Research Methodology Note

WASH Infrastructure Coding

BGD1903

Bangladesh

28/08/2019
V3

REACH Informing more effective humanitarian action

1. Executive Summary

Country of intervention	Bangladesh					
Type of Emergency	□	Natural disaster	X	Conflict		
Type of Crisis	□	Sudden onset	□	Slow onset	X	Protracted
Mandating Body/ Agency	UNICEF					
Project Code	70iAJC (UNICEF WASH)					
Research Timeframe *Add planned deadlines (for first cycle if more than 1)*	1. Start collect data: Tubewells: 09/04/2019 Sanitation: 05/08/2019		5. Preliminary presentation: Tubewells: 08/07/2019 Sanitation: 20/10/2019			
	2. Data collected: Tubewells: 01/07/2019 Sanitation: 30/09/2019		6. Outputs sent for validation: Tubewells: 08/08/2019			
	3. Data analysed: Tubewells: 21/07/2019 Sanitation: 14/10/2019		7. Outputs published: Tubewells: 29/08/2019			
	4. Data sent for validation: Tubewells: 18/07/2019 Sanitation: 21/10/2019		8. Final presentation: Tubewells: 15/08/2019 Sanitation: to be discussed			
Humanitarian milestones *Specify **what** will the assessment inform and **when*** *e.g. The shelter cluster will use this data to draft its Revised Flash Appeal;*	**Milestone**		**Deadline**			
	□	Donor plan/strategy	No specific deadline			
	□	Inter-cluster plan/strategy	No specific deadline			
	X	Cluster plan/strategy	Midterm Review JRP 2019 Endterm Review JRP 2019			
	□	NGO platform plan/strategy	No specific deadline			
	X	Other (Specify): reporting from implementing partners (both internal and external)	No specific deadline			
Audience Type & Dissemination *Specify **who** will the assessment inform and **how** you will disseminate to inform the audience*	**Audience type**		**Dissemination**			
	Strategic (Cox's Bazar WASH sector) Programmatic (Cox's Bazar WASH sector) Operational (WASH sector and Site Management Sector implementing agencies)		Cluster Mailing (WASH) Website Dissemination (Relief Web, HDX & REACH Resource Centre)			

Detailed dissemination plan required	□	Yes	X	No
General Objective	To strengthen strategic planning, programmatic decision-making, and operational monitoring for key WASH infrastructure in Rohingya refugee camps in Cox's Bazar through tagging with unique identifier codes.			
Specific Objective(s)	• To facilitate accurate, consistent spatial identification of unique WASH infrastructures by all interested actors • Provide a baseline 'snapshot' of WASH infrastructure functionality at the time of coding. • To establish a common dataset of tubewells, bathing cubicles, latrines and FSTPs to be used by all partners			
Research Questions	Tubewells • How many tubewells are there and where are they located? • How many tubewells have a high or very high contamination risk and where are they located? • How many tubewells are functioning and where are they located? Sanitation infrastructures (latrines and bathing cubicles) • How many sanitation facilities are there and where are they located? • How many sanitation facilities that are made out of tarpaulin and bamboo are there and where are they located? • How many latrines have a septic tank and where are they located? • How many twin pit latrines are there and where are they located? • How many sanitation facilities are gender segregated and where are they located?			
Geographic Coverage	All ISCG regocnized camps with exception of Kutupalong RC and Choukhali[1]			
Secondary data sources	• REACH infrastructure mapping rounds 7, 8 and 9 will be used for triangulation. • Most recent UNHCR Population data will be used to calculate number of people per functional tubewell. • REACH/UNOSAT January 2019 shelter footprint data will be used to calculate number and percentage of shelters within 200 meters of closest tubewell with handpump.			
Population(s)	X	Refugees in camp		
Stratification	X	No		
Data collection tool(s)	X	Structured (Quantitative)		
	Sampling method		**Data collection method**	
Structured data collection tool # 1 *Select sampling and data collection method and specify target # interviews*	X Census		X Questionnaires based on direct observations Target: Tubewells: 20,270 Latrines: 42,260 Bathing cubicles: 23,820 FSTPs: 450	
Data management platform(s)	X	Kobo	X	Dropbox
	X	Excel	X	R

[1] Kutupalong RC is currently a no-go area for REACH teams due to ongoing security concerns; Choukhali has been identified as a camp extension site, but is not currently populated.

Expected ouput type(s)	X	3 x clean "master" datasets and analysis tables in excel for 1) tubewells, 2) FSTPs, and 3) latrines and bathing facilities	X	10 x set of weekly progress reports to AFAs, members of the Tubewell Coding Sub-Group, the WASH Sector, TWiG Co-Chairs and all other interested parties across all phases of the coding roll-out	X	Mapset for tubewells
	X	2 x summary datasets by camp level containing analysis of tubewells, and latrines and bathing facility attributes	X	3 x coding system orientation sessions for the WASH Sector and the CFAs and other implementing partners on when, how and why to maintain and use the coding database	X	2 x lessons learned and key findings presentation
Access	X	Public (available on REACH resource center and other humanitarian platforms)				
Visibility *Specify which **logos** should be on outputs*	Cox's Bazar WASH sector, UNICEF, REACH					

2. Rationale

2.1. Rationale

Since August 2017, an estimated 700,000 Rohingya refugees have arrived in Bangladesh's Cox's Bazar District from Myanmar. The early stage of the crisis was characterized by a significant daily influx of refugee populations within rapidly-expanding new camps and spontaneous settlements across Ukhia and Teknaf Upazilas (sub-districts). Meanwhile, humanitarian actors were quickly upscaling their life-saving interventions, to provide basic services to Rohingya populations through in-kind distributions and by building emergency infrastructure – much of it poor quality and temporary in nature.

Throughout 2018-19, WASH Sector partners have worked to replace poor quality infrastructure by establishing standards and coordination systems to support more effective operations and maintenance. One major barrier to monitoring and maintaining infrastructure has been the absence of a unique identifier coding system. With an estimated 86,000 WASH facilities managed by over 50 implementing partners, monitoring and maintenance of infrastructure for strategic and operational purposes has proved very challenging. As the humanitarian response has shifted from an emergency to a protracted crisis, infrastructure monitoring data - including REACH's infrastructure monitoring censuses in 2017-18 – has not been effectively converted into actionable responses, and was rather used for strategic than operational purposes. Multiple datasets often contradicting each other has further hampered strategic and operational planning.

In the second year of the response, with fewer WASH facilities being built and decommissioned than in the first year – meaning facility censuses vary to a lesser extent - an opportunity is presented to build a unique identifier (UUID) database containing information about all WASH facilities, to assist in implementing better strategic and operational planning and

monitoring on an ongoing basis. Between April and August 2019, REACH will apply unique identifiers to all tubewells, latrines, bathing facilities and fecal sludge treatment plants (FSTPs) within the ISCG-registered camps, with unique information (type, location, and specifications) for each facility stored in a database. The database along with Standard Operating Procedures (SOPs) guiding processes for updating and using the database will form the basis of the WASH infrastructure coding system that will be maintained by the WASH Sector.

Image 1: Yellow tag on tubewell

3. Methodology

3.1. Methodology overview

Tubewells will be tagged first, followed by FSTPs, bathing facilities and latrines. The process of physically applying unique identifiers on each of these facilities is as follows.

Tubewells

A yellow label will be physically applied to each tubewell (see image 1 and 2). This label contains a barcode, the six-digit numerical version of the barcode, and in most cases a label code.[2] The barcode will serve as the unique identifier. The label code starts with a geocode that refers to the camp, followed by a three or four-digit number. The label code is aligned with a national coding system used by the Government Department of Public Health Engineering (DPHE), which is responsible for installing and maintaining tubewells across the country.

Image 2: Yellow tag used for tubewell coding

Latrines and bathing cubicles

Latrines and bathing cubicles will be coded with 4x6 inch waterproof stickers (see image 3). These stickers were procured based on their high levels of resistance to water and sunlight, as well as their ability to stick effectively to curved surfaces.[3] Stickers were designed in consultation with the WASH Sector Sanitation Technical Working Group (TWiG) and include a sector logo and a unique identifier code. Barcodes were not included on the labels due to TWiG concerns about potential negative community reception. The facility unique identifier on the sticker is numerical and contains eight digits, with the first two numbers indicating the type of facility (01 for latrines, and 02 for bathing cubicles).

With an estimated 40,000 latrines, a five-digit code will allow coding up to 99,999 latrines. To mitigate the potential of a large sudden increase in the amount of infrastructure, a six-digit code for both latrines and bathing facilities will be used. Therefore, up to 999,999 facilities for each type can be included in the database. Both the labels and the unique identifier sequencing for bathing cubicles and latrines will use the same format with the exception of the first two digits of the code.

[2] Tubewell label inventory was procured by UNICEF under a separate grant and handed over to REACH in early 2019. REACH or the WASH sector were thus not involved in the choice of label material or design. Approximately 10% of all labels were supplied with a barcode only and no label code.

[3] Labels are made of Zebra 8000T Vinyl Outlast material. For full product specifications, see Selector Guide: Genuine Zebra Supplies: https://www.zebra.com/content/dam/zebra/product-information/en-us/brochures-datasheets/supplies-accessories/supplies-selector-guide-en-us.pdf (accessed 5 August 2019).

FSTPs

FSTPs (see image 4) will be coded by using spray paint and stencils. As FSTPs differ in size, type, structure and material, using spray paint may not always be possible. In facilities where spray paint is not possible, the stickers used for latrines and bathing cubicles will be used. As agreed with the Sanitation TWiG, the code for FSTPs will start with 03, and will contain six digits in total. With 450 FSTPs requiring coding, it is unlikely that more than 9999 FSTPs will be coded in the future and therefore having four digits is assumed to include a sufficient buffer. Unlike other types of WASH infrastructure, there is an existing database of FSTPs with GPS locations. This exercise will therefore seek to update the current database with a unique facility ID rather than conducting a camp census to build a new database. Enumerators will therefore navigate to the coordinates of each FSTP in the existing dataset in order to apply a code.

3.2. Population of interest

The population of interest for this assessment includes all tubewells, latrines, bathing cubicles and FSTPs in all ISCG-recognized camps located in Ukhia and Teknaf Upazilas[4]. However, the following exceptions apply:

Tubewells

In camps where refugees live together with host communities, tubewells clearly belonging to host community households (e.g. with no clear identifying attributes to suggest they have been built by humanitarian organisations) will not be tagged, since they fall outside of the WASH sector's mandate. Additionally, privately-owned tubewells located inside shelters and built by an individual (refugee or host) that is not part of a humanitarian organisation will be excluded. Tubewells without a handpump will not be tagged with a unique identifier code but will have their GPS locations marked in order to aid Sector partner follow-up if required. Non-tubewell water infrastructure (such as tapstands, ring wells, etc.) fall outside of the scope of this assessment.

Latrines and bathing facilities

Privately-owned household facilities that are built and maintained by any individual (refugee or host) that is not part of a humanitarian organisation will be excluded, since they again fall outside of the Sector's mandate. This category of facilities is often found inside shelters, and enumerators will be instructed not to code anything that is within a shelter. Additionally, latrines that are part of another facility (e.g. a health centre or a school) will be excluded because the WASH Sector is not responsible for these facilities.

Image 3: Design sticker latrine coding

FSTPs

FSTP open desludging ponds will not be included in the coding roll-out. This is because this type of FSTP does not comply with the WASH Sector's standards and are therefore being decommissioned.

Image 4: Fecal Sludge Treatment Plant

3.3. Governance

[4] Bangladesh is divided in 8 divisions, which are subdivided in districts. Each district consists of upazilas, which are comparable to subdistricts.

To facilitate collaboration with and inform the WASH Sector and partners, REACH is coordinating the Tubewell Coding Sub-Group under the Water TWiG before and during the roll-out of the tubewell coding component of the coding system. The objectives of this sub-group are as follows:

- Develop/agree and sign off ToR for WASH Infrastructure Coding
- Agree on the database template
- Develop/agree and test communications strategy to inform the community, community mobilizers and employees from other NGOs/UN organizations
- Develop/agree (and test) process for database update

The Tubewell-Coding Sub-Group meets bi-weekly, with members including the co-chair of the Water TWiG, the three Area Focal Agencies (AFAs)[5], three Camp Focal Agencies (CFAs)[6], as well as the WASH Sector information management unit. All decisions regarding the establishment, maintenance and usage of the coding system will be made jointly by the WASH Sector's Water TWiG and Sanitation TWiG. Because sanitation coding will be rolled out once tubewell coding is complete, and the coding process is anticipated to be largely the same as those for tubewell coding, there will be no separate sub-group under the Sanitation TWiG during the roll-out of sanitation coding.

3.4. Secondary data review

REACH will use rounds 7-9 of its 2018 infrastructure monitoring data to provide initial estimates of the numbers of tubewells, latrines and bathing cubicles in each camp. This information will guide the planning during the roll-out, as it provides an approximate number of days required to finalise each camp. This data was collected in May-June 2018 (round 7), August 2018 (round 8), and September-October 2018 (round 9). To guide the coding of FSTPs, an existing dataset comprising GPS points of all WASH partners' facilities will be used.

Additionally, UNHCR population data will be used to calculate the number of people per facility during supplementary analysis of data collected. This dataset updates approximately bi-weekly and provides information on the number of individuals and families per camp. As of June 2019, the most recent version of the dataset is from 15 May 2019.

Thirdly, the REACH/UNOSAT January 2019 shelter footprint dataset will be used to be able to calculate the number and proportion of shelters within 200 meters of a tubewell, latrine or bathing facility. This data can be downloaded from OCHA's Humanitarian Data Exchange (HDX) here.

3.5. Primary Data Collection

Tools

Prior to data collection for each phase, REACH will develop a Kobo form in collaboration with the relevant Sector TWiG, aimed at collecting information for each facility type to meet the information needs of the WASH Sector. These forms will differ between tubewells, latrines and bathing facilities, and FSTPs. All Kobo forms will include a function to input the unique identifiers on the tags, stickers or spray-painted numbers that will be physically applied to each facility.

Tubewells

As shown in image 1 above, the tubewell tags consist of three elements (barcode, barcode number and label code). The tool for tubewells will record the barcode number (which can be entered both manually and by scanning the barcode using the barcode reader function in Kobo), the label code, basic attributes of the tubewell, functionality, and a short sanitary survey on the direct surroundings of the tubewell, which will generate an indication of facilities' contamination risk. The form will also include a basic functionality assessment which means that the coding exercise is doubled as a full census of the

[5] Three Area Focal Agencies (IOM, UNHCR and UNICEF) coordinate the WASH activities in between eight and fourteen camps each. They report directly to the WASH Sector. For more information, refer to the AFA ToR: https://www.humanitarianresponse.info/en/operations/bangladesh/document/tor-wash-sector-area-focal-point.

[6] Each camp has a Camp Focal Agency who is responsible for the coordination of all WASH activities in that camp. They report to the AFA. For more information, refer to the CFA ToR: https://www.humanitarianresponse.info/en/operations/bangladesh/document/tor-wash-sector-camp-focal-point

functionality status of the tubewells. The tool will be validated by the Tubewell Coding Sub-Group and piloted prior to implementation.

Sanitation

For sanitation there will be two different tools, one combining bathing cubicles and latrines, and one for FSTPs. Both will be shorter than the tool for tubewells and collect data only on basic, unchanging attributes, not functionality.[8] The sanitation tools will be limited to the facility code, type of infrastructure, geographical location and basic design aspects. The Kobo forms for bathing facilities and latrines will be validated by the co-chairs of the Sanitation TWiG. As with tubewells, the forms will be piloted prior to implementation. Both bathing facilities and latrines can be either a single facility or part of a block containing multiple facilities. When part of a block, each facility will be tagged with a separate sticker to facilitate accurate identification of all infrastructures. However, only a single GPS point will be taken for the block. One form will therefore be used per block containing a looping section for each cubicle it contains.

Where possible, questions and options in all the forms will be accompanied by photos (e.g. different types of infrastructure) in order to aid enumerator interpretation and ensure accuracy and objectiveness of data collected. In addition to the Kobo form installed on android smartphones, enumerators will carry a Garmin GPS device to collect the GPS location of the facility, as well as its unique identifier code. In previous infrastructure mapping rounds it has been noticed that GPS coordinates recorded with a smartphone are often not accurate enough to help in spatially identifying facilities, especially in a facility-dense environment like the Rohingya refugee camps. After data collection, the Garmin data will be linked to the Kobo data via the unique identifier codes.

Prior to implementation, the field teams (enumerators and team leaders) will receive a training on the Kobo tool and on using the Garmin devices, and how to apply the specific labels to the facilities, to avoid any confusion during data collection in the field and increase data accuracy. All tools will be translated in Bengali language with the support of Translators Without Borders in Cox's Bazar and the in-house translator.

Roll out

Data collection will be carried out by a team of 56 enumerators, supervised by seven team leaders and with oversight from a field coordinator. Data management and overall project management will be carried out by REACH Bangladesh's WASH team, with the Junior GIS Officer the focal point for the project.

Data collection for all tubewells, bathing facilities and latrines will be carried out employing the following methodology. Each camp will be divided up into a grid of 100x100m squares, which will be loaded as a shapefile onto the Maps.Me navigation app. Each grid square is covered by a single pair of enumerators, with one enumerator responsible for assessing the facility attributes while the other physically affixes the label to it. At the start of each day, team leaders assign grid squares to enumerator pairs by colour-coding them using the Maps.Me bookmark function, and sharing the bookmarks as a .kmz file by Bluetooth with each enumerator. Enumerators move through the grid in each camp moving north→south, west→east across the grid, walking across the grid and visiting each facility. After tagging each facility, they will also mark the bookmark location in Maps.Me to avoid duplication. After completion of a grid, the number of tagged infrastructures will be compared to the number of found infrastructures in rounds 7, 8 and 9 of last year's infrastructure mapping. Grid cells with a significant lower number of coded infrastructures will be revisited.

Since the number of FSTPs in the camps is substantially lower than other WASH facilities, the FSTP dataset developed by the WASH Sector and verified by its fecal sludge management (FSM) partners is assumed to be complete. Rather than doing a full census, enumerators will therefore use this dataset to navigate to the FSTPs they will be tagging.

Application of stickers onto facilities

[8] This is due to the structure of REACH's current grant, with functionality assessment budgeted for tubewells, but not for sanitation infrastructure.

Tubewells
As shown in images 1 and 2, a yellow tag will be applied to each tubewell. This plastic tag will be attached to the handpump with a steel tie wrap.

Latrines and bathing facilities
Latrines and bathing cubicles will be labelled with the white water-proof stickers shown in image 3. On each of the stickers a facility code will be printed. The stickers will be put on the door of the facility (see image 5). In case the facility is made out of bamboo and tarpaulin, the sticker should go on one of the bamboo pillars (see image 6). Enumerators will be instructed to clean the surface of the door prior to applying the sticker with a towel. Each facility will get its own coded sticker. The stickers and codes will be designed and printed by REACH.

Image 5: Location of sticker in sanitation facilities

Image 6: Location of sticker on infrastructures made out of bamboo and tarpaulin

FSTPs
Coding the FSTPs will be done using spray paint and stencils. Since different types of FSTPs have different structures and are made of different materials, spray paint will be procured in black and a brighter colour and will be applied to the different surfaces. Each stencil will be a separate piece with a single number on it, meaning that only 11 stencils (10 with the numbers 0-9 and one with a dash) are required to be able to create all the codes for the different FSTPs. The location of the spray paint on each facility will vary depending on the types of materials used, with enumerators aiming for solid and smooth surfaces (i.e. concrete slab or iron walls). In exceptional cases where it is not possible to use spray paint (for instance because the structure is not suitable for spray paint), the same types of stickers as those used for bathing facilities and latrines will be used, but with a separate FSTP code.

Timeline – roll-out

Tubewells
April – June 2019

Latrines and bathing facilities
August 2019 – September 2019

FSTPs
September 2019

3.5. Data Processing & Analysis

On each day of data collection, the collected data from phones will be uploaded to the REACH Kobo server. Daily numbers of facilities coded in each grid square will be compared by the REACH GIS team with highest numbers reported in REACH

infrastructure monitoring rounds 7-9 to cross-check comprehensiveness[9]. At the end of the first sweep of all camps, REACH will identify blocks with significant lower numbers of facilities compared to REACH infrastructure monitoring. Per grid will be assessed if there is need for a second sweep to clarify differences. Other data checks that are to be performed daily are enumerator statistics (e.g. number of completed surveys per enumerator per day, average survey time per enumerator), the number of facilities coded, the number of GPS points collected, the number of matching GPS points and collected surveys and the number of duplicated identifier codes. Additionally, checks will be performed on the GPS data coming from the Garmins to check for duplicated coordinates.

Throughout the coding roll-out, REACH's data team will conduct the data collection progress tracking and perform initial data cleaning. All these activities have been documented in a data cleaning SOP (see Annex I[10]). Any changes made in the dataset as a result of data cleaning will be recorded in a cleaning log. At the end of data collection, the REACH GIS team will also conduct spatial merges with camp boundaries, block boundaries, and mahjee block boundaries to ensure that spatial attributes of each infrastructure are accurately aligned.

Descriptive statistics of infrastructure attributes will be produced on the basis of a data analysis plan, which will be validated by REACH technical specialists in Geneva prior to publication of outputs.

3.6. Outputs

The outputs during and after data processing and analysis are the following:

- 10 x set of weekly progress reports to AFAs, members of the Tubewell Coding Sub-Group, the WASH Sector, TWiG Co-Chairs and all other interested parties across all phases of the coding roll-out
- 3 x clean "master" datasets and analysis tables in excel for 1) tubewells, 2) FSTPs, and 3) latrines and bathing facilities
- 2 x summary datasets by camp level containing analysis of tubewells, and latrines and bathing facility attributes
- 2 x coding system overview presentations, to be delivered to WASH Sector Water TWiG sub-group following completion of data collection for tubewells, and the Sanitation TWiG following completion of data collection for FSTPs, latrines, and bathing cubicles
- 3 x coding system orientation sessions for the WASH Sector and the CFAs and other implementing partners on when, how and why to maintain and use the coding database
- 1 x mapset showing locations and sanitary scores for tubewells

3.7. Follow-up

To guarantee the accuracy of the database, the development of appropriate procedures for updating the database is key. Through the Water TWiG Tubewell Coding Sub-Group, procedures for updating the database in case of decommissioning of tubewells and construction of new tubewells have been developed. The procedures for updating the database with new and decommissioned sanitation facilities will be similar to those for tubewells.[12] Therefore, the procedures developed in the Tubewell Coding Sub-Group will be adapted for bathing facilities, latrines and FSTPs and validated by the Sanitation TWiG.

Once the barcoding system is established, it has the potential to serve as the basis for regular monitoring by both WASH agencies and Site Management Sector agencies, and community members themselves. The system also serves as an opportunity to fit in existing feedback and complaints mechanisms. Under its wider engagement with the WASH Sector, REACH will work with the Water TWiG and Sanitation TWiG to develop additional monitoring tools and processes based on the coding exercise.

To ensure all CFAs and implementing organizations are aware of the existence and opportunities of the coding databases, there will be three orientation sessions to AFAs and their CFAs following completion of each phase of the coding system. In

[9] This only applies to tubewells, latrines and bathing cubicles, because FSTPs are not included in these rounds of infrastructure sweeps previously performed by REACH.
[10] The data cleaning SOP for tubewells is attached in Annex I, those for FSTPs and bathing and latrines will be finalised prior to data collection.
[12] When infrastructure is being decommissioned, the implementing organization reports the unique facility codes of the decommissioned facilities through an online reporting form to the WASH Sector. When labels go missing, or in case of newly built infrastructures, organizations can request new labels through a similar online request form. The WASH Sector Information Management team will be receiving these requests and updates and will provide the labels back to the partners.

these sessions, REACH will orient the participants on why the coding system is needed, how it can support their field operations, and how to access and use the data.

4. Roles and responsibilities

The following teams and units from REACH have roles or responsibilities in this project:

- WASH Team: consisting of Assessment Officer (AO) and Junior GIS Officer (Jr GISO)
- Field Management Team: consisting of Field Coordinator overseen by a Field Manager
- GIS & Data Unit: consisting of Senior GIS Officer (Sr GISO) and Data Officers (DOs)
- Country Focal Point REACH Bangladesh (CFP)
- HQ: IMPACT headquarters in Geneva

Table 1: Description of roles and responsibilities

Task Description	*Responsible*	*Accountable*	*Consulted*	*Informed*
Research design	AO, Jr GISO	AO, CFP	Tubewell Coding Sub-group	WASH Sector, HQ
Supervising data collection	Field Coordinator	Jr GISO	Field Manager, AO	CFP, HQ
Data processing (checking, cleaning)	Sr GISO & DOs, Jr GISO	Jr GISO	AO	CFP
Data analysis	Jr GISO, Sr GISO	Jr GISO	Tubewell Coding Sub-Group	CFP, HQ
Output production	Sr GISO, Jr GISO	AO, Jr GISO	HQ	CFP, WASH Sector
Dissemination	Jr GISO	Jr GISO, AO	HQ	WASH Sector, CFP
Monitoring & Evaluation	Jr GISO	AO, Jr GISO	HQ	WASH Sector
Lessons learned	Jr GISO	AO	Field Coordinator, other parties involved	Tubewell Coding Sub-group

Responsible: *the person(s) who executes the task*

Accountable: *the person who validates the completion of the task and is accountable of the final output or milestone*

Consulted: *the person(s) who must be consulted when the task is implemented*

Informed: *the person(s) who need to be informed when the task is completed*

5. Data Analysis Plan

DAP 1903a (Tubewell Coding)

Research questions	Data collection method	Indicator group / sector	Indicator type/list	Indicator / Variable	Questionnaire Question	Questionnaire Responses	Data reporting level	Calculation instructions	Subset	Stratification	Operation
How many tubewells are there and where are they located?	Tubewell coding Kobo tool	Camp information		Number of tubewells	Is there a handpump on the well	Yes; No	Facility	handpump_y	No subset	Overall response level	Exclude tubewells with no handpump
										Camp	
What proportion of tubewells has a handpump?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with handpump	Is there a handpump on the well	Yes; No	Facility	handpump_y / (handpump_y + handpump_n)	No subset	Overall response level	Calculate percentage of tubewells that have a handpump from total number of Kobo records
										Camp	
What proportion of tubewells is functional?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells that is functional	Is the tubewell functioning (Can you draw water from tubewell) at the time of the visit ?	Yes; No	Facility	tubewell_functioning_y / handpump_y	handpump_y n = y	Overall response level	Calculate percentage functional tubewells from all tubewells with handpump
										Camp	
How many people are there per functional tubewell?	Tubewell coding Kobo tool	Camp information	WASH Sector JRP 2019	Number of people per functional tubewell	Is the tubewell functioning (Can you draw water from tubewell) at the time of the visit ?	Yes; No	Facility	# of individuals / tubewell_functioning_y	handpump_y n = y	Overall response level	Number of people divided by the number of functional tubewells with handpump
										Camp	
What proportion of handpumps is a Tara pump?	Tubewell coding Kobo tool	Camp information		Proportion of Tara pumps	Type of hand pump	Tara Pump; Pump n#6, Other	Facility	type_of_hand_pump_tara / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of Tara pumps from total number of tubewells with handpump
										Camp	
What proportion of handpumps is a n6 pump?	Tubewell coding Kobo tool	Camp information		Proportion of n#6 pumps	Type of hand pump	Tara Pump; Pump n#6, Other	Facility	type_of_hand_pump_n6 / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of n#6 pumps from total number of tubewells with handpump
										Camp	

How many shelters are within 200m of the nearest handpump?	Garmin; OSM shelter footprint	Camp information	WASH Sector JRP 2019	Number of shelters within 200m of closest tubewell	N/A	N/A	Camp		handpump_y n = y	Overall response level	Draw 200m buffer around Garmin GPS, select all shelters that intersect the buffer
										Camp	
What proportion of shelters is within 200m of the nearest handpump?	Garmin; OSM shelter footprint	Camp information	WASH Sector JRP 2019	Proportion of shelters within 200m of closest tubewell	N/A	N/A	Camp	Shelters inside buffer / (shelters inside buffer + shelters outside buffer)	handpump_y n = y	Overall response level	Calculate percentage of shelters wihtin 200m buffer around tubewells from total number of shelters
										Camp	
What proportion of tubewells has no latrine within 10m?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with no latrine within 10m	Can you see any latrines that are obviously within 10 meters of the tubewell?	Yes; No	Facility	latrine_10m_n / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have no latrine within 10m from total number of tubewells with handpump
										Camp	
What proportion of tubewells has no latrine that is located uphill within 10m?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with no latrine within 10m uphill	Are there any latrines within 10 meters that are uphill of the tubewell	Yes; No	Facility	latrine_uphill_n / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have no latrine within 10m that is uphill from total number of tubewells with handpump
										Camp	
What proportion of tubewells has no other sources of pollution within 10m?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with no other sources of pollution within 10m	Are there any other sources of pollution within 10 meters of the tubewell (e.g. animal/human excreta, rubbish)?	Yes; No	Facility	pollution_n / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have no other source of pollution within 10m from total number of tubewells with handpump
										Camp	

What proportion of tubewells has a platform?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with a platform	Does the tubewell have a platform, apron, or neither?	Platform; Apron; Neither	Facility	apron_platform_platform / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have selected neither from total number of tubewells with handpump
										Camp	
What proportion of tubewells has an apron?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with an apron	Does the tubewell have a platform, apron, or neither?	Platform; Apron; Neither	Facility	apron_platform_apron / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have selected neither from total number of tubewells with handpump
										Camp	
What proportion of tubewells has both a platform and an apron?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with a platform and an apron	Does the tubewell have a platform, apron, or neither?	Platform; Apron; Neither	Facility	(apron_platform_platform + apron_platform_apron) / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have selected neither from total number of tubewells with handpump
										Camp	
What proportion of tubewells has neither a platform nor an apron?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells without a platform or apron	Does the tubewell have a platform, apron, or neither?	Platform; Apron; Neither	Facility	apron_platform_neither / handpump_y	handpump_y n = y	Overall response level	Calculate percentage of tubewells that have selected neither from total number of tubewells with handpump
										Camp	
What proportion of tubewells has a platform that is clean and not cracked?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with a platform that is clean and not cracked	Is the platform cracked or in need of cleaning?	Yes; No	Facility	platform_cracked_n / apron_platform_platform	handpump_y n = y; apron_platform = platform	Overall response level	Calculate percentage of platforms not cracked or dirty (tubewells with a 'good' platform divided by total number of tubewells with a platform)
										Camp	

What proportion of tubewells has no drainage problems?	Tubewell coding Kobo tool	Camp information		Proportion of tubewells with no drainage problems	Is the hand-pump drainage channel faulty? (Is it broken, permitting ponding? Does it need cleaning?)	No problems with drainage; No drainage channel exists; Drainage channel is broken/cracked; Drainage channel permits ponding; Drainage channel needs cleaning (blocked)	Facility	drainage_faulty_none / (apron_platform_apron + apron_platform_platform)	handpump_yn = y; apron_platform ≠ neither	Overall response level	Calculate percentage of tubewells without drainage problems from the total number of tubewells with a platform or apron
										Camp	
What proportion of tubewells has no drainage problems?								drainage_faulty_none / handpump_y	handpump_yn = y	Overall response level	Calculate percentage of tubewells with no drainage problems from the total number of tubewells with a handpump
										Camp	
What proportion of tubewells has a high or very high contamination rist??	Tubewell coding Kobo tool	Camp information		Proportion of tubewells that have a high or very high contamination rist	Sanitary survey	N/A	Facility	(contamination_risk_score_high + contamination_risk_score_very high) / handpump_y	handpump_yn = y	Overall response level	Calculate percentage of tubewells with high or very high contamination risk as percentage of total tubewells with handpump
										Camp	

DAP 1903b (Sanitation Coding)

Research questions	Indicator #	Data collection method	Indicator group / sector	Indicator type/list	REACH BGD1905 Indicator	Questionnaire Question	Questionnaire Responses	Data reporting level	Calculation instructions	Subset	Operation
How many latrines are there and where are they located?	L1	Kobo	Latrine		Number of latrines	Select type of facility How many latrines are in the block?	Latrine; Bathing space; Both	Overall response	Count number of single latrine cubicles	N/A	Sum of struc_num_lat
								Camp			
How many bathing facilities are there and where are they located?	B1	Kobo	Bathing		Number of bathing facilities	Select type of facility How many bathing cubicles are in the block?	Latrine; Bathing space; Both	Overall response	Count number of single bathing cubicles	N/A	Sum of struc_num_bat
								Camp			
How many latrines are made out of bamboo and tarpaulin and where are they located?	L2.1	Kobo	Latrine		Number of emergency latrines	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc number of latrines that have walls made out of tarpauling and pillars made out of bamboo	N/A	struc_walls_wall_tarpaulin AND struc_pillars_pill_bamboo
								Camp			
How many latrines are made out of bamboo and tarpaulin and where are they located?	L2.2	Kobo	Latrine		% of emergency latrines	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc percentage of latrines that have walls made out of tarpauling and pillars made out of bamboo from total number of latrines	struc_type_lat	(struc_walls_wall_tarpaulin AND struc_pillars_pill_bamboo) / struc_type_lat
								Camp			

How many bathing facilities are made out of bamboo and tarpaulin and where are they located?	B2.1	Kobo	Bathing		Number of emergency bathing facilities	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc number of bathing facilities that have walls made out of tarpauling and pillars made out of bamboo	N/A	struc_walls_wall_tarpaulin AND struc_pillars_pill_bamboo
								Camp			
How many latrines are made out of bamboo and tarpaulin and where are they located?	B2.2	Kobo	Bathing		% of emergency bathing facilities	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc number of bathing facilities that have walls made out of tarpauling and pillars made out of bamboo from total number of bathing facilities	struc_type_bat	(struc_walls_wall_tarpaulin AND struc_pillars_pill_bamboo) / struc_type_bat
								Camp			
How many latrines are made out of which materials and where are these located?	L3.1	Kobo	Latrine	WASH Sector JRP 2019	Number of latrines made out of different types of materials	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Count for each type of material the number of latrines that have that material used as primary material for the walls	N/A	struc_walls_wall_concrete struc_walls_wall_steel struc_walls_wall_bamboo struc_walls_wall_tarpaulin struc_walls_wall_wood struc_walls_wall_plastic struc_walls_wall_stone struc_walls_wall_other
								Camp			

How many latrines are made out of which materials and where are these located?	L3.2	Kobo	Latrine	WASH Sector JRP 2019	% of latrines made out of different types of materials	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc for each type of material the number of latrines that have that material used as primary material for the walls from total number of latrines	struc_type_lat	struc_walls_wall_concrete / struc_type_lat struc_walls_wall_steel / struc_type_lat struc_walls_wall_bamboo / struc_type_lat struc_walls_wall_tarpaulin / struc_type_lat struc_walls_wall_wood / struc_type_lat struc_walls_wall_plastic / struc_type_lat struc_walls_wall_stone / struc_type_lat struc_walls_wall_other / struc_type_lat
								Camp			
How many bathing cubicles are made out of which materials and where are these located?	B3.1	Kobo	Bathing		Number of bathing cubicles made out of different types of materials	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Count for each type of material the number of bathing facilities that have that material used as primary material for the walls	N/A	struc_walls_wall_concrete struc_walls_wall_steel struc_walls_wall_bamboo struc_walls_wall_tarpaulin struc_walls_wall_wood struc_walls_wall_plastic struc_walls_wall_stone struc_walls_wall_other
								Camp			

How many bathing cubicles are made out of which materials and where are these located?	B3.2	Kobo	Bathing		% of bathing cubicles made out of different types of materials	What are the walls of the structure primarily made from? What are the pillars in the structure primarily made from?	Concrete; Metal/steel; Bamboo; Tarpaulin; Wood; Hard plastic; Stone/brick; Other Concrete; Metal/steel; Bamboo; Wood; Other	Overall response	Calc for each type of material the number of bathing facilities that have that material used as primary material for the walls from total number of bathing facilities	struc_type_bat	struc_walls_wall_concrete / struc_type_bat struc_walls_wall_steel / struc_type_bat struc_walls_wall_bamboo / struc_type_bat struc_walls_wall_tarpaulin / struc_type_bat struc_walls_wall_wood / struc_type_bat struc_walls_wall_plastic / struc_type_bat struc_walls_wall_stone / struc_type_bat struc_walls_wall_other / struc_type_bat
								Camp			
How many latrines have a septic tank and where are they located?	L4.1	Kobo	Latrine		Number of latrines with septic tank	Do you see a septic tank under the structure of the latrine?	Yes; No	Overall response	Count number of latrines that have a septic tank	N/A	struc_st_yes
								Camp			
How many latrines have a septic tank and where are they located?	L4.2	Kobo	Latrine		% of latrines with septic tank	Do you see a septic tank under the structure of the latrine?	Yes; No	Overall response	Calc percentage of latrines that have a septic tank from total number of latrines	struc_type_lat	struc_st_yes / struc_type_lat
								Camp			
How many twin pit latrines are there and where are they located?	L5.1	Kobo	Latrine		Number of twin pit latrines	How many round concrete pits do you see nearby or attached to the structure of the latrine?		Overall response	Count number of twin pit latrines	N/A	struc_tp_yes
								Camp			
How many twin pit latrines are there and where are they located?	L5.2	Kobo	Latrine		% of twin pit latrines	How many round concrete pits do you see nearby or attached to the structure of the latrine?		Overall response	Calc percentage of twin pit latrines from total number of latrines	struc_type_lat	struc_tp_yes / struc_type_lat

								Camp			
How many latrines are gender segregated and where are they located?	L6.1	Kobo	Latrine		Number of female-only latrines	For which gender is this latrine?	Male; Female; Not specified	Overall response	Count latrines labelled as female-only	N/A	lat_gen_female
								Camp			
How many latrines are gender segregated and where are they located?	L6.2	Kobo	Latrine	WASH Sector JRP 2019	% of female-only latrines	For which gender is this latrine?	Male; Female; Not specified	Overall response	Calc percentage latrines labelled as female-only from total number of latrines	struc_type_lat	lat_gen_female / lat_gen
								Camp			
How many latrines are gender segregated and where are they located?	L7.1	Kobo	Latrine		Number of male-only latrines	For which gender is this latrine?	Male; Female; Not specified	Overall response	Count latrines labelled as male-only	N/A	lat_gen_male
								Camp			
How many latrines are gender segregated and where are they located?	L7.2	Kobo	Latrine		% of male-only latrines	For which gender is this latrine?	Male; Female; Not specified	Overall response	Calc percentage latrines labelled as male-only from total number of latrines	struc_type_lat	lat_gen_male / lat gen
								Camp			
How many latrines are gender segregated and where are they located?	L8.1	Kobo	Latrine		Number of latrines that are not gender segregated	For which gender is this latrine?	Male; Female; Not specified	Overall response	Count latrines that are not gender-segregated	N/A	lat_gen_not_specified
								Camp			
How many latrines are gender segregated and where are they located?	L8.2	Kobo	Latrine		% of latrines that is not gender segregated	For which gender is this latrine?	Male; Female; Not specified	Overall response	Calc latrines that are not gender-segregated from total number of latrines	struc_type_lat	lat_gen_not_specified / lat_gen
								Camp			
How many bathing facilities are gender segregated and where are they located?	B4.1	Kobo	Bathing		Number of female-only bathing cubicles	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Count bathing facilities labelled as female-only	N/A	bat_gen_female
								Camp			

How many bathing facilities are gender segregated and where are they located?	B4.2	Kobo	Bathing		% of female-only bathing cubicles	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Calc percentage bathing facilities labelled as female-only from total number of bathing facilities	struc_type_bat	bat_gen_female / bat_gen
								Camp			
How many bathing facilities are gender segregated and where are they located?	B5.1	Kobo	Bathing		Number of male-only bathing cubicles	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Count bathing facilities labelled as male-only	N/A	bat_gen_male
								Camp			
How many bathing facilities are gender segregated and where are they located?	B5.2	Kobo	Bathing		% of male-only bathing cubicles	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Calc percentage bathing facilities labelled as male-only from total number of bathing facilities	struc_type_bat	bat_gen_male / bat_gen
								Camp			
How many bathing facilities are gender segregated and where are they located?	B6.1	Kobo	Bathing		Number of bathing cubicles that are not gender segregated	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Count bathing facilities that are not gender-segregated	N/A	bat_gen_not_specified
								Camp			
How many bathing facilities are gender segregated and where are they located?	B6.2	Kobo	Bathing		% of bathing cubicles that is not gender segregated	For which gender is this bathing cubicle?	Male; Female; Not specified	Overall response	Calc bathing facilities that are not gender-segregated from total number of bathing facilities	struc_type_bat	bat_gen_not_specified / bat_gen
								Camp			

Annex I: Data Cleaning and Progress Tracking SOP

REACH BGD WASH Infrastructure Coding: Data Checking and Cleaning SOP April 2019

OVERVIEW OF DAILY RESPONSIBILITIES

- Senior Data Officer and Data Assistants ensure phones and batteries for the Garmin devices are fully charged prior to the next day of data collection. If not, Senior Data Officer and Data Assistants provide extra batteries enough for the day.
- Data Officer ensures phones are set to the correct time and date prior to the next day of data collection. This can be achieved using the following steps for each phone:
    - Settings→General management→Date and time→Automatic date and time **AND** Use 24-hour format set to **ON**
- Team leaders upload forms to the Kobo server on their way back from the camps.
- Team leaders bring finalized mobile phones and Garmin devices to the Data Officer.
- Senior Data Officer and Data Assistants read out the Garmin devices after every day of data collection, create a CSV file with the recorded data and provide this file to the GIS unit.
- Initial data cleaning should take place after each day of data collection to avoid backlogging and delays in delivering final outputs.

DATA COLLECTION PROGRESS TRACKING PROTOCOL

Every day during the data collection period, progress will be tracked. This will be done by monitoring the following aspects:

- Number of conducted surveys for each day
- Cumulative number of conducted surveys
- Number of conducted surveys per day per enumerator
- Cumulative number of conducted surveys per enumerator
- Which grid cells are completed
- Which camps are completed

To understand the enumerators daily productivity, it is important to monitor their performance. In order to keep track of this and the progress of the collection of data, these progress tracking tasks will be summarized in a table and analyzed after every day of data collection.

DATA CHECKING PROTOCOL

In order to ensure highest data quality possible and keep track of the progress over time, the data checking tasks outlined below will be performed. This is done using R. A script will be developed that automatically performs these checks and generates results.

Duplication of UUID

The unique identifier of an infrastructure will be the exact same as the code on the label. When there is duplication of the codes, it will not be a unique identifier anymore. Therefore, all entered codes of the infrastructures will be checked against all other codes, to detect duplication of unique identifiers.

Geographical location

To record the precise location of infrastructures, instead of mobile phones, Garmin GPS devices are used. The data from these trackers will be linked to the data submitted through the Kobo forms, based on the code. In case issues related to matching the datasets based on the codes arise, these will be flagged.

In the ToR of this exercise is specified that only infrastructures located within the boundaries of ISCG-recognized camps (except Kutupalong RC) will be tagged. Infrastructures located outside the camps and in host communities will not be part of this project. For this reason, the GPS location of each entry will be checked. Geographical outliers (GPS points that are not within the area of interest) will be flagged.

In addition to these checks, a spatial join between the camp boundaries and the recorded GPS points will be executed. A comparison between the camp name entered by the enumerator and the spatially joined camp name will be done and where these two do not match, the spatial join name will be adopted.

Survey duration

Also, the duration of the survey will be assessed. Surveys that take either very long or very short are highlighted, as this can be an indication of either confusion or rushing and inaccuracy of the enumerator, which might be a potential source of error for other questions as well.

Comparison with WASH infrastructure mapping round 7, 8 and 9

For each grid cell, the average number of infrastructures found in round 7, 8 or 9 from the REACH WASH infrastructure sweeps will be compared to the number of assessed infrastructures during the coding roll-out. A large difference between those indicates inaccuracy in either the previous infrastructure sweeps or in the current one and should therefore be assessed.

DATA CLEANING PROTOCOL

For the potential issues outlined above, the following actions have to be taken:

Check	Data cleaning protocol	Threshold	Who is responsible
Duplication UUID	Check with entered GPS and pictures if the records refer to the same infrastructure • If yes -> exclude one of the duplications • If no -> clean data and replace with actual code on the picture taken	UUID (= code) is same	Jr GISO
Geographical location	If multiple GPS points with same code exist: calculate distance between these GPS points • If distance is less than three meters: calculate average and use this as new location for the duplicated code • If distance is more than three meters: keep both records and send enumerators back If GPS record is more than 50 meters outside any camp area: exclude record. In case of wrong camp name after spatial join, adopt camp name from shapefile	Points that fall more than 50 meters outside camps Camp name is not same as camp name in shapefile	Jr GISO
Outlier check survey duration	Compare outliers in survey durations against enumerator IDs: • If same enumerators often have very long or short surveys, ask them what problem is. • If not structural same enumerator IDs: no big problem	Surveys taking more than 30 minutes	Jr GISO

Comparison number of assessed infrastructures coding exercise and highest number in round 7, 8 and 9 infrastructure sweep	If much higher number, but no duplicate UUIDs or GPS: no problem If much lower number: • Compare differences rounds 7, 8 and 9 • If this does not explain difference, send enumerators back to grid cell		Jr GISO Field Coordinator