_o=0.25$ kg CH_4/kg COD);</p> <p>Model Correction Factor ($UF=0.89$);</p> <p>Global Warming Potential (GWP=25)</p>	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake (COD _{ww, discharge})	<p>Not relevant for SBL development. Uganda regulates the quality of discharged wastewater after treatment e.g. the National Environment Regulations, S.I. No 5/1999 sets the discharge quality standard at COD_{outflow}=100 mg/l, thus this value shall be selected as the baseline COD discharge. Moreover, this parameter can be largely dependent on the type of wastewater flow and the treatment system and can vary significantly even in one sector.</p>
Baseline methane emissions from anaerobic decay of the final sludge produced	$BE_{s,final}$	Methane Conversion Factor (MCF= default as per "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site")	None	Not relevant for SBL development. There is no unknown parameter to be determined.

BASELINE SOURCE	PARAMETER	FIXED PARAMETERS	PARAMETERS TO BE DETERMINED	RELEVANCE TO SBL DEVELOPMENT
		Degradable Organic Content (DOC _s =0.5 for domestic sludge and 0.25 for industrial sludge)		
		Model Correction Factor (UF=0.89);		
		Fraction of DOC dissimilated to biogas (DOC _F = 0.5)		
		Fraction of CH ₄ in biogas (F=0.5)		
		Global Warming Potential (GWP=25)		
Baseline emissions from electricity or fuel consumption	BE_{power}	Baseline emissions from electricity and fossil fuel consumption shall be determined as per the procedures described in the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” and “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion”	This source of emissions is related to the amount of fossil fuel and/or electricity consumption at the facility. This can be measured directly through fuel invoices and/or power bills and cannot be standardised as it may vary significantly per practice depending on the upper stream sector type.	Not relevant for SBL development. This source of emissions can be directly calculated at the project stage with no significant effort.

According to the above analysis, the most crucial parameters are those used to determine the baseline emissions for wastewater treatment. These are the chemical oxygen demand inflow (COD_{inflow}) and the COD removal efficiency (η_{COD}). Among these parameters η_{COD} can be calculated once the COD_{inflow} data is available. This is because COD_{outflow} for Uganda can be set at 100mg/l as regulated through national standard and taking into consideration that any CDM project shall comply with national environmental requirements. Having both COD_{inflow} and COD_{outflow} will allow us to calculate the removal efficiency (η_{COD}) rather easily.

In addition to COD_{inflow} and η_{COD} , for the SBL distribution modelling the annual wastewater discharge (m³/yr) per sugar facility is required as well.

Data collection process

The data collection process for the establishment of the SBLs, shall follow the guidelines on quality assurance and quality control (QA/QC) of data used in the establishment of standardized baselines, version 2.0.¹⁴ In order to facilitate the data collection effort and assure that all QA/QC aspects in accordance to the

¹⁴ [Quality assurance and quality control of data used in the establishment of standardized baselines, version 2.0](#)

above guidelines is taken into consideration, the DNA of Uganda has prepared a QA/QC protocol that is attached to this report as Annex IV.

The protocol includes necessary instructions and provisions that need to be considered during data collection. The protocol also provides a data collection template that will be used by responsible parties during their data collection process.

3.1.5 Standardized baseline determination

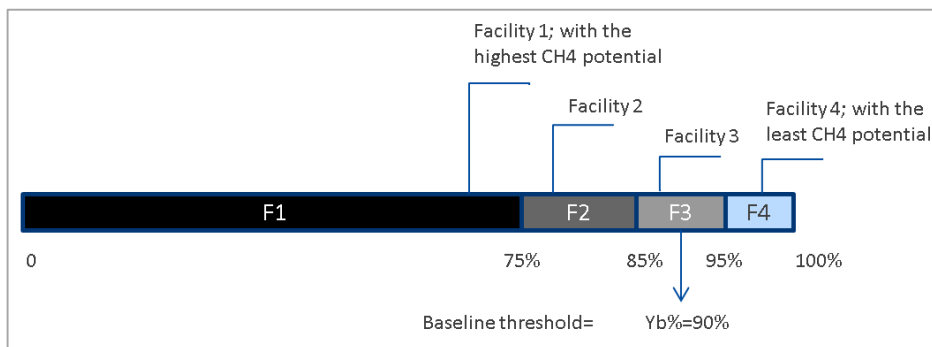
According to the analysis above and the *Guidelines*, in order to determine a standardized baseline for the sugar industry WWT sector using AMS-III.H., the following parameters need to be determined:

1. Chemical Oxygen Demand inflow (COD_{inflow}); and
2. COD removal efficiency (η_{COD}); Computable based on COD_{inflow} and the national standard value set for $COD_{outflow}$ at 100mg/l.
3. Wastewater discharge per sugar factory premises (this will be used to produce a distribution bar in accordance with the sector based SBL guidelines)

Since the purpose of this assignment is to define a national standardized baseline for the sugar industry sector, it is necessary to use a sectoral approach when determining values for the above parameters that can represent the entire sugar industry sector. In order to achieve this, the *Guidelines* offer a generic approach for the determination of a baseline indicator for a sector.

Under this approach treatment facilities (i.e. sugar WWT lagoons) from the same sector (e.g. sugar processing premises) are arranged in descending order of methane generation potential per litre of wastewater treated (e.g. COD removal efficiency higher to lower). Figure 2 illustrates the facility with the highest methane generation potential arranged on the far left, whilst the lowest methane generation potential is arranged on the far right. The width of the bars, or percentage indicators, illustrate the aggregated methane generation potential per year (e.g. total removed COD per year in tons) for a particular facility in the sector.

Figure 2. Determination of the baseline per sector. CH₄ = methane; Yb% = the baseline threshold



The *Guidelines* set the baseline threshold at 90% of the aggregated volume of wastewater, illustrated as Yb% in Figure 2.¹⁵ By using this approach, 90% of

¹⁵ The Guidelines set the Yb equal to 90% for sectors other than "Energy for household; Energy generation in isolated systems; and Agriculture".

the facilities using the baseline will have higher baseline emissions than the SBL. This means that the SBL is relatively conservative, and in our opinion should be voluntary for use. Only 10% of the facilities using the SBL would have lower baseline emissions than the determined SBL.

In the example in Figure 2, Facility F1, which is the most methane emission intensive, comprises 75% of the wastewater generation in the sector. Facilities F2 and F3, each generate 10% of the total wastewater and, together with facility F1, generate 85% and 95% of the total wastewater in the sector. This is more than the baseline (Y_b) thresholds of 90%. Therefore, the baseline emissions of facility F3 is determined as the baseline for the sector in the example above.

4.

Standardized Baseline Result

The SBL for the sugar industry sector in Uganda was calculated following the approach explained in the previous chapter and availability of required data from the sugar factory premises.

Data collection

According to AMS-III.H. (version 17.0, paragraph 38), in determining baseline emissions historical records of at least one year prior to the project implementation shall be used. Project implementation date here is unknown for future wastewater treatment projects, but we consider the SBL development as an appropriate benchmark.

QA/QC and data gap

The data provided reflect facilities' performance within the most recent years. However, the data does not cover the exact same time period or vintage due to several reasons., such as interruption in sugar production and/or lab operation, server back up break down and loss of data and/or in testing due to the installation of new wastewater treatment facilities. In addition, some sugar factories have only recently installed wastewater treatment facilities. Acquiring the most up to date and complete datasets from the sugar factories was not always possible, in such cases where appropriate, conservative extrapolation method has been used in order to fill the gaps.

It was also noticed that most of the stakeholders have lack of capacity in the area of methane avoidance techniques and its relevance to climate change impacts. Testing of sugar industry wastewater features during this assignment was neither practical nor possible due to several reasons. Challenges included a lack of response to official data collection requests, as well as the inability to test the average COD inflow and annual wastewater discharge of the premises at only one fixed point in time. Short term or single measurement campaigns for indicators that are either expressed in annual aggregations or change by season (sugar cultivation fluctuates per month) is not appropriate and will not lead to a credible result nor a value that can appropriately represent the sector as a whole. The most appropriate, credible, available and traceable manner for data collection was to acquire test results of COD_{inflow} and wastewater discharge from sugar factories' laboratories.

Despite the complexity the consultants faced with historic data availability in such an underrepresented sector, the authors believe the final SBL result is still valid as the very first SBL since the sector has not experienced any major

changes in the past years. Furthermore, the data vintages can be considered current as they relate to the past most recent years in accordance with the methodology, were available/credible and received directly from the sugar factories that represent around 93% of the country's total sugar production. In cases where no data was provided from a sugar factory, conservative assumptions have been used for SBL establishment.

To fill any data gaps, information was extrapolated using the most conservative figures identified among all other sugar factories. These values are shown as blue figures in [Table 3](#).

In order to assure that future updates and renewal efforts for the SBLs will be supported by further complete and credible data, the DNA of Uganda has prepared a QA/QC protocol in order to set up an appropriate and credible structure for data collection efforts. This way it will be ensured that in future SBL updates data gaps will be completely avoided or minimized. The QA/QC protocol can be found in Annexes of this report.

Summary of results

The data provided by the active sugar factory premises and the result of the SBL calculations in accordance with the *Guidelines* explained in the previous chapter are summarised in [Table 3](#). The data presented in columns 1 – 4 were provided by the sugar factories, while columns 5 – 7 contain data that was calculated for the purpose of determining the SBL for the sugar industry sector.

Table 3. Sugar industry SBL data and calculation result

1.Sugar processing facility (data vintage)	2.Market share	3.Wastewater discharge (m ³ /yr)	4.COD in (mg/l)	5.COD removal eff.	6.COD removal per year (Kg)	7.Share in methane emissions in the sector (%)
Kakira Sugar at Jinja (2012, 2013 and 2015)	42.00%	544,838	1,761	94.32%	904,810	32.46%
Kinyara Sugar Works Limited at Masindi (2012-2014)	28.00%	250,100	2,739	96.35%	660,042	23.68%
Sugar Corporation of Uganda Ltd (SCOUL) at Lugazi (2014 and 2015)	17.00%	114,000	8,194	98.8%	922,719	33.10%
Sugar and Allied Industries-Kaliro (2013-2014)	5.00%	95,000 ¹⁶	1,500	93.33%	133,000	4.77%

¹⁶ The extrapolated discharge values are calculated based on the maximum possible discharge for a sugar factory based on the data available from other sugar factories. This is conservative as it will increase the contribution of

1.Sugar processing facility (data vintage)	2.Market share	3.Wastewater discharge (m ³ /yr)	4.COD in (mg/l)	5.COD removal eff.	6.COD removal per year (Kg)	7.Share in methane emissions in the sector (%)
Sango-Bay Sugar Estates Ltd	Not active anymore					
Mayuge Sugar Industries Limited at Mayuge Uganda (no data)	5.00%	95,000	1,200 ¹⁷	91.67%	104,500	3.75%
GM Sugar (2014)	1%	19,000	1,200	91.67%	20,900	0.75%
Kamuli (no data)	1%	19,000.00	1,200	91.67%	20,900	0.75%
Sezibwa (no data)	1%	19,000.00	1,200	91.67%	20,900	0.75%

Columns 5 to 7 contain crucial data needed to establish an SBL for the sugar industry sector in Uganda as explained in the previous chapter. The COD removal potential (column 5) is based on the COD_{outflow} set by the national standards in Uganda (COD_{outflow} = 100 mg/l). The column represents the WWT facilities' COD removal efficiency from the highest (most polluting potential) to the lowest (least polluting potential).

The COD removal per year, in kilograms, (column 6) has been calculated using the COD removal efficiency and the wastewater discharge rate per WWT facility. It presents the annual COD removal potential per facility. The share in methane emission potential in the sector (column 7) presents the contribution of each facility in annual methane emissions generated in the sector.

Figure 3 shows the sector-based SBL establishment according to the *Guidelines*. The graph demonstrates where the aggregated methane emission generation meets the 90% baseline threshold defined by the *Guidelines*. The data derived from the figure is presented in **Table 4**.

The calculation and the graph suggests that the Standardized Baseline for the sugar industry wastewater sector in Uganda can be set at COD_{inflow} = 1,500 mg/l.

Applicability and project types

This SBL does not overrule any sections including applicability and eligibility criteria set by the methodology AMS-III.H. The result of this SBL (baseline COD_{inflow}) can only be used to replace the baseline COD_{inflow} of the prospective CDM projects only if they comply with the methodology in all relevant aspects including checks on applicability and eligibility.

Hence, as far as it is related to this SBL, any sugar factory in Uganda who would like to participate as a CDM project and control/destroy methane from its wastewater treatment facility via the application of AMS-III.H. is welcome to use the outcome of this SBL document. All checks in regards to the applicability and

this small factory in the SBL distribution bar, while its COD inflow value is relatively low compared to major sugar producers.

¹⁷ The extrapolated COD inflow value for the sugar factories who did not submit any data was calculated in a conservative manner by using the most conservative COD inflow value identified among other sugar factories.

eligibility under AMS-III.H. has to be carried out separately per project and this SBL document does not set any additional applicability/eligibility rules as far as it is related to the baseline application (COD_{inflow}).

Figure 3. Sector based determination
of SBL for the sugar industry
wastewater sector in Uganda

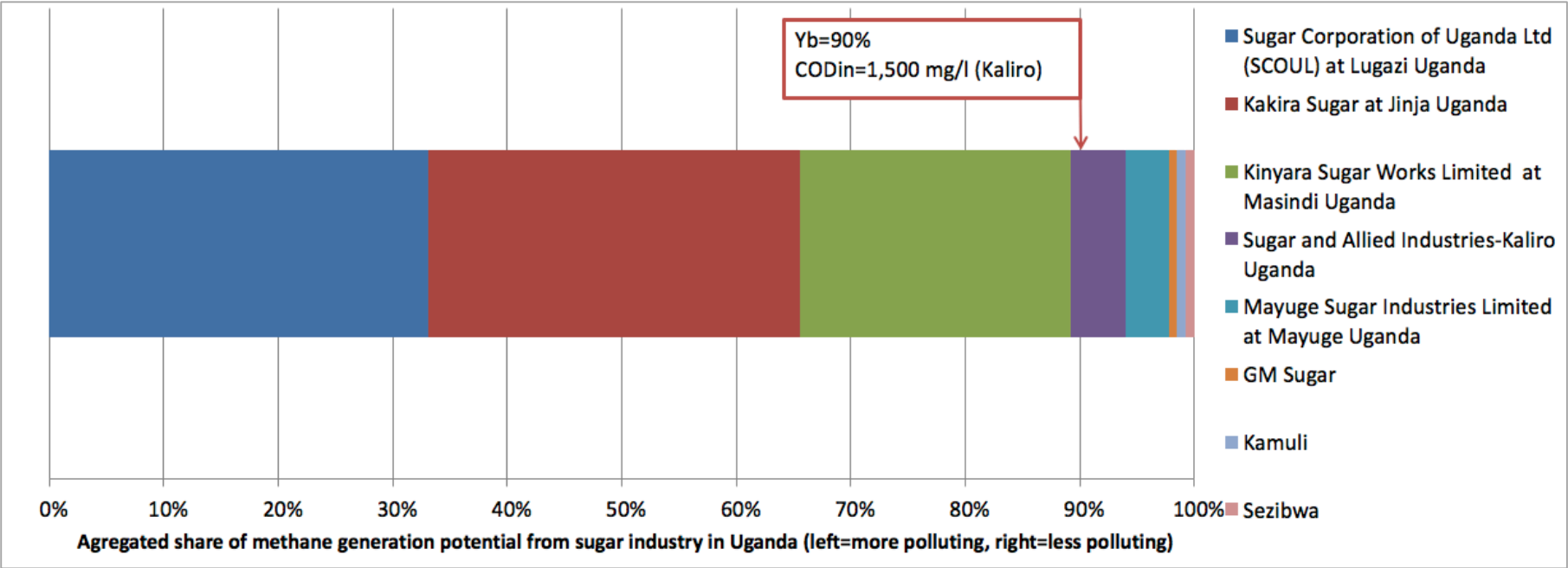


Table 4. SBL result for the sugar industry wastewater sector in Uganda

1.Sugar processing facility	2.Market share	3.Wastewater discharge (m ³ /yr)	4.COD in (mg/l)	5.COD removal eff.	6.COD removal per year (Kg)	7.Share in methane emissions in the sector (%)
Sugar and Allied Industries-Kaliro Uganda	5%	95,000	1,500	93.3%	133,000	4.77%

5.

Next steps

The procedure for development of an SBL¹⁸ includes proposing an SBL via the Form '*Proposed standardized baseline submission form*' (Version 2.0)¹⁹. Once this is completed, a Designated Operational Entity (DOE) needs to be hired to assess the SBL. The '*Procedure for development, revision, clarification and update of standardized baselines*' allows countries with 10 or fewer registered CDM projects as of 31 December 2010 to forgo this step for the first three SBL submissions. Thus far, Uganda has submitted three SBLs. Therefore, a DOE was hired as an independent third party to assess the wastewater SBLs. The DOE's site visit for the assessment of the SBL took place between 26-28 August 2015 and it involved meeting with the BTC, CCD representative (DNA of Uganda) and interviews with several stakeholders in the sector. The meetings focused on investigating issues in relation to data collection and QA/QC procedures, followed by an exchange of comments and responses between the consultants and the DOE. The final assessment report is expected to be issued by the DOE by the end of November 2015.

Once all comments from the DOE have been addressed, the Ugandan DNA may approve the SBL and submit the completed Form to the UNFCCC CDM website, including any additional supporting documentation such as data used to establish the baseline and a Letter of Approval. No fee is payable for the submission of the SBL.

The UNFCCC Secretariat will then perform an initial assessment of the submitted documents and provide feedback to the DNA if any additional documentation/evidence is required. If all comments are addressed satisfactorily, the Secretariat will approve the SBL and list it on their website. After this, projects are free to apply the SBL as long as the document is valid. According to the current UNFCCC procedures, SBLs need to be updated and approved every three years.

¹⁸ As per the '*Procedure: Development, revision, clarification and update of standardized baselines*' (Version 4.0)

¹⁹ Available from https://cdm.unfccc.int/Reference/PDDs_Forms/index.html#sbs

6

Annexes

6.1 Annex I: Key stakeholders

The main players in the wastewater treatment sector are summarised in the table below. Information presented is based on the interviews held with each organisation, and further investigation during the stakeholder identification site visit held early August 2014 in Kampala.

The list of specific sugar factories investigated during this SBL development is presented after the below stakeholder list.

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
Makerere University	Carrying out academic research mainly in the field of faecal sludge. E.g. using faecal sludge as a source of renewable fuel replacing fossil fuel.	Makerere University has been involved in several wastewater and sludge application research. Some of their data sources may be useful to the current assignment.
Sugar Corporation of Uganda Limited (Lugazi Sugar)	The independent sugar processing industry has no direct role in the wastewater treatment sector apart from their independent treatment facility, which is privately managed. However, this corporation has the only wastewater treatment system that is registered as a CDM project under the UNFCCC. It captures methane in anaerobic conditions and generates renewable heat for sugar processing. Prior to the CDM project, this was sourced from fossil fuels. The project generates up to 46,000 tCO ₂ reductions per year.	Some of the wastewater technical features used in the CDM Project Design Document (PDD) of this project might become useful when focusing on a specific industrial sub-sector for the feasibility study. These parameters are COD inflow and COD removal efficiency of the baseline treatment system as well as the treatment type of sludge in the baseline.
National Water and Sewerage Corporation (NWSC)	The NWSC was created as a government-owned parastatal organization in 1972 under the national administration of Idi Amin Dada, serving only the capital Kampala as well as Entebbe and Jinja. Subsequently its service area grew to incorporate large and mid-sized towns all over Uganda, reaching a total of 40	All new WWT designs could potentially have renewable energy components through anaerobic lagoons and methane capture systems. The old conventional wastewater treatment facilities do not have such options. There are only two conventional wastewater systems (incl. mechanical, biological,

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
	<p>cities and towns in 2014. In 1995 and 2000, it was reorganised under the NWSC Statute and NWSC Act, giving it substantial operational autonomy and the mandate to operate and provide water and sewerage in areas entrusted to it, on a sound, commercial, and viable basis.</p> <p>There is no independent economic regulatory body for water supply. Tariffs are proposed by NWSC and need to be approved by MWE. NWSC is regulated according to a performance contract with the national government. The Performance Review Committee (PRC) under the MWE reviews the performance of NWSC according to the contract. However, the PRC is partly financed by the NWSC, which may stand in conflict with the full independency of the committee.</p> <p>NWSC regulates its local branch offices through internal contracts that are monitored by its internal monitoring and regulation department. NWSC evaluates and monitors performances of private units responsible for management of WWT in major towns outside Kampala. The water quality department of NWSC monitors the WWT process and provides advice to the management of the WWT facilities. In addition, NWSC has data for municipal WWT parameters (CODs & BODs inflows and outflows) from 2005-2009. However, current data on municipal and industrial waste influent and effluents codes could be available with UCPC.</p>	<p>chemical etc., treatments in Kampala and Masaka, while the entire WWT systems in major towns under NWSC have waste stabilisation ponds that have no or little potential to generate methane emissions in the baseline scenario according to NWSC.</p> <p>Available data on essential parameters shall be availed base on official requests to the management).</p> <p>Given the amount of waste produced and close proximity of the breweries and abattoir to the BSTP, the potential of the three waste types to produce biogas for energy production makes a lot of sense. Based on this background, the different proportions of the three types of waste have been tested for biogas production.</p> <p>NWSC proposed to construct a new sewage treatment plant at Bugolobi. The study carried out may provide an insight into the biogas production potential for optimization and correct projections of the energy production from the new plant, therefore the SBL will offer an added bench mark in the calculations of the green gas emission levels and potential for methane recovery.</p>
<p>Directorate of Water Resources Management (DWRM)</p>	<p>The roles of DWRM can be briefed as following:</p> <ul style="list-style-type: none"> - Water quality testing: Laboratory testing and analysis of water and wastewater samples for internal purposes and provision of additional services at costs to the public (COD tests: UGX 16,000-30,000 per each WW sample). - Water Resources: Carries out assessments of water quantities (ground and surface water) - WR Regulation and planning: uses data from the 2 departments to regulate usage, abstractions and discharges. - Ground and surface water is regulated through issuance of permits, incl. drilling & construction permits (hydropower etc.) renewable yearly. 	<p>The national standard/regulation against which the tested effluent is compared is an appropriate benchmark to set the baseline for COD outflow. Since the law does not allow enterprises to have a COD outflow above the assigned benchmark, this can be already considered as an appropriate baseline COD outflow. DWRM has informed us that the allowed COD outflow is 100ppm and all tested effluents are compared with this figure for their compliance check.</p>

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
	<ul style="list-style-type: none"> - DWRM issues wastewater discharge permits according to the defined discharge parameters standards. - DWRM currently have BOD discharge parameters only and plan to include heavy metals and CODs etc., according to the discharge regulations under review. - DWRM has limited access to client's premises and in addition encounter weakness to enforcements on the pretext that the laws require proof beyond reasonable doubts. DWRM has round table dialogues as a means to instigate improvement in performance. In addition DWRM restricts issuance and renewal of permits in the event of non- compliance. - DWRM conducts on-spot monitoring and spot checks as well as self-monitoring of the zonal water management (Mbale, Lira, Kasese, Masaka etc.). <p>In brief, DWRM is in charge of permit issuance for business holders and factories that generate effluent with disposal to the environment. DWRM holds regular sampling and test of enterprises' effluent and compares it with national standards and regulations. The purpose is to ensure the validity of the issued permits. In case of non-compliance DWRM takes action against the enterprise through the Ministry channels. DWRM has informed us that they have no specific information of the wastewater treatment systems in the sector as they are only interested in wastewater outflow features such as COD outflow that they test regularly. This is due to the fact that the role of DWRM is to make sure the enterprises are in compliance with environmental regulations when it comes to wastewater disposal to environment. The most common type of wastewater/sludge treatment systems available in the sector are conventional treatments systems and wastewater stabilization ponds (lagoons) and complex systems with the breweries depending on the products of the factories etc.</p>	
GIZ Kampala / Reform of the Urban Water and Sanitation Sector (RUWASS)	GIZ has been involved in the assessment of Operation, Maintenance and Performance of the NWSW Sewerage Ponds outside Kampala. We were informed by Fredrick that GIZ has no further information for this assignment besides this specific assessment report that was shared. Despite follow ups and	Besides some relevant information in regards to stabilisation ponds for municipal wastewater outside of Kampala including some figures on COD inflow and COD removal efficiency, no further information may be found through GIZ.

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
Directorate of Water Development (DWD)	setting a fixed appointment we were not able to meet up with Fredrick after all.	
	The DWD under the MWE acts as the executive arm and provides support to local governments and other service providers. The DWD is expected to monitor the quality of drinking water provided by NWSC. However, in practice NWSC monitors its drinking water quality internally without any complementary external monitoring. NWSC's internal Quality Control Department examines whether the supplied water complies with the national standards for drinking water, which in turn follows the World Health Organization guidelines.	The applied national standards and regulations for wastewater can be considered as baseline for effluents or wastewater outflow. The relevance for this assignment is that the effluent requirement can be set equal to the COD outflow that can be used to calculate the COD removal efficiency per sub-sector (in case we can get hold of COD inflow data per sub-sector).
	The role of DWD is to develop infrastructures and required regulations standards and policy for water and wastewater projects. DWD is not directly involved in sampling and testing of wastewater quality but supports the DWRM with specific requirements including national standards and applied regulations and policy in the sector.	
National Environment Management Authority (NEMA)	DWD is also responsible for development of policies, standards for water supply systems and WWT and sanitation infrastructures, as well as conduct monitoring and supervisions, strategic planning and resources mobilization in the sector whereas NWSC is solely responsible for implementations and manage over 90% of the WWT systems in large towns and have information on designs and operation and maintenance of the systems. On the other hand, the local governments (LGs) are responsible for those towns and municipalities that do not have sewerage systems but on-site sanitation technologies.	
	NEMA is the ultimate authority in endorsing project activities by assessing their environmental impacts including their wastewater effluents. Projects need to apply for an environmental certificate before they can run their business and operate. Environmental Impact Assessment is one of the main requirements for NEMA to decide on issuing such certificates. As soon as the certificate is issued the wastewater effluent quality is regularly checked by the Directorate of Water Resources Monument (DWRM)	As projects need to submit all their operation and performance documents including wastewater treatment designs to NEMA, the entity is in possession of technical details of wastewater inflow and outflow data including COD inflow and COD removal efficiency for different industrial sector. This information is crucial for the development of SBL. NEMA cooperatively promised to provide the requested data and information. NEMA preliminary suggested that sugar industry and breweries in Uganda have the highest

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
	based in Entebbe to assure that the projects meet the national wastewater standards. If approved the DWRM issues a permit that extends their environmental certificates and allow the projects to resume their operation.	potential for methane generation in the baseline scenario thus appropriate sectors to assess further. However, we will assess more industrial sub-sectors before concluding a specific sector for SBL development for industry.
Uganda Manufacturers Association (UMA)	Despite our contact the meeting was not confirmed during the visit to Kampala end of July 2014. Further follow up may be made, in the event that information gap exists. Through our other interviews it was apparent that UMA will not have detail data and information on wastewater inflow and treatment systems.	It was learnt that UMA is more concern with the finished products from the industries and may have very little or no information about the industrial wastes data managements, which may be of little relevance to the SBL development.
Uganda Water and Sanitation NGO Network (UWASNET)	We were told that this organisation is active in water supply systems. The organisation showed interest in the meeting but despite of several follow ups, they did not confirm to set up any meeting. In addition, focal person of the network expressed further interest for the meeting, but would require time to sanction the meeting with the technical individuals relevant to the meeting who resides and operate from their office outside Kampala. The group leader would be informed and the meeting in question may be arranged at a later stage when deemed necessary.	Uganda Water and Sanitation NGO Network (UWASNET) is the national umbrella organisation for Civil Society Organisations (CSOs) in the Water and Environment sector. UWASNET is crucial in helping government realise its targets of alleviating poverty and achieving Millennium Development Goals (MDGs) through universal access to safe, sustainable water and improved sanitation. UWASNET plays this vital role in partnership with other key sector players such as the Government of Uganda, Development Partners (DP's) and the private sector. UWASNET role appears to be limited to provision and access to water and or improvement of sanitation and no major role in industrial/municipal wastewater management sector except sanitation and faecal sludge elements in small towns as well as involvement in Private Public Sector Partnerships.
World Bank - National Sanitation Working Group (NSWG)	We were told through NWSC that the role of the NSWG is to support policy development, advocate and lobby for sanitation and hygiene in national plans and funding, and support the coordination of institutions and activities for improved sanitation and hygiene services throughout the country.	Not much relevance to the assignment as the sanitation topic is mainly concentrated in domestic sanitation and hygiene. Not much data/information can be found relevance to this assignment. Most of the data and information can be obtained through NWSC (for municipal WWT) and NEMA and UCPC (for industrial WWT).
Uganda Cleaner Production Centre (UCPC) (UNIDO) - Uganda National Bureau of Standards -Industrial Research Corporation	UNIDO and UNEP have joined forces to establish National Cleaner Production Centres (NCPs) in developing countries and countries with economies in transition. The role of National Cleaner Production Centres is to promote the Cleaner Production strategy in enterprises and government	UCPC was established in October 2001, as a joint project of Government of Uganda, through then the Ministry of Tourism, Trade and Industry (MTTI) and United Nations Industrial Development Organization (UNIDO). The initial stages of establishments involved a process of selecting an Institution that was to host UCPC. This process was

ORGANISATIONS	ROLE AND RESPONSIBILITY	RELEVANCE TO THE ASSIGNMENT
	<p>policies, in harmony with local conditions, and to develop local capacity to create and meet Cleaner Production demand throughout the country. The aim primarily is to transfer know-how, not just to technology. The Cleaner Production assessors train and advise their clients on how to find the best solutions for their specific problems. Other activities undertaken by the centres typically fall under the following categories: awareness raising, information exchange, education and training, commitment & partnership building, policy advice and technical assistance.</p> <p>The main objective of UCPC is to introduce Cleaner Production practices to enterprises in Uganda in order to help companies reduce operating costs through increased overall efficiency, especially in the use of materials and energy. UCPC provides advice, technical assistance and training in Cleaner Production. The Centre is providing encouragement and assistance to enterprise, especially industries, to improve their environmental performance, while at the same time, fostering improved competitiveness and profitability.</p> <p>By reducing environmental impacts and cutting waste businesses, especially SMEs, can improve their productivity, save money and remain competitive especially in global markets where growing consumer concern about the environment is already being reflected in purchases of goods.</p>	<p>successfully carried out and Uganda Industrial Research Institute (UIRI) emerged ahead of the Department of Chemistry, Makerere University and consequently UCPC has been hosted by UIRI since 2001.</p> <p>UCPC has informed us that they have plenty of wastewater treatment performance indicators including COD inflow and COD removal efficiency of different industry sectors. We were told that this information may be shared with the consultants upon an official data request letter from official organisations.</p> <p>UCPC conducted a monitoring survey on the industrial sector in 2010 on key parameters and the report indicates the performance levels of the industries with regards to CODs and BODs with indication of the industrial production and emission levels which can guide narrowing down to industries with the greatest potential for Methane recovery.</p> <p>It is noted that the industrial discharge information is quite sensitive and confidential and permission may need to be sought from the industries. However, documentations which are open for public access has been requested are expected to be provided, following the official data requests.</p>

Table 5: Sugar industry facilities in Uganda

ORGANISATIONS	SHARE IN PRODUCTION	ESTIMATED SUGAR OUTPUT, 2014 (000 TONNES)	CONTACT PERSON	PHONE	EMAIL
Kakira Sugar at Jinja Uganda	42%	180	Mr. Kenneth Barungi (Technical Manager) and Christian Vincke (General Manager)	+256 772 797 997 & +256 759 629 212	kbarungi@kakirasugar.com & Christian.vincke@kakirasugar.com
Kinyara Sugar Works Limited at Masindi Uganda	28%	128	Mr.R.Ravi (Technical Manager)	+256 757 777248/+256 757 777 224	ravir@kinyara.co.ug
Sugar Corporation of Uganda Ltd (SCOUL) at Lugazi Uganda	17%	55	Mr. Nayan Desai	256 791 663 111	nayandesai@mehtagroup.com
Sugar and Allied Industries-Kaliro Uganda	5%	40	Mr.Ali (Technical Manager) & Mr. Richard Okolong (Chemist)	+256 703100100 & +256 755 663 548.	alialam@alam-group.com & admin.agro@sail.co.ug
Sango-Bay Sugar Estates Ltd	Not active anymore	20	Mr. Sharad Patel	+256 415 32732	
Mayuge Sugar Industries Limited at Mayuge Uganda	5%	20	Mr.Yogesh, Mr.Bora & Mr.Dhuivit	+256 717512 442	stl.fnc@mpgroupofindustries.com
GM Sugar Limited	1%	4	Mr. Magan M. Patel	+256 (71)6 - 858788, (75)3 - 161333,	gmsugarug@yahoo.com
Kamuli	1%	4	-	+256 434 251 712, +256 392 060 130, +256 776 706 666	info@kamulisugar.com
Sezibwa (Uganda Farmers Crop Industries Ltd)	1%	4	Mr. Godfrey Kyeswa	+256 (75)2 - 347999, (77)2 - 502039, (70)4 - 941288	sezibwasugar@gmail.com

6.2 Annex II: Effluent measures and standards for wastewater in Uganda

Table 6: Effluent standards for wastewater in Uganda (The National Environment Standards for Discharge of Effluent into Water or on Land, Regulations, S.I. No 5/1999)

PARAMETER	MAX. LIMITS
1,1,1 – Trichloroethane	3.0 mg/l
1,1,2 – Dichloroethylene	0.2 mg/l
1,1,2 – Trichloroethane	0.06 mg/l
1,2 Dichloroethane	0.04 mg/l
1,3 Dichloropropene	0.2 mg/l
Aluminium	0.5 mg/l
Ammonia Nitrogen	10 mg/l
Arsenic	0.2 mg/l
Barium	10 mg/l
Benzene	0.2 mg/l
BOD ₅	50 mg/l
Boron	5 mg/l
Cadmium	0.1 mg/l
Calcium	100 mg/l
Chloride	500 mg/l
Chlorine	1 mg/l
Chromium (total)	1.0 mg/l
Chromium (VI)	0.05 mg/l
Cis – 1,2 - Dichloroethylene	0.4 mg/l
Cobalt	1.0 mg/l
COD	100 mg/l
Coliforms	10000 / 100 ml
Colour	300 TCU
Copper	1.0 mg/l
Cyanide	0.1 mg/l
Detergents	10 mg/l
Dichloromethane	0.2 mg/l
Iron	10 mg/l
Lead	0.1 mg/l
Magnesium	100 mg/l
Manganese	1.0 mg/l
Mercury	0.01 mg/l
Nickel	1.0 mg/l
Nitrate-N	20 mg/l
Nitrite-N	2 mg/l

Nitrogen total	10 mg/l
Oil and Grease	10 mg/l
PH	6.0 – 8.0
Phenols	0.2 mg/l
Phosphate (total)	10 mg/l
Phosphate (soluble)	5 mg/l
Selenium	1.0 mg/l
Silver	0.5 mg/l
Sulphate	500 mg/l
Sulphide	1.0 mg/l
TDS	1200 mg/l
Temperature	20 – 35 °C
Tetrachloroethylene	0.1 mg/l
Tetrachloromethane	0.02 mg/l
Tin	5 mg/l
TSS	100 mg/l
Trichloroethylene	0.3 mg/l
Turbidity	300 NTU
Zinc	5 mg/l

6.3 Annex III: Stakeholder meetings and workshops

This Annex provides an overview of the organization and outcomes of the stakeholder meetings carried out on 18th and 19th December 2014 (**first workshop**) and 25th August 2015 (**second workshop**) at the Silver Springs Hotel, Kampala. The workshops were organized in support of the development of two Standardized Baselines (SBL) in the Uganda, one for municipal wastewater treatment; the other for wastewater treatment in industrial sugar production.

- The **first workshop** was facilitated by Hilda Galt from Climate Focus and Francis Okello from EcoSan.
- The **second workshop** was facilitated by Bamshad Houshyani from Climate Focus and Charles Omona from EcoSan; and supported by Martha Kasozi on behalf of the Climate Change Department (CCD) along with other colleagues from the Belgian Development Agency (BTC).

The overall goal of the workshops was to create capacity within relevant stakeholders in the municipal and industrial (sugar) wastewater treatment sectors to facilitate methane avoidance project development under the Clean Development Mechanism (CDM).

The specific objectives of the **first workshop** were to:

- Raise awareness of the CDM and standardized baseline (SBL) development among relevant stakeholders, including what SBLs are and how they could be useful for stakeholders.
- Present the result and outcome of the SBLs feasibility study that was commissioned during this assignment and collect comments and feedbacks from the stakeholders.
- Address the data gaps in the municipal and industrial (sugar) sectors by reaching out to participants that could help to address these.

The specific objectives of the **second workshop** were to:

- Train and raise awareness on how a SBL can be developed, with specific focus on municipal and industrial wastewater SBL establishment.
- Present the results of the final SBL calculations for both municipal and industrial sectors and collect comments and feedbacks from the stakeholders that are incorporated into the final version of the SBLs.
- Address the data gaps in the process of SBL calculation by:
 - Reaching out to participants that could help to address these and provide more credible and most recent data and fill the gap.
 - By using conservative data gap filling methods (e.g. extrapolation among others) in order to complete the SBL calculations in a conservative manner.

The organisation, agenda and content of the stakeholder meetings were as follows:

Stakeholder workshop I: 18-19 December 2014

Processes followed for public consultation

A list of relevant stakeholders to invite was compiled by EcoSan, Climate Focus, Climate Change Department (CCD) and the Belgian Development Agency (BTC's) Uganda office (see **Table 7**). Stakeholders were invited via email, telephone and personal visits. An invitation letter, presented in **Figure 4**, and workshop agenda were sent to all stakeholders as part of the invitations. Emails were first sent out on 1st December 2014, and followed up until 16th December 2014.

Table 7: List of stakeholders invited to participate in the 18th and 19th December 2014 SBL workshop

ORGANIZATION	STAKEHOLDER NAME AND POSITION	CONTACT DETAILS
Makerere University	Dr.Eng. Charles Niwagaba (Head of the Eng. Department, Makerere University)	cniwagaba@cedat.mak.ac.ug cbniwagaba@yahoo.co.uk cniwagaba@sswarsuganda.org , sswars@sswarsuganda.org www.mak.ac.ug ; www.sswarsuganda.org Tel: +256 772 335 477.
Makerere University	Mrs Robinah Kulabako (PhD) (Department of Engineering Civil and Environmental Engineering, MUK)	rkulaba@cedat.mak.ac.ug
National Water and Sewerage Corporation (NWSC), HeadQuarter	Christopher Kanyesigye Irene Mugabi	Christopher.Kanyesigye@nwsc.co.ug irene.mugabi@nwsc.co.ug
National Water and Sewerage Corporation (NWSC)	Eng. Alex Gisagara (Chief Manager Engineering services NWSC)	Alex.gisagara@nwsc.co.ug Tel: +256 772 426 775
National Water and Sewerage Corporation (NWSC)	Paddy Twesigye (Senior Manager Projects)	paddy.twesigye@nwsc.co.ug Tel: +256 717 315 149
National Water and Sewerage Corporation (NWSC)	Lance Okwerede (Principal Water Quality Officer)	lance.okwerede@nwsc.co.ug
National Water and Sewerage Corporation (NWSC)	Geoffrey Kasirikale (Principal Engineer Projects)	geoffrey.kasirikale@nwsc.co.ug Tel: +256 414 315 149/+256 717 315 122
National Water and Sewerage Corporation (NWSC)	James Maiteki Miiró (Manager, Bugolobi WWTP)	james.maiteki@nwsc.co.ug
Directorate of Water Resources Management (DWRM)	Eng. Callist Tindimugaya (Commissioner)	callist.tindimugaya@mwe.go.ug Tel: +256(0)772521413

GIZ Kampala / RUWASS (Reform of the Urban Water and Sanitation Sector)	Fredrick Tumusiime (Water and Sanitation Programme Officer)	fredrick.tumusiime@giz.de
GIZ Kampala / RUWASS (Reform of the Urban Water and Sanitation Sector)	Eunice Nandinda (Project assistant)	Enandinda@ruwas.co.ug
Directorate of Water Development (DWD)	Dominic Kavutse (Commissioner Urban WS and Sewerage services)	dominic.kavutse@mwe.go.ug Tel: +256772412853
Directorate of Water Development (DWD)	Eng. Ephraim Kitembo (Assistant Commissioner Urban Water Supply Department)	Ephraim.kitembo@mwe.go.ug Tel: +256 752 560 254
National Environment Management Authority (NEMA)	Arnold Waiswa Ayazika	aawaiswa@yahoo.com info@nemaug.org Tel: +256 (0)772 471 139/ +256-414-251064/ +256-414-251068
National Environment Management Authority (NEMA)	Kiguli Dan Kibuuka (Project Manager CDM)	dkibuuka@nemaug.org
National Environment Management Authority (NEMA)	Richard Mugambwa (Project Manager CDM)	rmugambwa@nemaug.org
Uganda Manufacturers Association (UMA)	Mr. Sali Godfrey	ssalikh@gmail.com ssalikh@uma.or.u
Uganda Water and Sanitation NGO Network (UWASNET)	Ms Doreen Kabasindi Wandera (Executive Director)	dwandera@uwasnet.org
World Bank - National Sanitation Working Group (NSWG)	Sam Mutono (National Coordinator WSP National Sanitation Working Group (NSWG)	smutono@worldbank.org
Uganda Cleaner Production Centre (UNIDO) - Uganda National Bureau of Standards -Industrial Research Corporation	Mr. Silver Ssebagala (Director Uganda Cleaner Production Centre (UNIDO)	Tel: +256 414 287 938/58 silverbms@ucpc.co.ug
Sugar Corporation of Uganda Ltd (SCOUL) at Lugazi	Mr. Nayan Desai (Senior Project Manager)	nayandesai@mehtagroup.com Tel: +256 312 55 55 00 Cell: +256 791 666 333
Uganda Breweries Limited	Henry Mugabi (Environmental Manager)	henry.mugabi@eabl.com +256 312 210011/22
Kinyara Sugar Ltd	Mr. R Ravi (Process Manager)	Ravir@Kinyara.co.ug +256 757 777248/+256 757 777 224

Kakira Sugar at Jinja Uganda	Mr. Kenneth Barungi (Technical Manager) and Christian Vincke (General Manager)	+256 772 797 997 & +256 759 629 212 kbarungi@kakirasugar.com & Christian.vincke@kakirasugar.com
Sugar and Allied Industries-Kaliro Uganda	Mr.Ali (Technical Manager) & Mr. Richard Okolong (Chemist)	+256 703100100 & +256 755 663 548 alialam@alam-group.com & admin.agro@sail.co.ug
Mayuge Sugar Industries Limited at Mayuge Uganda	Mr.Yogesh, Mr.Bora & Mr.Dhuivit	+256 717512 442 stl.fnc@mpgroupofindustries.com

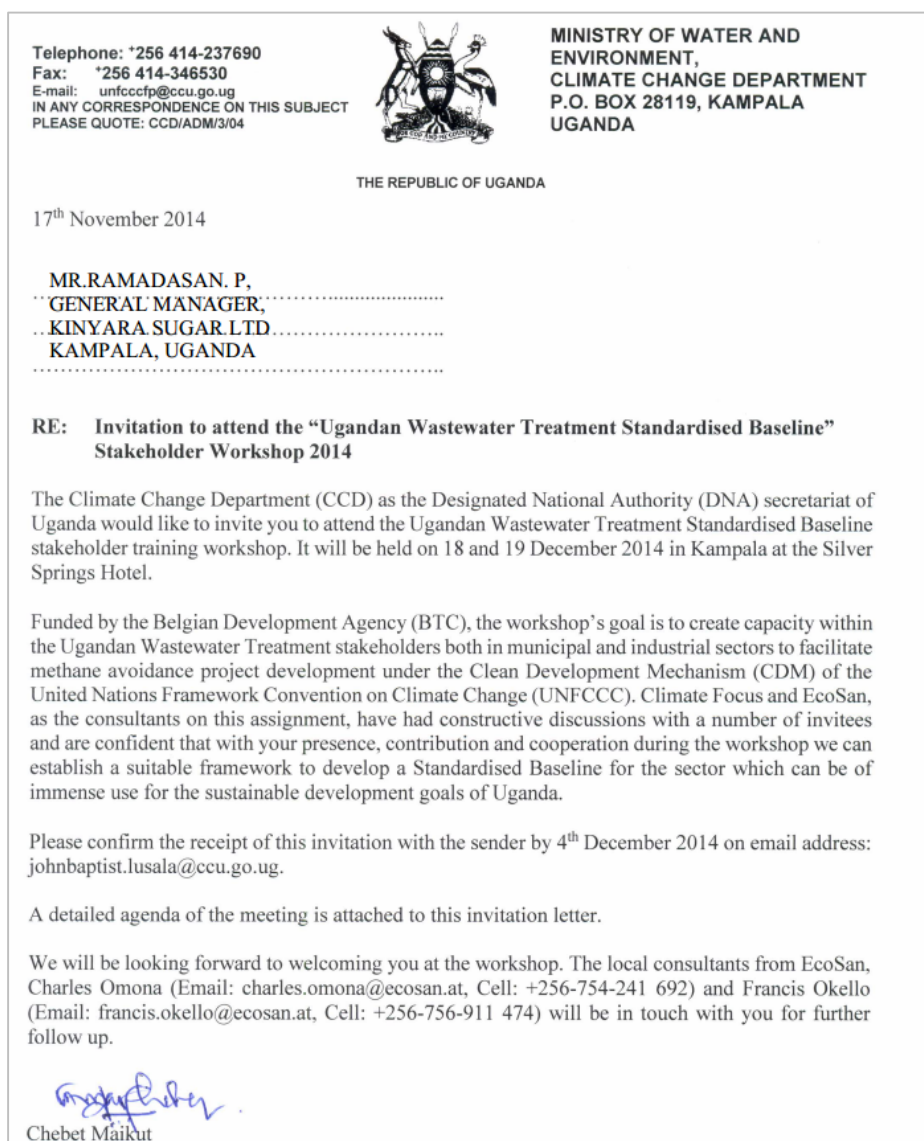


Figure 4: Invitation letter sent to stakeholders inviting them to participate in the December consultation meeting.

The first day of the workshop opened with an introduction to the assignment, background information of the CDM and wastewater treatment projects that aim to reduce methane emissions. The CDM methodologies available for these

types of projects were then explored, followed by a presentation of what standardized baselines are, and how they relate to the municipal and industrial sectors in Uganda.

The second day of the workshop focused on the methodological approach to SBL elaboration, the data gathered to date through the feasibility study, and where data gaps were. Steps to address these data gaps were discussed with stakeholders. The agenda of the workshop was as follows:

Ugandan Wastewater Treatment Standardized Baseline Stakeholder Workshop Agenda

Day 1: 18 December




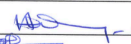


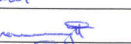




9.00-9.15:	Welcome and introduction from the Climate Change Department (CCD);
9.15-9.30:	Introduction from Climate Focus;
9.30-10.30:	Training: CDM and Methane Avoidance in Wastewater sector
10.30-11.00:	Coffee break;
11.00-12.30:	Training: Wastewater Treatment Methodologies and Projects;
12.30-14.00:	Lunch break
14.00-15.30:	Training: Standardised Baseline in the context of CDM
15.30-16.00:	Coffee break;
16.00-17.30:	Training: SBL and Wastewater Treatment; Municipal and Industrial sectors









Day 2: 19 December




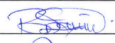
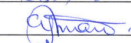



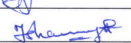


9.00-10.30:	Presentation on the feasibility study outcome
10.30-11.00:	Coffee break;
11.00-12.30:	Presentation on approaches towards SBL development for the sector
12.30-14.00:	Lunch break
14.00-15.30:	Presentation on gap analysis and needs for successful adaptation of the SBL
15.30-16.00:	Coffee break;
16.00-17.30:	Open discussion and stakeholders' possible voluntary support to close the data/information gap towards the SBL development

Participants who attended the public consultation

The following list includes those stakeholders who filled the attendee's form during the workshop:

 BTC UGANDA		<small>BELGIAN DEVELOPMENT AGENCY</small>		MINISTRY OF WATER AND ENVIRONMENT, CLIMATE CHANGE DEPARTMENT P.O. BOX 28119, KAMPALA UGANDA
			THE REPUBLIC OF UGANDA	
WASTEWATER SBL WORKSHOP				
VENUE:	SILVER SPRINGS HOTEL BUGOLOBI			
DATE	18TH DECEMBER 2014			
TIME				
S/N	NAME	ORGANISATION	EMAIL/CONTACT	SIGNATURE
1	JOHN L. BAPTIST	camco/BTC/CCD	lusjok@yahoo.com	
2	Henry Musman	UBEL	Henry.Musman@unep.org	
3	Maseta Ivan	UWASNET	maseta@uwaset.org	
4	Banyirwa Kabon Rongye	MUKWANO group	banyirwakabon@ukwano.org	
5	ENOS MAMAMBA	NWSC	Enos.Melambale@nws-c.org	
6	Martin Orwinyo	NWSC	orwinyomachi@yahoo.com	
8	Nayan Desai	SCDUL	nayan.desai@melitegroup.com	
9	Tumukweze Sepiano	Harris International Ltd (Kigali)	Stefano@harrisgroup.com	
10	Francis Okello	ESC	Francis.Okello@alisan.co	

 BTC UGANDA		 BELGIAN DEVELOPMENT AGENCY	 THE REPUBLIC OF UGANDA	MINISTRY OF WATER AND ENVIRONMENT, CLIMATE CHANGE DEPARTMENT P.O. BOX 28119, KAMPALA UGANDA
WASTEWATER SBL WORKSHOP				
VENUE:	SILVER SPRINGS HOTEL BUGOLOBI			
DATE	18TH DECEMBER 2014			
TIME				
S/N	NAME	ORGANISATION	EMAIL/CONTACT	SIGNATURE
1	MARTIN OJOK	BIC	martin.ojok@ccu.go.ug	
2	KAKKETO JAMES	BTC	jkaketo@gmail.com	
3	HODA GATI	CLIMATE FOCUS	h.gati@climatefocus.com	
4	Ronald Turyagye	CANCO/BTC	ronnie@gmail.com	
5	Daniel Lubanga	BTC		

 BTC UGANDA		 BELGIAN DEVELOPMENT AGENCY	 THE REPUBLIC OF UGANDA	MINISTRY OF WATER AND ENVIRONMENT, CLIMATE CHANGE DEPARTMENT P.O. BOX 28119, KAMPALA UGANDA
WASTEWATER SBL WORKSHOP				
VENUE:	SILVER SPRINGS HOTEL BUGOLOBI			
DATE	19TH DECEMBER 2014			
TIME				
S/N	NAME	ORGANISATION	EMAIL/CONTACT	SIGNATURE
1	Banyu Kabson Rozas	Mucwano group	banyu.kabson@ya.hooda	
2	Tumukwereze Sebana	Rikani group	cyprianum@gmail.com	
3	Masete Ivan	UWA-NET	imasete@uwa-net.org	
4	Ian Baragamu	NWSC	ibaragamu@nwscc.org	
5	MARTIN OJOK	BIC	Martin.Ojok@ccu.go.ug	
6	Martha Owingy-	NWSC	owingy-martha@ya.hooda	
8	Enos Malambala	NWSC	Enos.Malambala@nwscc.org	
9	Nayam Rossi	SCOL	nayam.rossi@melita-group.com	

Summary of the comments provided by stakeholders/experts

Feedback forms were distributed at the end of the workshop to gather feedback from stakeholders. The feedback forms sought to answer the following questions:

- What was your impression of the workshop?
- Did you know anything about standardized baselines before?
- What did you learn?
- What could have been done better?

A summary of the comments received to each of these questions is provided in **Table 8**.

Table 8: Summary of comment received during the stakeholder consultation

QUESTION	COMMENTS RECEIVED
What was your impression of the workshop?	<ul style="list-style-type: none"> • It was very elaborate on most of the aspects and interactive. Most of the very important topics in having a project registered as CDM were very clear. • I will learn on entire CDM process, I will get an idea of cogeneration and wastewater CDM projects

	<ul style="list-style-type: none"> • Hilda has been wonderful, all presentations were so educational and provides a basis in the management of wastewater. • Very good knowledge (informative) delivered. • The workshop was an eye opener to us as we discovered that organisations and companies can regain back some of their investment through carbon credits trading. • The training content was quite good and informative. It is quite useful to me as an environmentalist. However, the timing of the workshop was hard, since the attendance was poor. • The presentations especially the calculation of carbon credits and the methods. • The facilitator explained well during the presentations.
Did you know anything about standardized baselines before?	<ul style="list-style-type: none"> • I had an overall picture but not so much the details. • Somehow, but have gained deeper knowledge. • I had little knowledge, I had many doubts. Those doubts are cleared now. • No, I didn't. • No, but I had heard of carbon credits.
What did you learn?	<ul style="list-style-type: none"> • How to calculate and set up a SBL for a wastewater treatment plant • Managing wastewater whilst avoiding methane emissions as well • Standardized baseline, how it is calculated, development of two SBLs in municipal and industrial sector • Learnt the importance of having standardized baselines in reducing... global warming. And the challenges faced in gathering data in Uganda, hence the need for a multi-stakeholder approach. • Development of standardized baselines for wastewater in which we are involved. Calculation of carbon credits. • I learnt more about the additionality condition after applicability. It was very unclear before the workshop. • Calculation of standardized baselines. Procedure of registering CDM projects for carbon credits trading. • Carbon credit calculations and standardisation of the baseline. • I learnt how to calculate carbon credits and standardized baselines.
What could have been done better?	<ul style="list-style-type: none"> • This kind of constructive discussion should continue so long as [...] shall be able to capture the data and eventually solve problems • Could include more description of monitoring & verification process, selection of DOE, drafting ERPA etc. • The training was basic, so more time was needed especially for those encountering this for the first time. The timing of the workshop could have been better. • A case study/practical example where prior to the workshop consultant develops a case study probably

in the host country and takes us through the major stages in the project.

- They should involve more stakeholders because it was good information.
 - Training certificates and travel refund
-

How comments were taken into account

The comments received from stakeholders were primarily positive, with many attendees having gained new knowledge on the CDM, methodologies, how to calculate an SBL, additionality and carbon trading mechanisms.

Comments on how the workshop could have been improved are addressed as follows:

- "This kind of constructive discussion should continue so long as... shall be able to capture the data and eventually solve problems". *Response:* a follow-up workshop was organized on 25 August 2015 to further the SBL dialogue and keep stakeholders involved in the development process.
- "Could include more description of monitoring & verification process, selection of DOE, drafting ERPA etc." *Response:* the focus of the workshop was the development of an SBL, rather than pursuing the issuance of carbon credits through project registration, monitoring and issuance. All stakeholders were invited to follow-up with the facilitators to discuss these specific aspects in more detail after the workshop
- "The training was basic, so more time was needed especially for those encountering this for the first time. The timing of the workshop could have been better". *Response:* due to the need to tight timeline of the assignment, and need to gather baseline data quickly, the workshop needed to be held before the Christmas and New Year holiday breaks. The follow-up workshop was organized at a date outside the holiday season.
- "A case study/practical example where prior to the workshop consultant develops a case study probably in the host country and takes us through the major stages in the project". *Response:* Thank you for your feedback, we will keep this in mind for future workshops.
- "They should involve more stakeholders because it was good information" *Response:* Thank you, a follow-up workshop was organized on 25 August 2015 to further reach more stakeholders.
- "Training certificates and travel refund". *Response:* this is within the remit of BTC.

Stakeholder workshop II: 25 August 2015

Processes followed for public consultation




All the stakeholders were invited to attend this workshop through official invitation letters one month before the workshop. The letters were sent to their email contacts. In addition, the invitees were followed up and reminded about the workshop via telephone calls and additional emails as well. The list of stakeholders who were contacted and invited for the workshop is the same as the list presented for the first workshop above.

The agenda of the workshop was as follows:

Ugandan Wastewater Treatment Standardized Baseline Stakeholder Workshop Agenda 25 August 2015	
9.00-9.15:	Welcome and introduction from the Climate Change Department (CCD);
9.15-9.30:	Introduction from Climate Focus;
9.30-10.30:	Refresh from workshop 2014: Feasibility study outcome
10.30-11.00:	Coffee break;
11.00-12.30:	Sectoral Approach towards SBL development;
12.30-14.00:	Lunch break
14.00-15.30:	Presentation on gap analysis for successful SBL development
15.30-16.00:	Coffee break;
16.00-16.45:	Final results: Standardized Baseline documents for Municipal and Sugar sectors
16.45-17.30:	Discussions and next steps for SBL submission and approval

Participants who attended the public consultation

The following list includes those stakeholders who filled the attendee's form during the workshop:

 BTC UGANDA		 <small>RELIAN DEVELOPMENT AGENCY</small>	 <small>MINISTRY OF WATER AND ENVIRONMENT, CLIMATE CHANGE DEPARTMENT P.O. BOX 28119, KAMPALA UGANDA</small>	
SBL WORKSHOP				
Uganda Wastewater Treatment Standardised Baselines Stakeholder Workshop				
ATTENDANCE LIST				
VENUE: SILVER SPRINGS HOTEL				
DATE: 25th August 2015				
TIME: 9.00am				
S/N	NAME	ORGANISATION	DESIGNATION	SIGNATURE
1	TURYAMWIZUKA JULIUS	UIRI/Biochar project	Research officer	<i>[Signature]</i>
2	CHARLES OMONA	Ecosol Club Consulting	DIRECTOR CONSULTANT	<i>[Signature]</i>
3	Ssali Godfrey	Uganda Manufacturers Association	Head Private Sector Working Group on Climate change	<i>[Signature]</i>
4	Bamshad Houshyani	Climate Focus	Project manager	<i>[Signature]</i>
5	Jweheyo Jovet	bic Uganda	Fin & Admin	<i>[Signature]</i>
6	Banagamu Ian	NWSC	Engineer	<i>[Signature]</i>
7	Ritah Rukundo	UNFCCC-RCC	Research Associate	<i>[Signature]</i>
8	KAVEETO JAMES	BTC	CDM Project officer	<i>[Signature]</i>
9	MARTHA NABANDE KINUWA	BTC	National Technical Advisor	<i>[Signature]</i>
10	SSEBUNGA-KIMEZE	UIA	CDM Technical Advisor	<i>[Signature]</i>
11	Richard Mugambura	UCMA	PM-NISC	<i>[Signature]</i>
12	Enos Malimbale	NWSC	Quality Officer	<i>[Signature]</i>
NAME		ORGANISATION	POSITION	SIGNATURE
13	Orwiny Martin	NWSC	Plant Engineer	<i>[Signature]</i>
14				

Summary of the comments provided by stakeholders/experts

The summary of the comments received is as follows:

1. The impression about the workshop: the response was mostly very positive. No negative comment was received.
2. Views on the Standardized Baseline (SBL): All of the attendees expressed satisfaction on the topic specifically the parts that explained the calculation of the SBL and the applicability of the SBL in CDM projects.
3. What attendees learnt during the workshop: Mostly how to develop a SBL, issues with data collection and data gaps and how to tackle them, application of the SBL, assessment process before the SBL approval and updating procedures when SBLs need renewal every three years.
4. Improvement: More similar workshops in future, expanding the SBL topic to other sectors and refund for commuting as well as possible certificates from the BTC for attending the workshop.

How comments were taken into account

All the comments/feedback received from stakeholders were positive and there was no objection nor negative comments to be considered and addressed that relates to the calculation and establishment of the SBLs.

6.4 Annex IV: QA/QC protocol

Quality assurance and Quality Control (QA/QC) protocol for the wastewater treatment Standardized Baseline for municipal and sugar industry sectors in Uganda

Sectoral scope	Scope 13: Waste handling and disposal
Name of DNA	Ministry of Water and Environment Climate Change Department (former Climate Change Unit)/DNA Secretariat P. O. Box 28119 Kampala, Uganda
Primary person for the QC report	Mr. Chebet Maikut
Contact info of the contact person	chmaikut@yahoo.com, chmaikut@gmail.com Phone: (256) 414 237 690/ (256) 752 414 609 Fax: (256) 414 346 530
Implementation date of QC procedures	The QC procedures were implemented from the start date of the Ugandan Wastewater Standardized Baseline (SBL) development in June 2014 until the submission of SBL documents to the UNFCCC (expected by the December 2015). The same will be applicable for the renewal process of SBL.
Please describe how the QC procedures were implemented	
<p>The QC procedures are implemented by the CDM and Standardized Baseline coordinating personnel and focal point within the DNA of Uganda, at the Climate Change Department (CCD) of the Ministry of Water and Environment. When necessary, assistance from national and/or international consultants with relevant expertise will be acquired.</p> <p>All the data and information sources regarding the wastewater treatment plants within the municipal and sugar industry sectors were checked for their credibility by contacting the focal points within the relevant organizations and/or double checked against any existing datasets made available to the Ministry of Water and Environment.</p> <p>For the establishment of the first Standardized Baseline (SBL) document, the project manager travelled three times to Kampala to assure and control quality in terms of data collection process, data quality, data gap possibilities and data credibility and the overall progress during the SBL development. The consultants also have directly and actively led in the capacity building and stakeholder workshops held in Kampala on 18-19 December 2014 and on 25 August 2015. The stakeholders were informed during the workshop of the procedures and steps taken during the data collection and SBL development. This increased the transparency in data collection efforts, minimized data gaps and reduced risks in receiving irrelevant and false figures and values for the development of the first SBL.</p> <p>The data for development of municipal wastewater SBL was provided by Ugandan authorities, namely, the National Water & Sewerage Corporation</p>	

(NWSC) who has access to most up-to-date data on municipal ponds throughout Uganda. NWSC has its own local and central labs based in Jinja and Kampala and other major regions within the country and follows specific data testing and data measurement protocols.

For the sugar industry sector, the relevant data was submitted directly by sugar manufacturers where available.

In both cases (municipal and sugar industry) the data was reviewed in case of doubts and data gaps, the relevant contacts were re-approached for clarification. In some cases, where data was not available at all, conservative measures such as extrapolation method was used in order to replace blank data cells with feasible figures. It was assured that the assumptions in filling the data gap will lead to a conservative SBL calculation.

Moreover, the DNA of Uganda will be supported by the UNFCCC regional Collaboration Centre (RCC) based in Kampala during the SBL submission process and all probable issues will be cleared before the SBL documents are submitted to UNFCCC. This as well applies when the SBL needs to be updated and renewed.

The data and information that were checked are as follows:

Data	Source	Cross checking method
Name of the municipal treatment sites and the locations, COD inflow and Wastewater discharge in municipal ponds and sites	National Water and Sewage Corporation (NWSC)	<ul style="list-style-type: none"> - Independent check through local experts in the field (EcoSan); - Independent check with sources and other contacts within NWSC; - Direct cross check with the Climate Change Department (DNA secretariat) based on their ongoing studies and similar datasets submitted by NWSC to the Ministry of Water and Environment (these studies were not public and the check was made by the BTC/CCD focal point Ms. Martha Kasozi; - Additional check by the UNFCCC Regional Collaboration Centre in Kampala will be held before the SBL submission/renewal process;

Name of the sugar producer and the locations, COD inflow and Wastewater discharge in the factory.	Sugar producers/factories in Uganda	<ul style="list-style-type: none"> - Checking the lab testing protocols and measurement procedures followed by sugar factory personnel; - Asking the sugar factories for any official lab testing evidence if available; - Independent check through local experts in the field (EcoSan); - Independent review with Uganda Sugar Manufacturer's Association (USMA) as well as the Uganda manufacturers' Association (UMA); - Additional check by the UNFCCC Regional Collaboration Centre in Kampala will be held before the SBL submission;
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All the data acquired for the development of the SBL will be archived and maintained electronically at least for three years from the date of SBL approval and/or renewal.

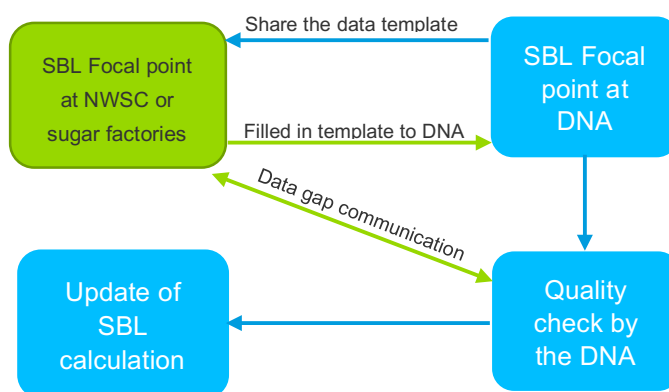
Data collection process

Currently, the information in regards to the existing municipal wastewater treatment sites are being collected by NWSC. The DNA of Uganda through its dedicated focal point for SBL development and update/renewal will be in touch with NWSC to make sure up-to-date and credible data for the ponds will be collected for renewal of the SBL. The DNA will make sure there will be permanent contacts within the NWSC to follow up the data collection process regularly, at least every three months. The DNA of Uganda will remain the focal point for follow ups and data tracing. The DNA will assure that the data flow will not be interrupted and in all times the submitted data has satisfactory data quality with minimum data gaps. Where data gaps are discovered within the data templates, contacts will be made with NWSC to justify and evidence the data gaps and find a conservative manner to fill the gaps.

Similar procedure will be followed in the case of sugar factories wastewater data collection. In addition, since sugar factories are mostly private entities, it will be ensured that the sugar producers will be periodically updated on the procedures needed to update the SBL report. This will be done by sharing the most up to date report and calculations of the SBL with the sugar producers. Special attention will be given on why sugar manufacturers may

become interested in using such a report and advantages of maintaining and renewing a SBL will be explained to these entities.

The SBL will be renewed based on the approved SBL guidelines and all data templates will be reviewed and updated in case the applied tools are upgraded to newer versions. The overall data collection and data quality check structure that DNA will implement during the update/renewal process of the SBL is shown as follows:



Data template

NWSC is the ultimate authority in Uganda that keep track of municipal wastewater treatment plants in Uganda and keeps data on the following fields:

- Information on the plants' organizational charts, performance and maintenance;
- Information on each plants' name, location and operator;
- Information on wastewater data such as wastewater discharge rates, COD inflow and COD outflow;

In regards to sugar industry data, detail wastewater treatment performance indicators such as COD inflow and wastewater discharge are either being tested at the dedicated lab located at each sugar factory or in case they do not poses a lab within their premises, the test is carried out by external labs (e.g. DWRM). Each sugar factory collects, maintains and reports the relevant wastewater test results. Therefore, sugar factories remain the only source of data when it comes to SBL update/renewal.

The DNA of Uganda will use data templates in order to collect the most up-to-date data sets from the municipal ponds (through NWSC) as well as sugar factories (via direct contact to their wastewater testing labs, and if possible via DWRM). The example of the data templates that will be used is as follows:

Data template to be used for data collection from Municipal ponds in Uganda:

Municipal Sector Wastewater Treatment Data from Ponds in Uganda												
Please complete the template below with any relevant additional informations												
No.	AREA	POND SYSTEM	POND	DESIGN DEPTH (m)	Wastewater Q (m ³ /d)	COD _{IN} (mg/l)	COD _{OUT} (mg/l)	National Standard for COD OUT (mg/l)	COD removal efficiency	Where is the final treated water discharged?	How is the remaining sludge treated?	Comments
1								100				
2								100				
3								100				
4								100				
5								100				
6								100				
7								100				
8								100				
9								100				
10								100				
11								100				
12								100				
13								100				
14								100				
15								100				
16								100				
17								100				
18								100				
19								100				
20								100				

Please add more rows as needed.
Please provide data for the latest three years as possible/available, e.g. 2012, 2013 and 2014/2015.

Data template to be used for data collection from Sugar factories in Uganda:

Sugar Industry Sector Wastewater Treatment Data in Uganda													
Important note: Industry types can be mentioned per anonymous company, in case it is sensitive to have the name of the company, having the type of industry and relevant data suffices.													
No.	Town/ address	Industry name/id	POND / treatment type	DESIGN DEPTH (m)	Wastewater Q (m ³ /d)	Q (m ³ /yr)	COD _{IN} (mg/l)	COD _{OUT} (mg/l)	National Standard for CODOUT (mg/l)	COD removal efficiency	Where is the final treated water discharged?	How is the remaining sludge treated?	Comments
1						0			100				
2						0			100				
3						0			100				
4						0			100				
5						0			100				
6						0			100				
7						0			100				
8						0			100				
9						0			100				

Please add more rows as needed.
Please provide data for the latest three years as possible/available, e.g. 2012, 2013 and 2014/2015.

Capacity building workshops carried out

The DNA of Uganda with the support from the Belgian Development Agency (BTC) has held two workshops for the wastewater treatment sector in Uganda on 18-19 December 2014 and 25 August 2015 as follows:

Stakeholder workshop I: 18-19 December 2014

The main objectives of the stakeholder meeting were to inform and update the main stakeholders identified in Annex I in regards to the SBL establishment assignment as well as to increase their capacity in the context of CDM and Standardized Baseline. The workshop comprised topics in relation to the CDM, SBL concept, baseline indicators, data collection, data management, SBL calculation and renewal of Ugandan wastewater SBL. Through the workshop draft data templates were presented to the sector. These data templates will facilitate further transparency in data collection as well as quality control. The workshop organizers distributed feedback forms during the workshop in order to receive any comments in relation to the SBL development assignment in general and the development of SBLs for both municipal and sugar industry sectors and the outcome of the SBLs feasibility study in specific.

Stakeholder workshop II: 25 August 2015

The main objectives of the stakeholder meeting were to inform and update the main stakeholders identified in Annex I in regards to the result of the Standardized Baseline establishment for both municipal and sugar industry sectors and next steps towards the approval of the SBL.

Both workshops' objectives, processes, agenda, participants and feedback are documented and available.

Future DNA training workshop and SBL update instructions/manual

The DNA of Uganda is already planning for further improvement of SBL data collection, calculations and update/renewal. For this the DNA has already begun with designing training sessions for dedicated DNA personnel who will be responsible for tracking and acquiring most up-to-date data for SBL calculations update and renewal from both municipal and sugar industry sectors.

Please specify how the credibility of the data sources was checked.

The data supplied are either from the Uganda authorities i.e. National Water and Sewage Corporation (NWSC) or from the sugar producers (in case of the sugar industry SBL) in consultation with Uganda Manufacturers Association (UMA) and Uganda Cleaner Production Centre (UNIDO), all of which credible and reputable organizations in Uganda. Please refer to the table above where the cross checking activities held are listed.

Please specify how the accuracy of the data was checked.

NWSC is a governmental organization whose accuracy in wastewater indicators' testing is a key for the operation and performance of the Ugandan municipal wastewater treatment ponds. NWSC follows national standards that assure stable performance of water and sewage networks in the country. The accuracy of the data received from NWSC was cross checked with several contacts within the NWSC all of which resulted in the same data source.

For the sugar industry sector, the data was only available through direct contacts at sugar factories in Uganda. For this sector the data accuracy was checked when possible through accredited wastewater test labs. It is noteworthy that the wastewater treatment sector in Uganda is under-represented and suffers from lack of capacity and modern practices. However, each of the sugar factories are equipped with a relatively up-to-date wastewater testing devices and each follows the manufacturer's calibration and test manuals and protocols. This was assessed by the DOE during the SBL assessment site visit as well.

Please specify how the consistency was achieved and how the data vintage provision was met.

For the data from NWSC, the consistency of the data vintage was checked with the NWSC lab principals and senior data managers. The data vintage achieved was most-up-to-date between 2011 and 2014/2015. The detail data for wastewater discharge was provided monthly between 2011 and 2015. The monthly values were used to come up with an annual average value per given year. The COD data was provided as annual average values for 2012, 2013 and 2014. For the calculation of SBL the data from 2012, 2013 and 2014 (and part of 2015 if there was data) has been used.

For sugar factories, since wastewater treatment systems in most of these facilities are just commissioned, most up-to-date data was mostly from 2013 or 2014.

Please specify how the completeness was achieved.

The calculation process and approach follows the latest approved version of the Guidelines for the establishment of sector specific standardized baseline in combination with the latest version of the small scale methodology AMS-

III.H.. The methodology asks for specific parameters, data and information for the determination of the baseline indicators. These data and information were available through the above mentioned official sources in Uganda. The calculated SBL is independently checked by a UNFCCC approved DOE (TuV Nord) and the final assessment report is submitted as a complimentary document to the SBL submission. Moreover, the completeness for the submission of the SBL will be checked both by the DNA's focal point as well as the UNFCCC regional collaboration center (RCC) based in Kampala.

Completeness in regards to data gaps in municipal SBL was achieved by the fact that the data submitted by NWSC was complete and there was no need for conservative assumptions/estimations to fill the data gaps.

Completeness in regards to data gaps in industrial SBL was achieved by applying the most conservative values achieved within the industry for those sugar factories that either had no data or had incomplete data. This was to ensure that the final SBL result will be a conservative representative for the sector despite of data gap assumptions made.

Please specify how the transparency was achieved.

The transparency was achieved during data collection activities, calculation of SBL by the consultants and their constant reporting to the DNA and BTC (the funding agency) as well as during the assessment of the SBL by the DOE through the following steps:

- The official sources and specifically NWSC were available to share the documented and well managed data sources with the consultants and the DNA;
- The consultants could meet with the focal points from NWSC and other stakeholders for further information or clarification of any raised issue;
- Although the data collection effort was a time intensive process, the officials had the utmost cooperation during the assignment and have provided more up-to-date and further complete datasets till October 2015;
- Up to 28 stakeholders were invited to a workshop held on 18-19 December 2014 on how the SBL development process works, what data is needed, how data collection efforts shall be managed, how data gaps shall be addressed and how the SBL can be maintained for renewal;
- The final stakeholder workshop was held on 25 August 2015 during which the final results were presented and the stakeholders were informed on the renewal process of the SBL including the data collection procedures;

All the supplied data and information are listed and made publically available through the SBL submission. The intention of the DNA would be to publish the SBL related information and updates on the DNA's web-page.

The DNA will also have the opportunity to cross check the data and calculation processes before each SBL renewal/update through the UNFCCC Regional Collaboration Centre in Kampala.

Please specify major issues and uncertainties identified during the QC procedures.

General point: some data gaps were identified during the quality check, specifically in relation to sugar industry SBL calculations. However, these gaps were minor and could be filled using extrapolation approach by using conservative figures from other sugar factories who submitted complete datasets. Overall, it was assured that the data replacements will lead to a conservative calculation of baseline during the SBL establishment.
Please specify major corrective actions taken during the QC procedures.
Data gaps were filled using conservative approaches, such as extrapolation.
Please justify the conservativeness of the approaches taken during the QC procedures
In addition to conservative measures taken into consideration when dealing with data gaps, the approach for SBL establishment follows an approved UNFCCC tool “Guidelines for the establishment of sector specific standardized baseline” as well as small scale methodology AMS-III.H. thus all conservative measures are already taken into account within the applied tool/methodology. For instance the benchmark for identifying the SBL is set by the guidelines at 90%, meaning that the baseline indicator established in the SBL is more conservative than 90% of the contribution within the sector. No additional conservative measure was taken into account.
Please summarize key findings and present a plan to improve the data quality in future
<p>The current data management system implemented is sufficient to renew the SBL calculations for Ugandan wastewater treatment sector. Further suggestions were given through workshop and capacity building practices²⁰ in 2014 and 2015, where specific data templates were presented to NWSC, sugar producers, Climate Change Department of the Ministry of Environment and other present stakeholders in order to facilitate a smoother and further timely calculation of the future SBLs.</p> <p>In general, data availability and capacity are of major issues when it comes to specific sectors in under-represented countries such as Uganda. Modern wastewater treatment systems and related knowledge have not been practiced/spread in a systematic manner and in a country wide scale. Further capacity building in waste handling and management sector in Uganda is definitely required. The DNA of Uganda is therefore planning specific training sessions for dedicated DNA personnel in order to improve the data collection and data quality for future updates. This capacity building workshop is expected to be held before 2016.</p>

Date to of QC report finalization

Signature of the DNA

²⁰ Funded by the Belgian Development Agency (BTC), ccoordinated and managed by the DNA of Uganda and carried out/presented by the consultants.