Al Za'atari Camp Wastewater Assessment

February 2014

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EXECUTIVE SUMMARY

Since the official opening of Al Za'atari in July 2012, the infrastructure in the camp has been continuously adapted as the Syrian refugee population has increased. One of these adaptations has been the introduction and use of informal and unregulated water systems. At the request of UNICEF, the REACH team conducted an assessment of the unregulated and informal wastewater production and disposal by households in the camp.

The assessment was requested because of the need to gather information on the production of wastewater inside Al Za'atari Camp, partly given the potentially heavy impacts by this on public health and sanitation. The assessment was designed to understand the situation inside the camp and thus to inform the camp's WASH actors and provide baseline information for the potential creation of a communal wastewater system inside Al Za'atari Camp.

Each household in the camp was asked to answer a survey about their wastewater production outside official WASH centres or kitchens. This assessment found that 93% households in Al Za'atari Camp produce wastewater, which amounts to 9,695 households and 71,074 camp residents.

Sources of wastewater included use of sinks for washing clothes; sinks for washing vegetables; private showers; private toilets; and washing machines. This assessment revealed that the most common source of wastewater in the camp is the use of private sinks for washing both vegetables and clothing, reported by 85% of households in the camp. In addition, 63% of all assessed households reported producing wastewater through the use of private showers in addition to the use of sinks for washing vegetables and clothes.

Means of wastewater disposal included surface runoff, small pits, large pits, petrol barrels/drums, plastic tanks and WASH facility tanks. The use of WASH facility tanks to dispose of wastewater implies that piping has been installed underground to connect facilities with households. Many households used the 'storm water' drainage network created by the German organization Bundesanstalt Technisches Hilfswerk (THW) for disposal. This drainage network was originally created to direct rainfall outside of the camp into a deposit and as such, is not designed to accommodate wastewater.

The key recommendation that can be made based on the assessment findings is that a formal communal wastewater system should be created in Al Za'atari camp to allow households to safely store and dispose wastewater that may otherwise have a detrimental impact on public health.

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FIGURES, MAPS AND TABLES

1. INTRODUCTION

UNICEF requested the REACH team to conduct an assessment regarding wastewater produced at the household level in informal and unregulated ways.

The assessment was conducted in response to a clear and present need to gather accurate information on the already widespread informal and thus unregulated wastewater infrastructure inside the camp. Given the potential implications of an exponential increase in private wastewater production on public health and sanitation, this assessment was designed and deployed in order to improve the camp's WASH actors' understanding of the situation on the ground and to eventually feed into programming for the creation of a communal wastewater system inside Al Za'atari Camp.

Data collection included information about:

- The sources of wastewater and types of wastewater produced,
- The methods of wastewater discharge,
- The location of household's wastewater storage.

The first part of the assessment took place from 21.09.2013 to 24.10.2013 and covered districts 1, 2, 3, 4 and 12, often referred to as the "Old Camp". Following the presentation of preliminary findings from these districts, UNICEF requested the REACH team to expand the assessment to cover the remaining seven districts. The second part of the assessment took place from 10.11.2013 to 11.12.2013 and was conducted in districts 5, 6, 7, 8,9,10 and 11, commonly referred to as the "New Camp".

2. METHODOLOGY

The assessment covered the entire camp, including every household. Each refugee household was requested to answer a brief survey regarding their wastewater production outside of the official communal areas such as the WASH centres or kitchens[1]. Sources of wastewater specified in the survey referred to sources within refugee households, and included toilets, showers, sinks for washing clothes, sinks for washing vegetables, washing machines. Information about population was collected only for households that produce wastewater and does not include number of families. Questions asked in the survey are attached in the Annex.

The data collection was undertaken on the same ODK (Open Data Kit) mobile data collection platform that has been in use in Al Za'atari Camp since February 2013.

Household boundaries, the location of wastewater storage, pipes and ditches were defined based on a combination of satellite images and field visits which included observations made by field teams and interviews with household residents. Tracing paper was used in conjunction with satellite images in the background against which households and wastewater discharge structures were hand-drawn by field enumerators and then scanned and digitized using ArcGIS software. Data collected on the ODK platform and digitized households boundaries were joined using ArcGIS software in order to enable spatial analysis.

Identifying the accuracy of spatial location of each household in terms of land surveying is impossible; however, the locations of all structures shown on the map are consistent and can be used to locate households, storages areas, pipes and ditches in the camp. It is important to note that these locations can change over time.

[1] For access to the full survey, please contact REACH reach.mena@impact-initiatives.org

Assessment findings should therefore be seen as indicative of the situation in each district at the time that data collection took place, which is specified in Table 1 below.

Table 1: Dates of field work for each district (September – December 2013)

District	Start Date	End Date
District 1	08.10	24.10
District 2	10.10	24.10
District 3	24.09	10.10
District 4	05.10	21.10
District 5	10.11	14.11
District 6	25.11	02.12
District 7	02.12	09.12
District 8	02.12	05.12
District 9	25.11	04.12
District 10	14.11	25.11
District 11	13.11	24.11
District 12	29.09	24.10

2.1. TERMS, DEFINITIONS AND SPATIAL LOCATION

Terminology was standardised across the report, presentation and thematic maps.

Households

A household was defined as a set of individuals / families sharing a set of shelters (tents, caravans). The methodology used in this assessment defines households based on information derived from household residents. As a single household can be inhabited by more than one family or one family can live in more than one household, the assessment focused solely on the definition of a household. So that, a household was considered in relation to shared facilities that produce wastewater, such as shared toilets or washing areas, and any clearly delineated physical boundaries, such as fences surrounding multiple caravans, which make up one unit. It should be noted that tents used for other purposes than residential were also included into boundaries of household.

Wastewater Sources and Type

In the survey, each household was asked whether they produce wastewater and what the sources of their wastewater are. Possibilities for the latter were: sinks for washing clothes, private sinks for washing vegetables, washing machines, showers, private toilets, as well as an open answer for "others". Any answer regarding other types of wastewater source than those listed was not noted.

In this assessment, 'wastewater' refers to both black and grey water. Given how context-specific this assessment is, if relevant, distinctions between black and grey water were made at the household level. The presence of private toilets is related with the production of black water, which consists of fecal matter and urine. The water produced by other listed sources is considered as grey water. It should be noted that when grey and black wastewater mix, the mixture is considered as black water.

If a household has a toilet it is likely that the wastewater storage contains black water. Considering the complexity of the assessment and the dynamic situation across households and the camp itself, it was beyond the scope of this assessment to gauge whether grey and black water are separated at the household level; for example, through separate methods of discharge. However, most of households have more than one way to dispose of wastewater, or more than one means of storing wastewater, which may allow for separating grey and black water.

Methods of Wastewater Disposal

Means of wastewater disposal reported were: surface runoff, small pit, large pit, petrol barrel/drum, plastic tank, WASH facility tank, and 'other'. The reported use of WASH facility tanks to dispose of wastewater implies that underground piping has been installed to connect households to tank of WASH facilities, including those that are operational and those that have been destroyed.

Photo 1: Underground WASH Centre tank with metal cleanout pipe showing above ground and small pipes connecting households to tank.

The first part of assessment conducted in the Old Camp reported the use of informal connections using drainage pipes and therefore this mean was also included as part of the assessment in the New Camp. The 'storm water' drainage network was created by German organization Bundesanstalt Technisches Hilfswerk (THW) in districts 1, 2, 3, 4, and 12. The purpose of this network was to direct the flow of rainwater to a deposit outside the camp.

Surface runoff can be understood as caused by either a surface ditch, an independent method of discharging wastewater with no determined actual ending, or water that is discarded straight onto the ground (e.g. from a sink or bowl after washing vegetables). Ditches from different households can create a small network of surface runoff, generally following the direction of the slope.

Wastewater Storage

Regarding informal wastewater storage, the terminology used includes:

Photo 2: Wastewater pit with grey water inlet through pipe.

- *Pit*– a hole dug in the ground for the purpose of storing wastewater. Pits are not lined, so there is potential for wastewater to infiltrate into the ground. However, given that the soil in Al Za'atari Camp is mostly clay - a type of soil with low permeability rate - infiltration may be limited. Some pits are uncovered and water can evaporate, whilst some are covered with metal plates, earth or dirt. Pits that are no longer in use were excluded from the assessment. Pits were subsequently categorized as "large pits", where volume was larger than two water cooler containers, and "small pits", where the volume was less than this.

- *Barrel* – oil/petrol barrel or drum used as wastewater storage.
- *Tank* – plastic tank used as wastewater storage.

Pits can be connected to household either through a ditch, which runs along the surface of the ground, or by an underground pipe; whereas tanks and barrels are always connected to a household by pipe. Barrels and tanks are often dug into the ground however in some cases they have been perforated and therefore the wastewater infiltrates into the ground.

The assessment found that wastewater is stored both outside and within household boundaries. In the latter case, wastewater storage sometimes occurs inside tents, under caravans or between tents/caravans. Alternatively, wastewater is stored just next to the caravan/tent though sometimes it is situated even further away and connected to the household by a pipe or ditch.

However, both wastewater storage and disposal by pipe is not limited to a single household. In some cases, more than one household might be connected to the same wastewater storage, or one underground pipeline might service several households; therefore the pipe might run under several caravans or between caravans and tents that compose one household.

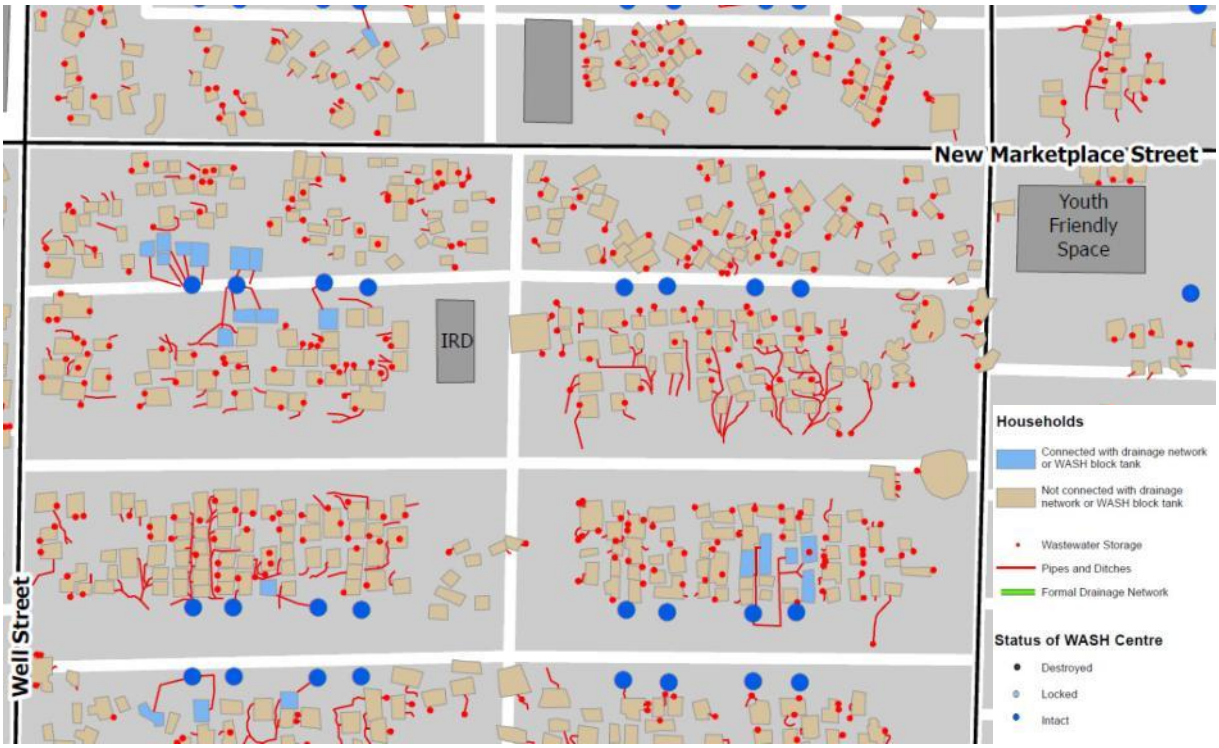
Photo 3: Ditches connected to a waste water pit by several households.

Photo 4: Ditches connected to a waste water pit by several households.

Photo 5a: Ditch inside tent kitchen leading waste water to outside pit.

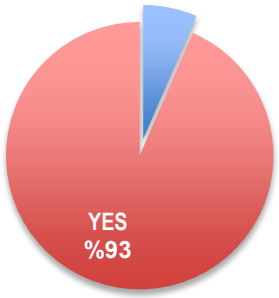
Photo 5b: Ditch leading wastewater from tent kitchen to outside pit.

Map 1: Example of household, wastewater storage, pipe, and ditch location (part of map *informal wastewater discharge)*



3. KEY ASSESSMENT FINDINGS

Figure 1: Households in the camp that produce/do not produce wastewater



This assessment found that 93% households in Al Za'atari Camp produce wastewater, which is equal to 9,695 households of a total of 10,069 assessed households. There are 71,074 people residing in these households producing wastewater.

The existing methods of wastewater discharge are informal wastewater storage at the household level, surface runoff and connections with the formal drainage network or WASH block tanks.

Furthermore, the assessment reveals that 6,414 households have informal wastewater storage capacity, which constitutes 62% of households across the camp and 66% of all households that produce wastewater. This yields a total of 8,645 informal wastewater storages in the camp. The actual types of wastewater storage infrastructure include: pits, petrol/oil barrels and plastic tanks.

Findings also indicate that 888 households are connected to the drainage network or WASH block tanks. Across districts 1, 2, 3 and 12, where exist underground drainage network, part of households has connected directly into drainage pipes through smaller pipes leading from household. As a result the developed underground pipe network exists in districts 1 and 2, where 44% and 12% of households are connected to the drainage network or WASH block tanks, respectively.

Moreover, 40.4% of households in the camp have a private toilet and produce black water, which is equal to 4,184 households with a total population of 33,200 people. This in turn means that 5,137 informal wastewater storages possibly contain black water (or 59% of all informal household wastewater storages).

Based on analyses of spatial data (as displayed on the thematic maps) it can be deduced that methods of discharge are replicated across households in close proximity, meaning that people from one neighborhood usually use the same methods to discharge wastewater. The spatial data also indicates that private toilets form clusters across given neighborhoods rather than being regularly distributed across the camp.

The distribution of households that produce wastewater is generally regular across the camp; however a breakdown of wastewater sources and discharge mechanisms varies significantly between districts.

Districts 1 and 2 display the highest rates of possession of private goods reported in the REACH camp sweep report from November 2013[2] and have the highest number of private toilets and washing machines. At the same time, these districts display a significant number of connections to the drainage network and tanks of WASH blocks and number of wastewater storage.

Findings also indicate that districts 11 and 12 have a large number of households using wastewater storage infrastructure and possessing washing machine and showers, however a much smaller number of private toilets which is why black water production is lower. District 10 has similar characteristics to districts 11 and 12, but the spatial distribution of wastewater production is not regular: higher concentrations can be noticed in the north-west part and lower in the south-east.

In districts 5, 6, 7, 8 and 9, a sizeable portion of wastewater discharge is surface runoff. In these areas, the evidence suggests that the majority of wastewater produced is grey water. District 8 has the lowest production of wastewater.

Districts 1, 2 and 11 together constitute 35% of all household wastewater sources in the camp, 55% of all private toilets and 62% of all washing machines in the camp. In District 1, 2 and 11 the production of wastewater is visibly the highest, which has in turn led to the development of the most developed wastewater discharge mechanisms.

71,074

People residing in households where wastewater is produced

44%

Of households in District 1 are connected to the drainage network or WASH block tanks

1,509

Washing machines are present at the household level

4,184

Private toilets are present at the household level

Comparing data from the Wastewater Assessment to the 'Shelter Type Map' from the Al Za'atari camp sweep report on shelter and NFIs November 2013 it became apparent that areas with only tented households are more likely not to produce wastewater; if wastewater is created then tented areas either have no black water production, less wastewater storage or no wastewater storage and widespread discharge by surface runoff.

[2] REACH (November 2013) *Al Za'atari Camp Sweep Report: A Shelter and NFI assessment for winterization programming*.

It can be concluded that the creation of wastewater is positively correlated with the general development of household structures in districts. There is also a correlation between wastewater discharge methods and the production of black water. When people are able to have wastewater storage or connect to the underground network, they create private toilets. This is further connected with funds possessed by refugees, type of shelter, the hardness of the ground etc.

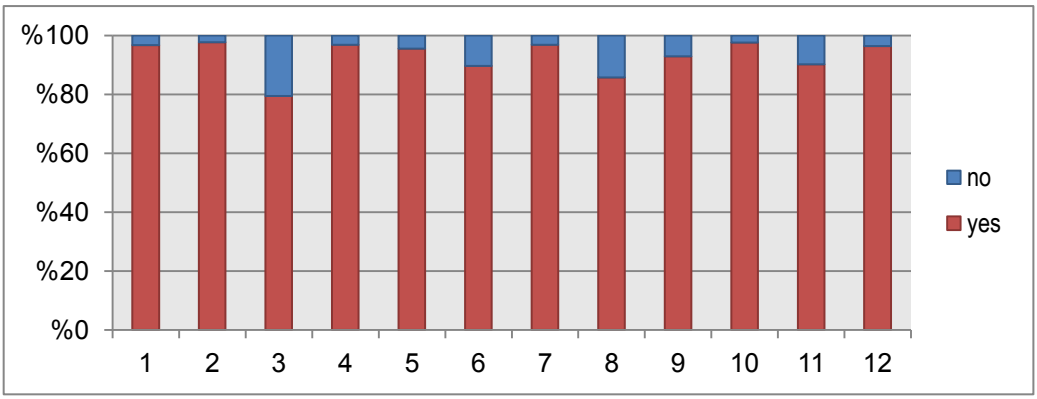
Table 2: Household data breakdown per district

Districts	Number of households	Number of households that produce wastewater	% of households produce wastewater per district	Number of households with wastewater storage	% of households with wastewater storage per district	Number of wastewater storage	Number of households connected to drainage network of tank of WASH block	Number of households with private toilets
District 1	1,056	1,021	97%	568	54%	702	464	742
District 2	1,255	1,226	98%	1,033	82%	1,537	155	1,065
District 3	820	651	79%	413	50%	473	65	157
District 4	590	571	97%	308	52%	351	33	107
District 5	765	731	96%	381	50%	489	4	152
District 6	727	652	90%	313	43%	418	52	213
District 7	815	789	97%	443	54%	570	5	117
District 8	330	283	86%	113	34%	140	0	68
District 9	736	684	93%	380	52%	481	24	235
District 10	1,023	998	98%	637	62%	845	34	421
District 11	1,328	1,198	90%	1,040	78%	1,586	21	527
District 12	924	891	96%	785	85%	1,053	31	380
Camp Total	*10,369*	*9,695*	93%	*6,414*	62%	*8,645*	*888*	*4,184*

3.1. HOUSEHOLD WASTEWATER TYPES AND SOURCES

The assessment revealed that 93% of households in Al Za'atari Camp produce wastewater, which is equal to 9,695 households of the assessed 10,069 households. This in turn implies that 71,074 people live in households that have a wastewater source with an average family size of 7.33 people.

Figure 2: Proportion of households that produce waste water by district

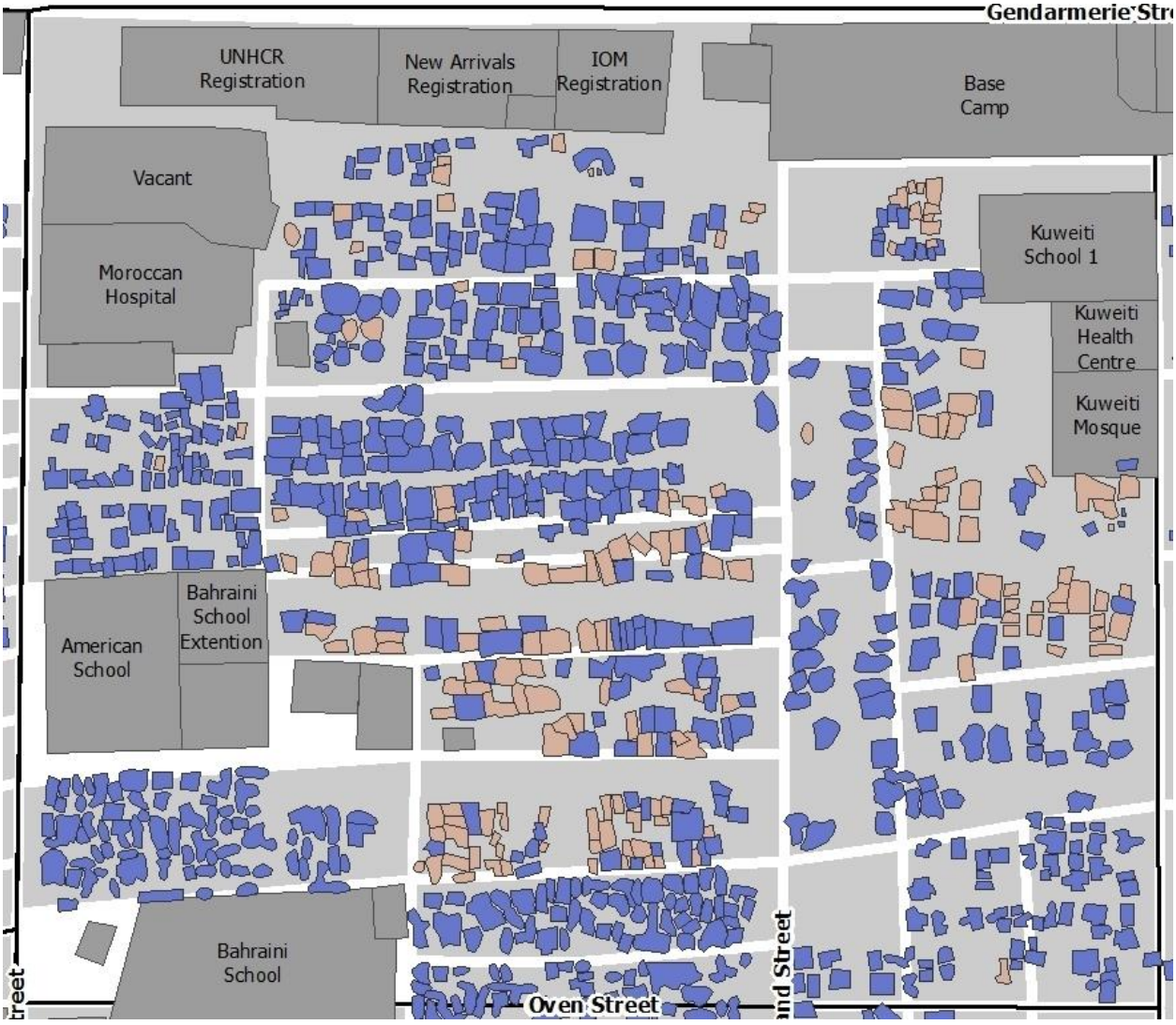


The highest percentage of households that do not produce wastewater is in District 3 (21% of household) and District 8 (18% of households).

The number of households without a wastewater source is greatest in District 3 (169 households) and occurs in clusters. This could be connected with the high rate of tent ownership amongst residents as well as demographic factors: 1-2 people per tent that prefer to use public kitchen or WASH block instead of installing their own household level facilities.

Map 2: Clusters of households that do not produce wastewater in District 3 (Part of a map *Households possessing a wastewater source* in set of thematic maps)

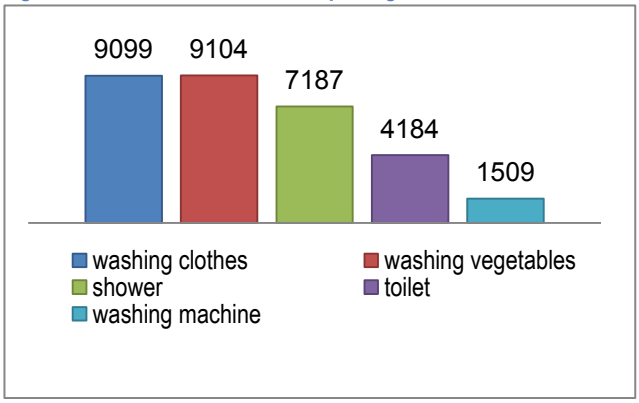
Beige – Households with no wastewater production
Blue – Households with wastewater production



3.1.1. SOURCES OF HOUSEHOLD WASTEWATER

The assessment distinguished between five sources of wastewater at the household level: four of these produce grey water: sinks for washing clothes, private sinks for washing vegetables, washing machines, showers. One produces black water – private toilets. It should also be noted that when grey and black wastewater mix, the mixture is considered black.

Figure 3: Number of households reporting source of wastewater



Considering the complexity of the assessment as well as the dynamic situation across households and the camp itself, it was beyond the scope of this assessment to gauge whether grey and black water are separated at the household level, for example through separate methods of discharge. Due to this, households covered by the assessment were categorised as creating: only grey water, only black water, or grey and black water.

Assessment findings show that a total of 31,083 sources of wastewater exist in the camp at the household level, as seen in Figure 3. The biggest number of wastewater sources appears in districts 1, 2 and 11, which together constitute 35% of wastewater sources at the household level in the camp. These districts also have the highest number of private toilets (55% of all private toilets) and washing machines (62% of all washing machines in the camp). In districts 1, 2 and 11 the production of wastewater is visibly the highest which has in turn led to the highest development of wastewater discharge mechanisms (see chapters about wastewater discharge).

Furthermore, the assessment clearly revealed that the most common source of wastewater in the camp is washing using private sinks: both vegetables (88% of households in the camp) and clothing (88% of households in the camp). A total of 8,908 households in the camp (85%) use private sinks to wash both vegetables and clothes, whereas 6,574 households (63% of all assessed households) have all of the three most common wastewater sources (washing vegetables, washing clothes and shower).

The most common combination of wastewater sources are showed below in Figure 4. In the camp there are also households with other combination of wastewater sources, however the number of each different type is lower than 100 households.

Figure 4: The most common combination of wastewater sources at household

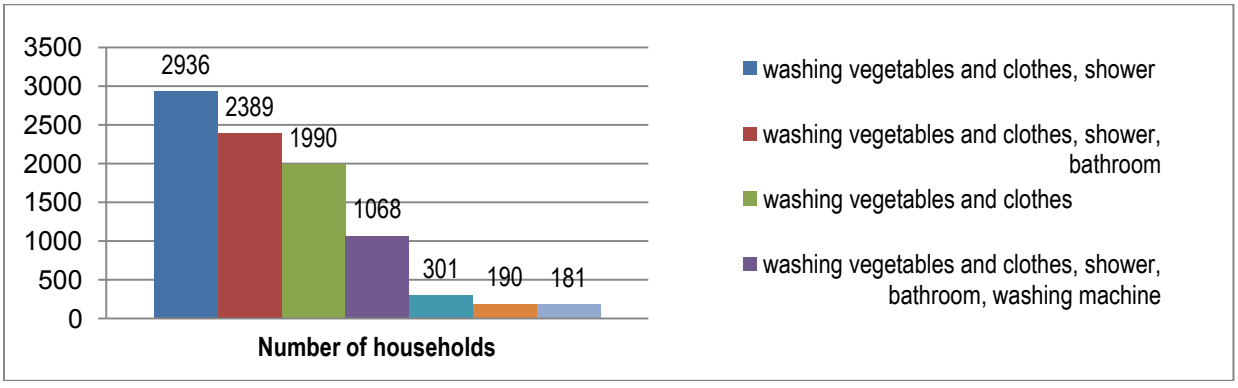


Table 3: Number of household wastewater sources per district

Districts	Private toilet	Washing machine	Shower	Washing clothes in sink	Washing vegetables in sink	District total
District 1	742	293	727	962	981	*3,705*
District 2	1,065	463	1,049	1,088	1,091	*4,756*
District 3	157	39	308	616	631	*1,751*
District 4	107	84	385	529	482	*1,587*
District 5	152	36	466	688	701	*2,043*
District 6	213	85	355	634	644	*1,931*
District 7	117	23	619	785	785	*2,329*
District 8	68	25	182	236	269	*780*
District 9	235	54	568	674	681	*2,212*
District 10	421	94	880	978	989	*3,362*
District 11	527	186	880	1,193	1,195	*3,981*
District 12	380	127	768	716	655	*2,646*
Camp Total	*4,184*	*1,509*	*7,187*	*9,099*	*9,104*	*31,083*

Table 4: Percentage of household wastewater sources per district

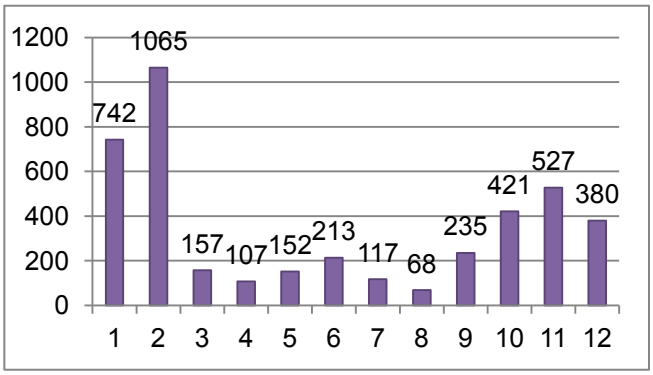
Districts	Private toilet	Washing machine	Shower	Washing clothes in sink	Washing vegetables in sink
District 1	70%	28%	69%	91%	93%
District 2	85%	37%	84%	87%	87%
District 3	19%	5%	38%	75%	77%
District 4	18%	14%	65%	90%	82%
District 5	20%	5%	61%	90%	92%
District 6	29%	12%	49%	87%	89%
District 7	14%	3%	76%	96%	96%
District 8	21%	8%	55%	72%	82%
District 9	32%	7%	77%	92%	93%
District 10	41%	9%	86%	96%	97%
District 11	40%	14%	66%	90%	90%
District 12	41%	14%	83%	77%	71%
Camp total	*40%*	*15%*	*69%*	*88%*	*88%*

Private toilets

Findings indicate that 40.4% households in the camp have access to private toilets and produce black water, which in turn translates to 4,184 households with a total population of 33,200 people.

The majority of private toilets are located in districts 1 and 2, where they represent 742 (70%) and 1065 (85%) of households respectively. The prevalence of private toilets is also significant in districts 10, 11 and 12, where approximately 40% of households have these facilities.

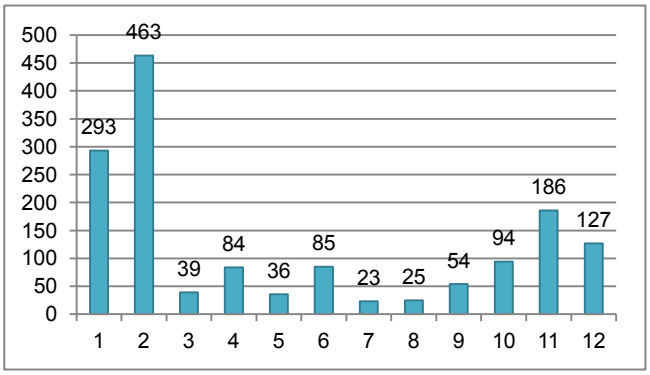
Figure 5: Households with private toilet



Washing machines

The prevalence of washing machines in the camp is not widespread, which is significant since it exponentially increases the creation of wastewater in households.
The highest number of washing machines was noted in districts 1 (293 washing machines in 28% of households) and 2 (463 washing machines in 37% of households) which are the most "developed" in terms of production and disposal of wastewater (Table 3). The proportion of households possessing a washing machine was less than 15% across the remaining districts.

Figure 6: Households with washing machine

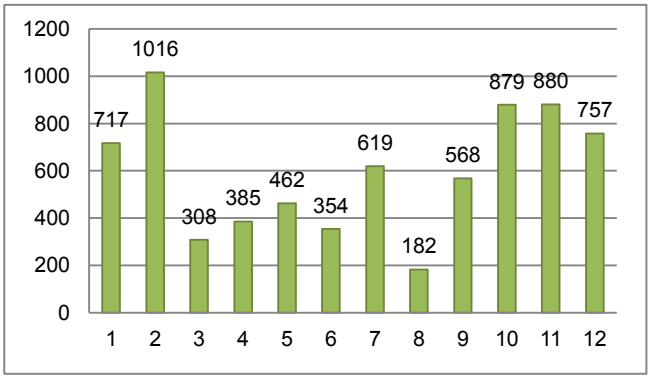


Showers

Showers are also a relatively common household facility in households across the camp (see Figure 8 and Table 4).

However, in districts 1 and 2, the number of showers is lower than private toilets. In line with findings from previous Camp Sweep reports (May and November 2013), districts 1 and 2 overall have a higher rate of possession of private goods. This factor, coupled with active community organisation; limited space per person; and socio-cultural preferences to share showers but not latrines amongst families, may underlie this finding.[3]

Figure 7: Households with shower



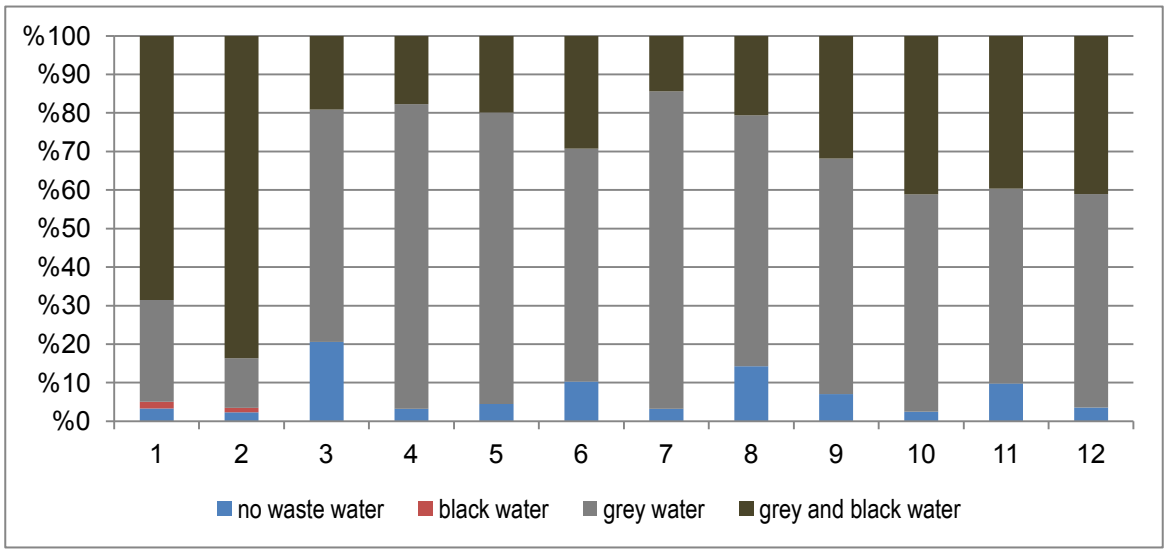
[3] REACH (November 2013) *Al Za'atari Camp Sweep Report: A Shelter and NFI assessment for winterization programming*.

3.1.2. OCCURRENCE OF GREY AND BLACK WATER

Regarding information about households possessing private toilets, the figures indicate that 40.4% of households in the camp produce black wastewater and that 5,137 informal wastewater storages may contain black water (which represents 59% of all informal wastewater storage at household level).

The production of black and grey wastewater varies between districts, as seen in Figure 8 below. Households in districts 1 and 2 mostly produce both grey and black water - 69% and 84% of households respectively – while a mere 3% and 1% of households in the two districts respectively, produce black water only. In the rest of the camp, the majority of households produce only grey water. The highest proportions of households that produce only grey water appear in District 7 (83% of households) and District 4 (79% of households). Simultaneously, these districts also contain the smallest proportion of households that produce black water.

Figure 8: Types of wastewater in households per districts

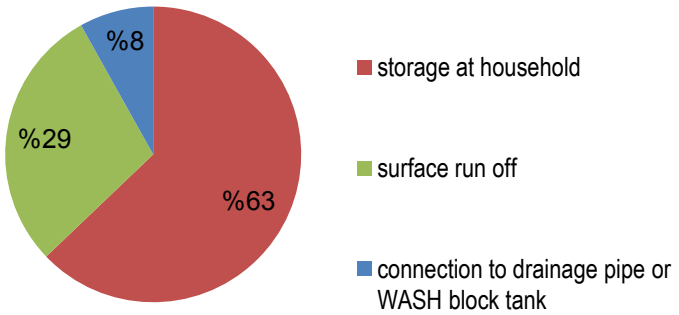


3.2. HOUSEHOLD WASTEWATER DISCHARGE METHODS

Existing methods of wastewater discharge are wastewater storage at the household level, surface run-off and connection with drainage network or WASH block tanks. The most commonly reported method is wastewater storage at the household level.

According to the assessment, there are 8,645 informal wastewater storages in the camp. Based on digitized spatial data, nearly 7,000 pipes and ditches were found in the camp, with the vast majority being ditches.

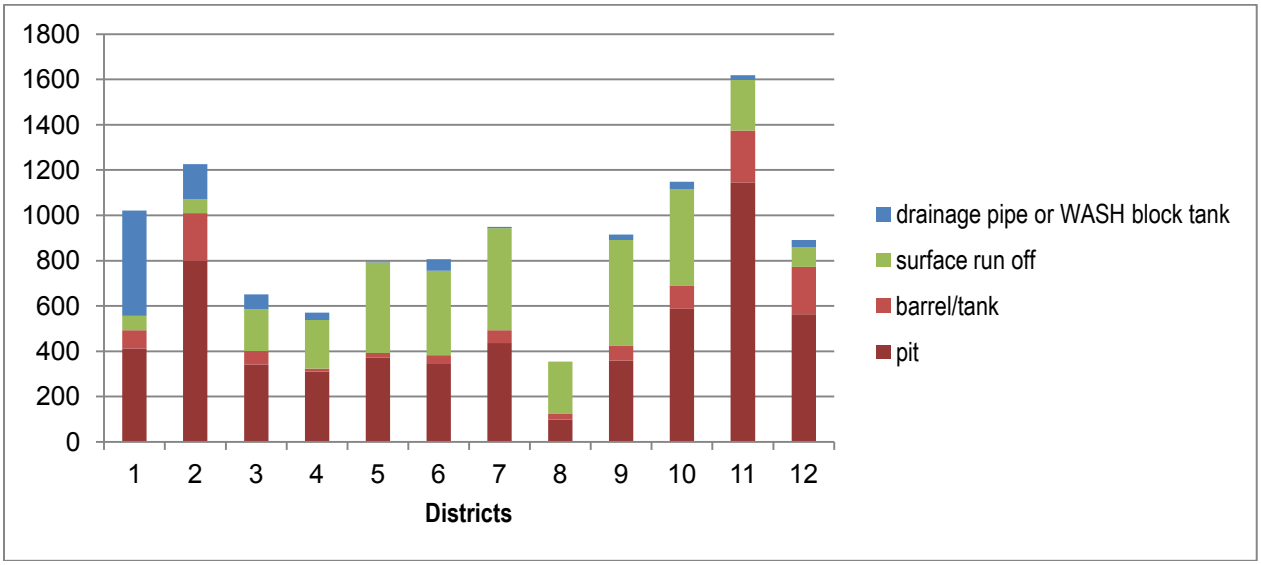
Figure 9: Household wastewater discharge methods



Findings indicate that the vast majority of households which produce wastewater use just one method of discharge. Among households with two methods of wastewater discharge, almost all use wastewater storage and surface runoff. Although difficult to say with certainty, it is considered likely that in cases where two methods of wastewater discharge are used - surface run-off discharges grey water and wastewater storage discharges black water.

The breakdown of wastewater discharge methods reported by households per district is shown in Figure 10 below. It displays all types of distribution of methods reported by each household. Pits are the most common way to store wastewater, in contrast to barrels and tanks which were reported by a small number of households. Barrels and tanks are used mostly in districts 2, 11 and 12, all of which are districts with high levels of wastewater production. In District 1, barrels and tanks may be relatively uncommon due to widespread use of connections with the drainage network. In districts where the majority of wastewater is grey water (3, 4, 5, 6, 7, 8, 9 and 10) residents were most likely to report that waste water was emptied in ditches or on the ground (both displayed as surface run off in Figure 9).

Figure 10: Household wastewater discharge methods per district



3.2.1. WASTEWATER STORAGE

The assessment showed that 6,414 households have informal wastewater storage, which constitutes 62% of all households in the camp and 66% of households which produce wastewater. Some households reported using several storage types, which yielded a total number 8,645 informal wastewater storage in the camp.

The 3,430 households that were found to have both private toilet and wastewater storage yielded a total number of 5,137 informal wastewater storages that may contain black water, which represents 59% of all informal wastewater storages.

Figure 12: Proportion of households with wastewater storage per district

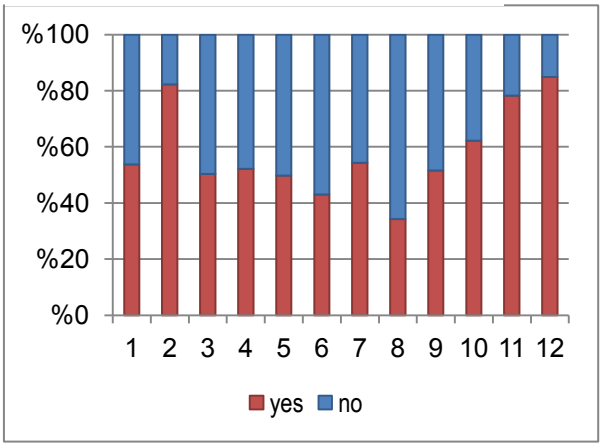
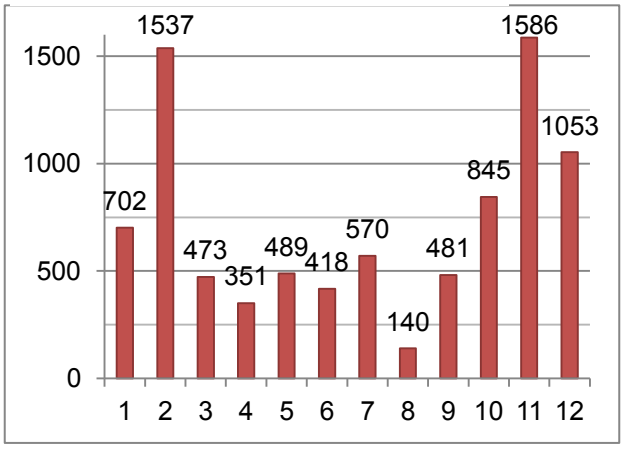


Figure 11: Number of wastewater storages per district

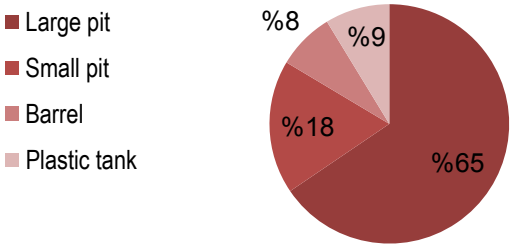


The highest numbers of wastewater storages were found in districts 2 and 11, followed by districts 10 and 12 (see Figure 12 above). District 1 had a small number of wastewater storages in comparison to the number of wastewater sources due to widespread connections to the drainage network and WASH block tanks.

Types of wastewater storage are: pits, petrol/oil barrels, plastic tanks. A description of each type is presented in Section 2.1 (Terms, Definitions and).

Being the cheapest and easiest to implement, pits are the most common type of wastewater storage: 65% of all wastewater storage are large pits and 18% are small pits. Barrels and tanks are not widespread; it is possible that as they require a more significant investment, they are less convenient for people as an option to discharge wastewater.

Figure 13: Types of informal wastewater storage



3.2.2. CONNECTION WITH DRAINAGE NETWORK OR WASH BLOCK TANKS

Evidence suggests that 888 households in the camp are connected to the drainage network or WASH block tanks. These include usage of operating WASH block tanks as well as the remaining tanks of destroyed WASH blocks.[4]

Photo 6: Destroyed WASH centre site with two cleanout pipes of underground WASH tank showing above ground

Photo 3: Underground connection pipes leading to wastewater pit.

[4] NB This refers to cases where the superstructure of a WASH block (showers, walls, toilets) have been destroyed, however the underground water tank remains in place, meaning it is still possible for refugees to connect wastewater pipes to these.

The assessment survey did not enable distinction between households that use underground pipes to connect to drainage network from those that connect to WASH block tank. However, it is possible to illustrate how underground pipes are connected from households to WASH facilities through digitized drawings, although this format does not show the number of each different type of connection.

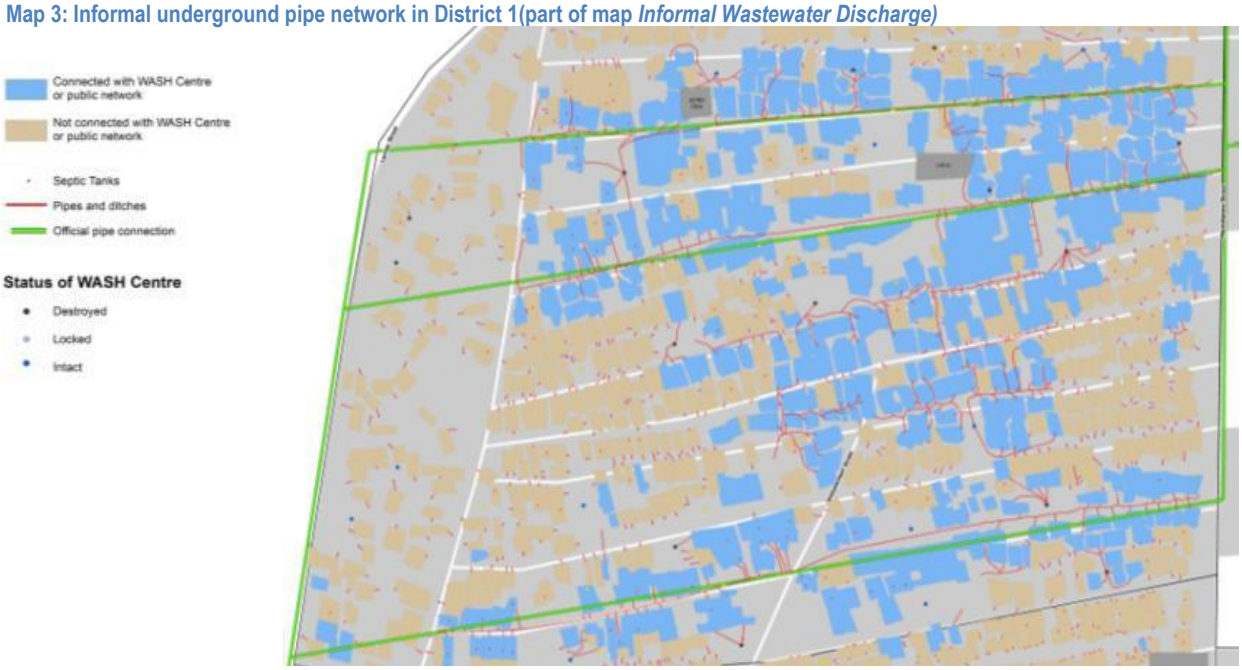
In the Old Camp (districts 1, 2, 3, 4 and 12), it was discovered that a lot of households in districts 1, 2, 3 and 12 were disposing of wastewater through underground pipelines connected to a drainage network built by THW. 'storm water' drainage network is located in districts 1, 2, 3, 4 and 12, for the purpose of directing the flow of rainwater to a deposit outside the camp. The system was not designed for household wastewater, hence as a result of the design and installation methods, the system is experiencing major operational issues, as dirt and rubbish from wastewater clogs the pipes.

All connections with WASH block tanks in the camp are underground pipes, sometimes joining wastewater from multiple households. An informal underground pipe network has been developed in District 1, where 464 households (44% of households in the district) are connected to the drainage network or WASH block tanks and similarly in District 2, where 155 households (12% of households in the district) are connected to the drainage network or WASH block tanks. The informal underground pipe network developed in District 1 has been displayed with spatial data in Map 3.

Given that this happened in neighborhoods between two drainage pipes, it can be concluded that the underground pipe network, as a solution for wastewater discharge, is convenient for people and as such, they created their own network based on the experience of neighbors. The proximity of formal drainage pipes in districts 1 and 2, appears to not only have inspired the district population to connect to the drainage network but also to use underground pipes to connect to WASH tanks.

Some households are not connected to existing networks possibly due to lack of funds and other resource constraints – using wastewater storages or ditches are comparatively cheaper solutions compared to connections to any form of pipe network.

Map 3: Informal underground pipe network in District 1(part of map *Informal Wastewater Discharge)*



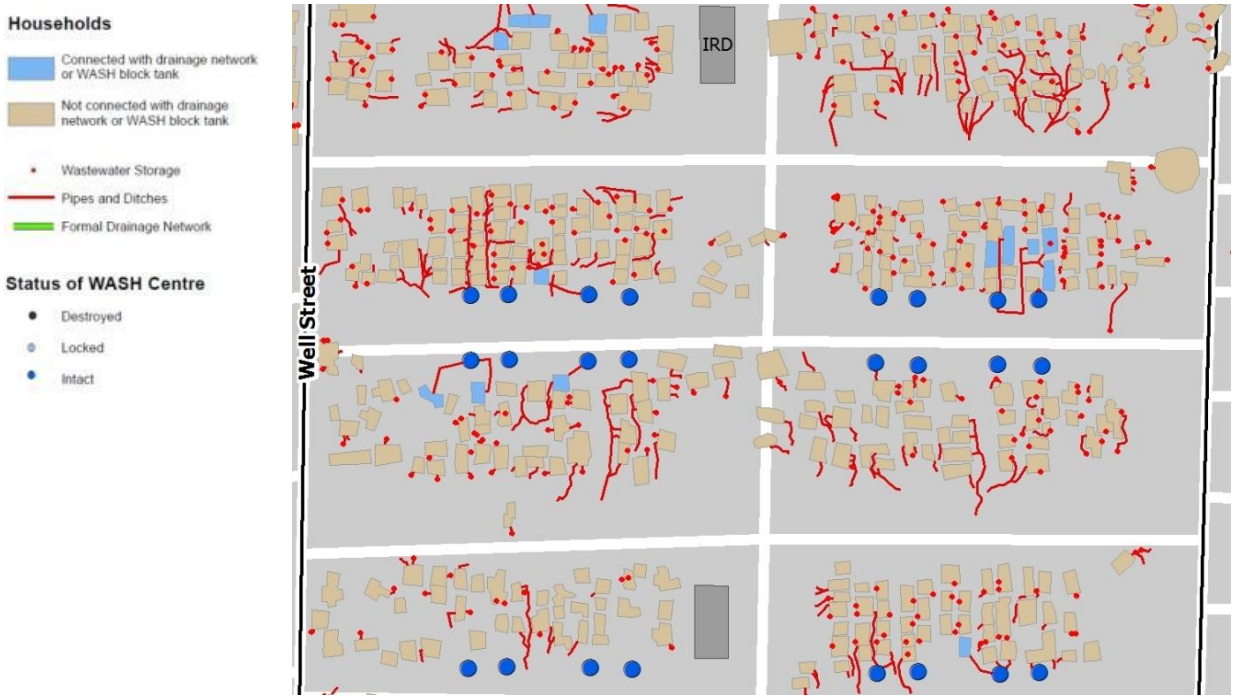
3.2.3. SURFACE RUNOFF

In districts 5, 6, 7, 8 and 9 a sizeable portion of wastewater discharge is through surface runoff. In these areas, evidence suggests that the majority of wastewater produced is grey water, which is convenient to discharge in small amounts through a ditch or by pouring onto the ground. Despite this, it seems to be a wastewater discharge method with limited capacity, which should be taken into account in any analysis of water circulation in the camp.

The thematic maps *Informal wastewater discharge* and *Household wastewater types and storage, pipe and ditch locations* show the location of ditches for surface runoff that go in a vast number of different directions.

Map 4: Example of household, wastewater storage, pipe, and ditch location (part of map Informal Wastewater Discharge)

Red lines with no ending in WASH centres represent ditches, while red lines that end in WASH centres represent pipes.

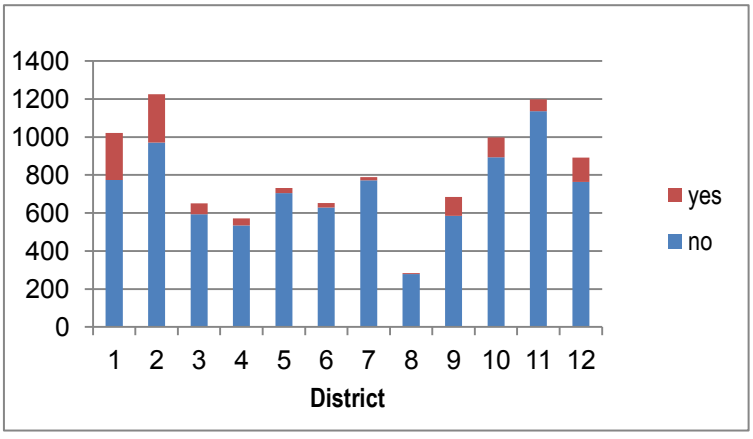


3.3. PRIVATE WATER STORAGE

Beside questions regarding wastewater, people were asked if they have storage of drinking water in households.

The assessment revealed that 11% of households (1,060 households) which produce wastewater also have private water storage.

Figure 14: Water storage in households which produce wastewater per district

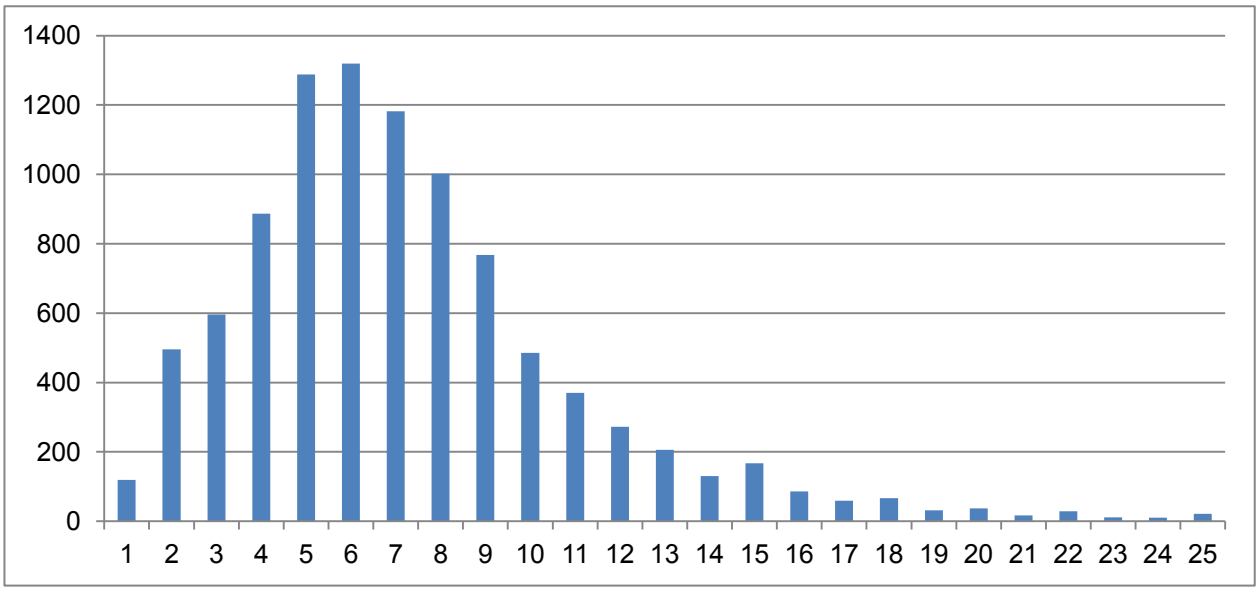


The majority of water storage can be found in districts 1 and 2 (around 250 households per district). In districts 9, 10 and 12, households with water storage average between 100–130 households per district. Districts 3, 8 and 11 have on average less than 65 households with water storage capacity.

3.4. POPULATION IN HOUSEHOLDS WHICH PRODUCE WASTEWATER

The assessment attempted to assess the size of households in relation to their production of wastewater. For households that do not create wastewater, no data collection was conducted. There is no clear correlation between household size and number of wastewater storages. However it is possible that storages are larger or are emptied more often. There are many more factors that influence the existence of wastewater sources as well as discharge methods, including type of shelter, the hardness of the ground, funds and future intentions.

Figure 15: Households that produce wastewater - by number of household members



4. COMPARISON WITH AL ZA'ATARI CAMP SWEEP REPORT ON SHELTER AND NFIS NOVEMBER 2013

The Al Za'atari camp sweep report on shelter and NFIs in November 2013 revealed 74,447 individuals residing in 13,352 households in the camp.

This assessment revealed 71,074 individuals in 9,695 households, which represented 93% of 10,069 total households in the camp – population data was gathered only for households that produce wastewater.

Given that the camp sweep showed that on average households contained 5.57 people, we can estimate that the 374 households that do not produce wastewater have a total population of 2,083 people. This yields a total number of 73,157 individuals from this assessment, which is very close to the population numbers collected during the camp sweep, with any differences accounted for by the differing periods of data collection.

The difference in the number of households between the two assessments may also be due to differing operational definitions of household boundaries. The camp sweep approached each family cohabiting in a compound as an individual household, given that the main unit of analysis on the individual level. This assessment methodology on the other hand, define households based on real-time information provided by household residents, where shared facilities that produce wastewater is the defining feature, including shared toilets or washing areas, as well as any clearly delineated physical boundaries, including fences surrounding multiple caravans.. The lower number of households can thus partly be attributed to this difference in definition of the term 'household'.

An additional factor to consider, is that since the camp sweep took place, distributions of caravans have occurred in the camp. . In areas where new caravans where delivered, structure of households may therefore have changed change; where families have merged to form one household. . This would hence influence the total number of households.

Table 5: Comparison of data from November 2013 camp sweep in Al Za'atari

	Camp Sweep (November 2013)				Wastewater Assessment (December 2013)			
Districts	Households	Private toilets	Washing Machines	Showers	Households	Private toilets	Washing Machines	Showers
District 1	1,161	708	213	618	1,056	742	293	727
District 2	1,305	1,096	146	736	1,255	1,065	463	1,049
District 3	1,157	266	56	249	820	157	39	308
District 4	981	221	23	159	590	107	84	385
District 5	1,101	123	27	156	765	152	36	466
District 6	935	51	21	110	727	213	85	355
District 7	1,076	257	8	400	815	117	23	619
District 8	368	15	3	47	330	68	25	182
District 9	964	197	11	401	736	235	54	568
District 10	1,340	655	27	555	1,023	421	94	880
District 11	1,784	515	47	857	1,328	527	186	880
District 12	1,180	532	64	608	924	380	127	768
Camp Total	*13,352*	*4,636*	*646*	*4,896*	*10,369*	*4,184*	*1,509*	*7,187*

5. CONCLUSIONS

- A majority of households in Al Za'atari produce wastewater inside their homes, beyond the confines of the communal WASH blocks. This includes both black and grey water, and in some areas in particular consists of a high volume. In the old camp in particular people have created their own access to WASH services such as latrines and showers, and do not use or do not exclusively use the communal WASH blocks for this purpose.
- Although there is no formal system in place for the disposal of wastewater from individual households in Al Za'atari, the refugees have created a system themselves. In District 1 specifically and in the old camp in general, this is often a highly functioning underground system of pipes which tap into the WASH block tanks for waste water, and can resemble a proper plumbing system joining multiple houses on the same street.
- Given the above, it is crucial that WASH actors and camp management continue to work on a sustainable and professional standard solution to the creation of wastewater within Al Za'atari, as the current system is vulnerable to flooding and can be a public health concern. The tendency to damage communal wastewater storage facilities in order to provide outlets for individual wastewater production is of concern, and any sewage system implemented in the camp should allow refugees the option to connect their individual pipes into it without the risk of structural damage.
- Many refugees own items such as washing machines, and even fountains, and all WASH strategies should take this high level of appliances into account when thinking about water use within the camp.

REACH: MISSION AND IMPACT

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