

Inception Report

*Ghana REDD+ Database/Information System
Project*

April 2017

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1. SECTION I – INTRODUCTION

1.1. Purposes and Objectives

According to the terms of reference for the project the key objective of the data management system is to create a repository for information on project activities and environmental indicators.

During the inception meeting with the NRS and Forestry Commission it was stated that the REDD+ database will be considered successfully implemented if the following is met:

- i. User friendliness
- ii. Ability to easily generate emissions estimates and requisite reports
- iii. Ability to display spatial information for basic GIS analyses towards enhancing transparency in calculating Emission Reductions
- iv. Potential for upgrading of database as data requirements become complex with time or Ghana begins implementation of other sub-national REDD+ programmes
- v. Its ability to serve as the online repository for Ghana's National Forest Monitoring System
- vi. Staff are trained on the software
- vii. Reports can be easily generated
- viii. The online database is easily found via search engines
- ix. The online interface can track the number of visitors to the site
- x. Provide links to other databases (e.g. SIS, EPA Climate Data Hub).
- xi. The database should have an offline mode

The consultants agree with the above measures of success, with the exception of creating a separate offline version of the software. While recognizing the value of this, it was not included in the TORs or proposal and is considered outside the scope of the current project. During the meeting there was also considerable discussion around what calculations the database should perform automatically. Automating all calculations – including those associated with the monitoring system – is complex. The database will store primary data associated with monitoring, and will also automatically calculate ERs available for sale, but will not automate all steps associated with analysis of monitoring data. See below for additional discussion.

1.2. Summary of Activities and Deliverables

For the aim of the project to be achieved, the activities include:

- Kick-off Meeting(s) to determine requirements and gather data
- Programming and implementation of Online Database in collaboration with client's contact person
- Training of selected personnel
- Dummy run of the database in collaboration with the client
- Handing over and hand-holding via ongoing IT support consisting of 10 days of Screaming Digital staff time made available over a 6 month period.

The key outputs of these activities are:

- Reports (inception, draft and final)
- Online system deployed to a cloud server

2. SECTION II – METHODOLOGY AND WORK PLAN

2.1. Summary of Key Questions and Input Data

2.1.1. Key personnel

Table 1: Key personnel rights and responsibilities

	Question	Response
	Who will have rights to upload data?	<ul style="list-style-type: none"> • Anyone designated to have upload rights by an administrator. This is expected to include NRS and IT staff (FC staff).
	Who will be responsible for checking and approving data?	<ul style="list-style-type: none"> • MRV / Registry Specialist or others designated by the administrator • There will be 2 levels of approval for all data uploaded into the system before the data is published and becomes live. An initial screening will check uploaded data for completeness and approve, correct, or reject. If rejected the person who uploaded the data will need to re-enter the data. Once approved, the Head, NRS will be alerted and will give final approval that will result in the data being published onto the live website.
	Who will have administrator rights?	<ul style="list-style-type: none"> • Head of IT • Head of NRS

2.1.2. Data Capture and Processing

Table 2 (below) lists the types of data that will be included in the database along with the format in which the data will be stored. The table was created after careful review of the following issues and decisions: transparency, Nationally Determined Contributions (NDC), MRV sections of UNFCCC COP decisions, the FCPF Methodological Framework to ensure compliance with transparency and other requirements, the data used to calculate Ghana's reference level, and through discussion with the NRS and FC in the initial kick-off meeting.

All data will be public, and will follow the same uploading and approval process described below. Data may be updated on a rolling basis, with historic records archived and available for viewing and reporting as needed.

During the kick off meeting, the NRS and FC requested that the database include **automatic calculation of emission factors, removal factors, emissions, removals, and emission reduction credits within the database**. Screaming Digital discussed this option with the Winrock team that developed the reference level for Ghana. The TORs for the work and our proposal focused on building a database that acts as a repository of information and can calculate and track ERs rather than fully automated software to calculate all information captured as part of Ghana's monitoring procedures. Programming all the calculations in the REL requires additional programming time not budgeted. The existing budget will be allocated to cover the costs of programming the following six calculations in the database. The underlined parameters in formulae 1 will be calculated in the REDD+ database in formulae 3 – 6 below:

1. Calculation of **emission reductions and removals available for sale**, which is calculated as follows:

$$ERs = (RELe - RVe) - (RELr - RVr) - DEFu - DEGu - BA - DC$$

Where each of these parameters are defined as follows:

ERs = Emission reductions and removals available for sale

RELe = Reference level emissions

RVe = Reported and verified emissions (since program start for first verification or since last verification for subsequent verifications)

RELr = Reference level removals

RVr = Reported and verified removals (since program start for first verification or since last verification for subsequent verifications)

DEFu = Uncertainty from deforestation

DEGu = Uncertainty from degradation

BA = ERs sent to the buffer account

DC = ERs deducted to avoid double counting

2. Calculation of **R (reversals)**, which will be calculated as follows:

$$\mathbf{R = (tRVe + tRVr) - ERtrans} \quad \textbf{Note: A reversal will occur where R is a negative number}$$

Where each of these parameters are calculated as follows:

tRVe = total RVe (i.e. the cumulative sum of all reported and verified emissions to date)

tRVr = total RVr (i.e. the cumulative sum of all reported and verified removals to date)

ERtrans = ERs in the transferred / sold account

3. Calculation of **RELe (reference level emissions)**, which will be calculated as follows:

$$\mathbf{RELe = DEFh + LLh + ILh + FWWh + FFh}$$

Where each of these parameters are defined as follows:

RELe = Reference level emissions

DEFh = Historical annual emissions from deforestation

LLh = Historical annual emissions from legal logging

ILh = Historical annual emissions from illegal logging

FWWh = Historical annual emissions from fuelwood extraction

FFh = Historical annual emissions from forest fire

4. Calculation of **RELr (reference level removals)**, which will be calculated as follows:

$$\mathbf{RELr = OnPPh + OffPPh}$$

Where each of these parameters are defined as follows:

OnPPh = Historical annual removals from on-reserve plantation programs

OffPPh = Historical annual removals from off-reserve plantation programs

5. Calculation of **RVe (reported and verified emissions)**, which will be calculated as follows:

$$\mathbf{RVe = DEFrv + LLrv + ILrv + FWrv + FFrv}$$

Where each of these parameters are defined as follows:

RVe = Reported and verified emissions since the program start or last verification

DEFr_v = Reported and verified emissions from deforestation (since program start for first verification or since last verification for subsequent verifications)

LLr_v = Reported and verified emissions from legal logging (since program start for first verification or since last verification for subsequent verifications)

ILr_v = Reported and verified emissions from illegal logging (since program start for first verification or since last verification for subsequent verifications)

FWr_v = Reported and verified emissions from fuelwood (since program start for first verification or since last verification for subsequent verifications)

FFr_v = Reported and verified emissions from forest fire (since program start for first verification or since last verification for subsequent verifications)

6. Calculation of **RVr (reported and verified removals)**, which will be calculated as follows:

RVr = OnPPrv + OffPPrv

Where each of these parameters are defined as follows:

OnPPrv = Reported and verified removals from on-reserve plantation programs (since program start for first verification or since last verification for subsequent verifications)

OffPPrv = Reported and verified removals from off-reserve plantation programs (since program start for first verification or since last verification for subsequent verifications)

A no-cost extension of the contract will be needed to accommodate this additional programming and time taken to approve the inception report. Subject to the timing of NRS approval of this inception report and the proposed specifications contained herein, a functional beta version will still be ready for when the ER-PD is presented to the FCPF – it just may not have these additional features finished.

Data processing will occur as follows:

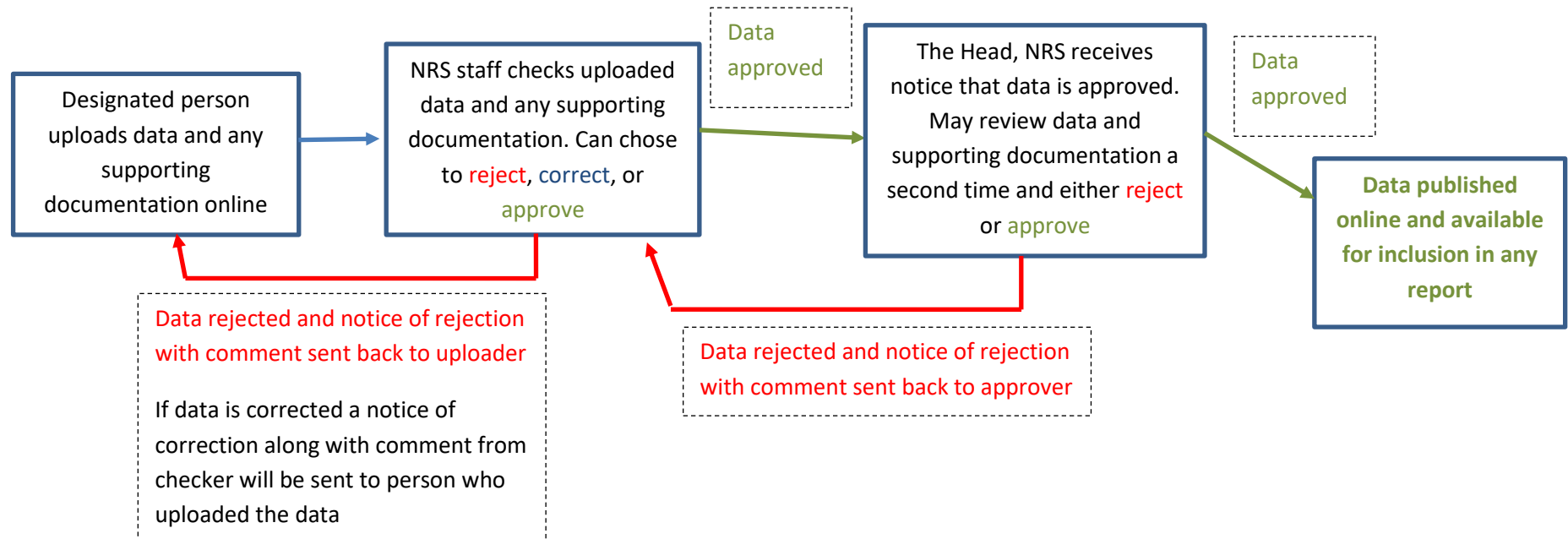


Figure 1: Data processing flow chart

Table 2: Database data types and formats

Types of input data to be captured	What format is the data captured in. What is the unit of data? If electronic, what devices are used, what format is the file, etc.	Does the data have a spatial component? If so, how is this recorded? (shape file, GPS coordinates or point?)	Anything else to consider? Notes
Data captured for ER and other calculations			
DC = ERs deducted to avoid double counting; i.e. credits issued by other programs	Credits issued by other programs that need to be deducted from ERs claimed by Ghana will be recorded. Information is expected to include both PDFs of reports on the number of credits issued in the other system along with an excel table that records the number of credits and is uploaded into the database.	Yes	NRS staff will need to check other program's websites and upload information from other sites, potentially including but not limited to VCS, Gold Standard, and CDM. Will be calculated by NRS as part of the monitoring system
DEFu = Uncertainty from deforestation	Input parameter calculated by NRS according to Meth Framework Criterion 22.	No	
DEGu = Uncertainty from degradation	Input parameter calculated by NRS according to Meth Framework Criterion 22.	No	
BA = ERs sent to the buffer account	Input parameter calculated by NRS based on the reversal risk assessment - see Meth Framework Criterion 18	No	
DEFh = Historical annual emissions from deforestation	Input parameter calculated by NRS	No	
LLh = Historical annual emissions from legal logging	Input parameter calculated by NRS	No	
ILh = Historical annual emissions from illegal logging	Input parameter calculated by NRS	No	
FWh = Historical annual emissions from fuelwood extraction	Input parameter calculated by NRS	No	

FFh = Historical annual emissions from forest fire	Input parameter calculated by NRS	No	
OnPPh = Historical annual removals from on-reserve plantation programs	Input parameter calculated by NRS	No	
OffPPh = Historical annual removals from off-reserve plantation programs	Input parameter calculated by NRS	No	
DEFrv = Reported and verified emissions from deforestation since the program start or last verification	Input parameter calculated by NRS	No	
LLrv = Reported and verified emissions from legal logging	Input parameter calculated by NRS	No	
ILrv = Reported and verified emissions from illegal logging	Input parameter calculated by NRS	No	
FWrv = Reported and verified emissions from fuelwood extraction	Input parameter calculated by NRS	No	
FFrv = Reported and verified emissions from forest fire	Input parameter calculated by NRS	No	
OnPPrv = Reported and verified removals from on-plantation programs	Input parameter calculated by NRS	No	

OffPPrv = Reported and verified removals from off-plantation programs	Input parameter calculated by NRS	No	
<i>Outputs calculated by the REDD+ Database automatically and stored in the database and made available for reporting</i>			
ERs = Emission reductions and removals available for sale	See equation above	No	
RELe = Reference level emissions	See equation above	No	
RVe = Reported and verified emissions (since the program start or last verification)	See equation above	No	
RELr = Reference level removals	See equation above	No	
RVr = Reported and verified removals (since the program start or last verification)	See equation above	No	
Reversals	See equation above	No	Note: A reversal will occur where R is a negative number
tRVe = total RVe (i.e. the cumulative sum of all reported and verified emissions to date)	See equation above	No	
tRVr = total RVr (i.e. the cumulative sum of all reported and verified removals to date)	See equation above	No	

ERtrans = ERs in the transferred / sold account	See equation above	No	
<i>Other Data Captured and Stored in the REDD+ database for record keeping, transparency, and report generation purposes</i>			
Carbon stock	Scan of paper record will be uploaded and stored in database. Electronic records will be recorded in a Microsoft excel spreadsheet that can be uploaded into the database to create the electronic record.	Yes – GPS coordinate (points and polygons)	Methods for estimating will be available online
Deforested area	Raster files	Yes, georeferenced in satellite images.	Remote sensing analysis needed before data uploaded
Volume of logs extracted legally	Electronic records will be recorded in a Microsoft excel spreadsheet that can be uploaded into the database to create the electronic record.	Yes, GPS coordinates of the stump site.	Methods for estimating will be available online Over time, data from the Wood Tracking System (WTS) being implemented under VPA should be captured.
Volume of logs extracted illegally	Electronic records will be recorded in a Microsoft excel spreadsheet that can be uploaded into the database to create the electronic record.	Specific only to administrative units (locality).	Methods for estimating will be available online. Over time data from the WTS being implemented under VPA should be captured.
Biomass available for wood fuel harvest	Excel tables	Ability to capture spatially will be programmed into the database.	Methods for estimating will be available online
Forested area burned	Raster files	Yes, georeferenced in satellite images.	Remote sensing analysis needed before data uploaded
Area planted under NFPDP	Excel tables	Yes, specific to forest reserve and off-reserve areas	
Area planted outside NFPDP	Excel tables	Yes	Data not yet captured but expected to be in the future

			so functionality will be pre-programmed in.
Removal factors for plantation species	Data is estimated from Microsoft excel spreadsheets, and data from the spreadsheets will be uploaded into the database. Updates to how a removal factor is calculated will be made in the spreadsheet that is outside the database.		Calculation, not field-based Methods for estimating will be available online
HIA Boundaries / CREMA boundaries	Shape files	Yes	This supports transparency around the Implementation Plan
Carbon benefits – payments for ERs	Data on payments received from selling ERs. To be recorded next to the sold ER account.	No	Crucial issue for transparency
Non-carbon benefits – cocoa yields	Excel tables	Yes	Data likely be aggregated at HIA or sub-HIA levels, but not at farmer level to protect farmers' privacy
Other non-carbon benefits	The database will be able to store other documents of non-carbon benefits on a page for each HIA that contains files that can be downloaded.	No	
Other Safeguard information	To be included in separate SIS database. A passive hyperlink will allow public to click to the other database for additional safeguard information.	NA	

2.1.3. Existing Data to be loaded into the system

All the data that were used to calculate the reference level will be uploaded into the system.

2.1.4. Links to other databases

Table 3 provides an overview of the types of systems, data, and information that is critical to the ERP, but will be captured in other databases, with an indication of the links to be provided.

Table 3: Links to other databases

Name of other database or system (and URL if possible)	An overview of the type of data that is or will be included in the other database	Please describe how the two systems will be linked – e.g. will the REDD+ database send info to the other system, receive info, or both?
Safeguard Information System	FGRM, Benefit Sharing, Land and Tree Tenure	The REDD+ database will provide a link to the other database or systems
EPA GHG Database (http://climatedatahubgh.com/ghg-database.html)	Data on AFOLU (Forestry sector)	The REDD+ database will provide a link to the other database or systems
VCS, CDM, or other project databases	Carbon projects or programs registered with voluntary market or CDM.	The REDD+ database will provide a link to the other database or systems PLUS the REDD+ database will flag any ERs issued under other systems from projects
Climate smart cocoa landscape standard: Likely that it will initially sit with VCS and may eventually link with Cocoa Board	Description of the Ghana Cocoa Landscape standard, methods for assessing the standard, and validation report.	The REDD+ database will provide a link to the other database or system

2.1.5. Other Ecological zones to be included in the design

Ghana's National REDD+ Strategy describes a plan to roll-out REDD+ through landscape programs defined by ecological boundaries, and in some cases commodities of national and international importance. The other landscapes (outside the ERP area) listed in the National REDD+ Strategy are:

1. Northern Savanna Woodland Shea Landscape
2. Togo Plateau
3. Coastal Mangrove Zone
4. Transitional Zone

The database will be built such that as the design of these programmes advances to implementation, data and information can be captured in the system.

2.2. Establishment of Data Flow – Capture, Review and Publishing

The data will flow into the database through the following processes:

- **Data capture**
Here the primary data is entered into the online system from notes taken in the field and elsewhere. Scanned copies of the field notes are uploaded along with the data entered to serve as originating documents. Secondary data are also uploaded from simplified spreadsheets containing the emissions calculations.
- **Review of Data and Validation**
The primary entered data are validated against the scanned copies and approved for processing/publication. The secondary data uploaded is validated against the spreadsheet calculations.
- The processed information is published by the final authority in the approval process.
- Revisions to already published information will be published with comments, retaining previous publications for reference.

See Figure 1 in section 2.1.2 for a diagram representing this.

2.3. Implementation of Software Features and Deployment of Software

An incremental approach will be used in software development with the NRS reviewing the product fortnightly. During the building of the software, the initial deployment and subsequent updates will be available online for NRS to access and provide feedback.

The features to be included in the software are:

- Authentication, authorisation, and role-based access
- Online data capturing
- Online uploading of data from file such as Excel spreadsheet
- Uploading of other files with spatial data (shape files etc.)
- Functionality to validate captured data and uploaded files
- Functionality to publish validated information

- Functionality to publish revisions and archiving old copies for reference
- Reports generation from published information. Reports may be generated on any of the data sets included in the database.
- Functionality to export reports into MS Excel, PDF and MS Word.
- Provision of links to other nominated systems such as that of EPA, SIS, FC webpages, etc.
- Interface to dynamically generated maps from captured spatial information (i.e. visualisation)
- Management of carbon accounts
 - Generation of serialised emission reduction credits
 - Establishment accounts:
 - 1) holding account;
 - 2) sold account – that tracks who the credits were sold to;
 - 3) buffer account; and
 - 4) cancellation account.
 - An administrator or other designated user will have the authority to move credits between accounts
 - Indication of status of account and transfers between accounts
 - Filtered views (listing) for HIAs
- Data security will be built into the system using Secure Sockets Layer (SSL) for all data in transit.
- Back-up and restore feature should be included in the functionalities.
- The source code will be a bonafide property of the Forestry Commission.

2.4. Proposed but out-of-scope specifications

During the kick-off meeting a number of possible design specifications and functionality were discussed. The team carefully reviewed each request to assess the level of effort needed to meet the specifications and whether or not the requests were within the scope of the TORs and the proposal. The team also considered the advantages and disadvantages of the request for the REDD+ database, and if there were other options to achieve the same functionality. The following requests were considered to be beyond the scope of the current project and will not be delivered under the current contract, but could be added to the database in the future:

- **Offline versions of the database to allow field collection on devices offline and automatic syncing once re-connected:** The TORs and our proposal only referred to building an online database and building offline versions for different devices that sync with the online database requires additional programming that is beyond the scope of the current assignment. Mobile Apps (Android, etc.) will not be built under this assignment. In the field, the primary data will be collected with another tool or clipboard before being uploaded or entered into the online database. The upload functionality facilitates the entry of data in bulk whenever there is Internet connectivity. The database will be able to store scans of hard copies of field data for archiving and to allow cross checking primary data against

digital records. We recommend starting with a simple database that can work for the purposes of the ER-PD and FCPF needs initially. Additional functionality and features such as this could be added over time.

The team also discussed with the NRS and FC how the REDD+ database should share or extract information from other data sources in other on-going GoG projects – e.g. the databases listed in 2.1.4 above. It was agreed during the kick-off meeting that staff from other agencies could be granted upload rights as needed, and would also be free to download any data from the database via the report function. It was therefore considered unnecessary for the REDD+ database to either directly read or serve data in other software systems.

2.5. The proposed platform and tools to be used:

The platforms and tools that are proposed to be used in building and maintaining the data management and information system are listed in Table 4.

Table 4: Proposed platforms and tools

Platform & Tools	Description	Estimated Cost
Platform	Platform as a Service (PaaS) offering from Microsoft Azure	100.00 USD / month
Programming Language and Framework	C# and ASP.NET MVC	-
Database backend	MS SQL Server 2012/2016 (Standard)	20 USD / month
Graphical User Interface and Interactive Reports	Telerik UI components for ASP.NET MVC (Perpetual licence)	1,149.00 USD
GIS components / plugins	Easy GIS .NET Web Edition (Alternatives: Google Maps, CartoDB, ...)	-
Documentation Tools	Microsoft Office Professional and MS Visio 2007	-

The team will use the budget set aside for the server to cover the cost of the above. It is expected that the budget will be able to pay the platform and database backend costs in advance for 5 years.

2.6. Training of Selected Staff and Feedback

Training of the staff will start before the final deployment of the software. This is to enable the consultants to obtain some feedback for incorporation into the final release of the software.

2.7. Project Management:

Winrock International is the lead organisation responsible for managing and completing this project. Winrock is working in collaboration with Kenneth Azumah of Screaming Digital and Rebecca Asare, an independent consultant.

- Winrock will provide overall oversight and management of the work. With expertise in REDD+ and in the calculation of reference levels and MRV system in particular, Winrock will ensure that the necessary requirements and specifications are met, and that the appropriate types of data and data formats are captured in the system. It will lead in communications with the NRS and in ensuring that reports are completed in a thorough and timely manner.
- Screaming Digital will be responsible for building the online software, drafting the user manual, and providing training to NRS and FC-IT Unit staff.
- Rebecca Asare will support Winrock in the generation of reports, in liaising with the NRS, and in integrating a description of the system into other key documents as requested by the NRS.

The table below describes specific tasks, activities, person responsible, time frame and expected deliverables.

2.7.1. Work plan

Table 5: Work plan to completion of data management/information system

	Objective/Task	Activities / Methods	Primary Responsibility	Time Frame – note dates are indicative and depend on timely responses from NRS	Expected Output / Deliverables
1	Requirements Specification and Documentation	Kickoff meetings Writing and Acceptance of Specifications	Winrock, Screaming Digital and R. Asare	3 weeks (14 th – 28 th March 2017)	
2	Building of Online Software	Requirements Analysis	Screaming Digital Consult	2 weeks (29 th March – 11 th April 2017)	Input data and calculation formulae defined
		Systems Design			Entity-Relationship Diagram of Database
		Systems Programming (Coding)		3 weeks (12 th April – 8 th May, 2017)	
		Testing and Deployment		1 week 9 th – 16 th May 2017	Online System Deployed
3	User manual	Initial Draft Manual and revisions covering changes within project period	Screaming Digital Consult	1 week – during testing and deployment stage	User manual in soft and hard copy
4	Training	<ul style="list-style-type: none"> Basic online skills User management Analyses/management of data capturing and processing 	Screaming Digital Consult	4 days 16 th -19 th May, 2017	Selected staff trained to manage the online system and upload existing data
5	Loading of Initial Data	Extraction, Transformation and Loading (ETL) of Existing Data	Screaming Digital with NRS, GFC	2 days 22 nd – 23 rd May 2017	
6	Reporting	Draft Report	Winrock with R. Asare	1 week 17 th – 23 rd May, 2017	
		Final Report	Winrock with R. Asare	1 week 29 th May – 2 nd June 2017	