

SANITATION TECHNOLOGY TRANSFER

From UK festivals to migrant camps in Greece

by

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Abstract

Conflict in Syria and other Middle Eastern countries prompted thousands of migrants to attempt the journey to western European countries, only to be held up in countries such as Greece because of closing borders. Greek camps in summer 2016 varied in standard, but all official ones were initially run by the military, who installed chemical toilets. UNHCR and NGOs subsequently worked on improved sanitation solutions. This thesis explores the sanitation situation in Greek migrant camps, concentrating on three camps near Thessaloniki, and investigates the potential of transferring sanitation technology from two UK festival toilet companies to a Greek context. It is concluded that elements of the technology might be suitable for particular camp phases, but both companies would need to adapt their technology to be appropriate for a largely Muslim population in a Greek setting. They should also consider collaboration with Greek companies, and ongoing management scenarios using either camp residents or NGO employees.

Executive Summary

Introduction

Sanitation in UK festivals has had a bad reputation over the years, and this is only now beginning to be redeemed by organisers rejecting the traditional chemical toilet solution, and adopting new waterless technologies. These solutions embrace the whole sanitation chain by providing safe, easily cleaned toilets that are able to contain human waste and subsequently use it to provide power or fertiliser for agriculture.

It may seem trite to draw parallels between festivals and refugee camps, but they are both generally temporary to one degree or another, they host large numbers of people who are out of their natural environment, and good WASH facilities are essential if disease outbreaks or environmental damage is to be prevented.

The thesis looks at the European migrant emergency in the context of refugees in Greece, where tens of thousands of migrants were held due to the closing of borders in March 2016. Sanitation facilities in three camps in the north, close to Thessaloniki, were investigated, in order to find out what facilities were provided, and how festival toilet technologies might fit into a camp environment.

Aim and objectives

The *aim* of this dissertation was to look at festival technologies, and gauge their appropriateness for migrant camps in Greece. The *objectives* were:

- 1) To use specific UK-based festival toilet companies as examples of container-based toilet solutions
- 2) To investigate the context of contemporary Greek camps in order to ensure that any solutions recommended be appropriate
- 3) To investigate the limitations and influences upon technology selection in migrant camps
- 4) To analyse the potential for the above companies' technologies to be used in migrant camp settings

Festival toilet technologies

The author used his experience working with two festival toilet companies, Natural Event (Europe) Ltd. and Loowatt Ltd., to improve his knowledge of their systems and build relationships with their operators. Natural Event have helped transform the toilet situation at Glastonbury Festival, one of the largest in the world, by installing 1,111 of their composting toilets across the site (TEDx, 2015). These toilets use standard 200L wheely bins as containers for a mixture of faeces and soak (usually sawdust), with liquid being drained out of the bottom of the bins into an IBC (Intermediate Bulk Container) using an electric pump. The bin mixture is usually removed to a designated area for composting and onward application to the land, although low-use toilets would enable on-site, in-bin composting to a certain degree (Skermer, Interview, 2016).

Loowatt's system uses a sealing technology that contains excreta in a biodegradable film before it is passed down into a container. One of the major plusses of this system is that the user cannot see faeces from any previous users, with odour also being eliminated. The UK festival version of their toilets (they also manufacture household-level toilets for sale in Madagascar) is hosted on a trailer with six cubicles. As with the Natural Event system, a selling point is the end of the sanitation value chain, with waste going to biogas production.

Greece: migrant camps

Research on an appropriate location to study revealed that the north of Greece was struggling to cope with refugee numbers. The area around Thessaloniki was chosen because of the high concentration of camps, of all sizes and accessibility. The three camps chosen for study were

selected because the NGO responsible for their WASH set-ups, the International Rescue Committee, had a team that was particularly open to the author's research intentions.

Camps visited in Greece were found to have large numbers of chemical toilets (installed by contractors hired by the Greek military). Responsibility for these toilets had often passed to either UNHCR or other NGOs, who were responsible for paying up to 650 euros (736 US dollars) per month *per toilet*. These chemical toilets were generally disliked by refugees (although Sphere standards were generally met), and open defecation was common, probably as a result.

Two camps were in the process of installing custom-made toilet blocks which utilised prefabricated 'Isobox' buildings. These facilities had several distinct advantages over their chemical counterparts: they provided squatting facilities and a hose with shower attachment for anal cleansing (which suited the mainly middle-eastern refugees), they had adequate lighting, were easy to clean, and provided water for hand washing. Perhaps their most notable feature was that they used water for flushing, as they were all installed in camps that had been created within municipal town boundaries, and could therefore be connected up to existing sewerage networks (at a not-insignificant cost of 600,000 euros (680,000 USD) for the three camps).

Appropriateness of festival toilets

Sewer systems might not meet 'Waste to Value' or 'sustainable sanitation' criteria, as they tend not to close the 'sanitation loop', an important factor for funders (see Bill and Melinda Gates Foundation, 2010). It is likely that both Loowatt and Natural Event would meet such requirements.

Analysis of technology appropriateness revealed that it is very unlikely that either festival company might be able to 'plug and play' their technology in the Greek migrant camp context, as this would risk falling into the 'finding a problem for a solution' trap. Similarly, top-down introduction of that technology without appropriate involvement of all stakeholders risks failure of that technology – even if it appears to work well on paper (Byars, 2013)).

It should be noted that the provision of power and water to camps, and access to sewerage networks, does not necessarily negate the need for a waterless sanitation solution. Services can be stopped for a variety of reasons, and sewerage networks can get blocked (especially in Greece, where pipes struggle with toilet paper).

Technology transfer

It was concluded that Natural Event's technology would be most suitable for a Phase 1 or unofficial camp, where flexibility and rapid deployment are key. This would be dependent on them converting their toilets into squat, or sit/squat toilets, and might also depend on installation of solar power for their IBC pumps. Loowatt's technology centres around its sealing mechanism, with toilet superstructure less an integral part of what the company stands for. Their technology is recommended for Phase 2 or 3 scenarios, where there is a lack of water for flushing (the system can handle water for anal cleansing, depending on the size of barrels being used for collection). It is recommended that their technology be housed in robust anti-vandal superstructures.

There is potential for both companies to liaise with a Greek toilet or logistics company to manufacture and maintain an adapted system – this would create local employment, and help reduce bureaucratic challenges. Neither system can work without continual cleaning and maintenance - both companies would need to integrate a comprehensive post-installation management plan, agreed with camp residents, NGOs and camp managers, and to help with this the allocation of facilities to specific families or groups is recommended (Harvey, 2007, pp.32-34). Arguments for waterless technologies in the camps studied revolve around the reliability of water supplies for newly-installed flush toilets, the 'moveability' of waterless options, the waste-to-value benefits, and the relative cost-effectiveness compared to installing a sewerage system. A pilot scheme, with neutral monitoring of results, is recommended.

Conclusion

Perhaps now is the time to seriously consider non-water-flushing / non-chemical options in Greek refugee camps, especially considering the country's arid nature and the uncertain longevity of camps. The two companies highlighted in this report have the ability to move into this field; whether they are successful will depend on appropriate adaptations to cope with user habits, careful management plans, the willingness to collaborate with a range of actors – and the desire to make a difference.

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Abbreviations

CLTS	Community-Led Total Sanitation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German government-owned development organisation)
HIF	Humanitarian Innovation Fund
FSM	Faecal Sludge Management
IBC	Intermediate Bulk Container
IRC	International Rescue Committee (NGO)
MHM	Menstrual Hygiene Management
NGO	Non-Governmental Organisation
OD	Open Defecation
REA	Rapid Environmental Assessment
SDGs	Sustainable Development Goals
SFD	Shit-flow Diagram
UD	Urine Diversion
UDDT	Urine-Diverting Dry Toilet
UNHCR	United Nations High Commission for Refugees
WASH	Water, Sanitation and Hygiene
WEDC	Water, Engineering and Development Centre
WTV	Waste-to-value

1 Introduction

1.1 Terminology – some clarifications

Migrant camp and **refugee camp** are terms used interchangeably throughout this document. Likewise, **refugee**, **camp resident**, and **migrant** are all used interchangeably. No political statement on the status of refugee camp residents is intended by particular terminology.

Container-based toilet systems refer to those systems that use barrels, buckets or bins to contain excreta.

Isobox container toilets are prefabricated shipping containers which have been adapted to house toilet cubicles (admittedly, the two ‘container’ terms are uncomfortably similar to each other: it was difficult to find generally-accepted alternate descriptors).

Humanure refers to compost created from human waste.

Sanitation only refers to management and disposal of excreta, and does not include hygiene management, solid waste management, disposal of dead bodies or wastewater management.

All three camps studied in detail have been anonymised (Camps, 1, 2 and 3), in order to protect the interests of residents and camp workers. All respondents have also been anonymised, and were speaking on their own behalf rather than representing their employer. Persons wishing to conduct further research in the area are welcome to contact the author for information on camps visited. Other camps, which may have been visited briefly by the author, are named within the body of the work.

1.2 Festivals to refugee camps

‘Toilets save lives’ (WaterAid, 2016a). Containment of excreta, separation of it from humans and other vectors, and safe transport and treatment or disposal of it contributes to a reduction in life-threatening diseases. It is too often the case that adequate sanitation solutions are not seen as an equal priority alongside access to shelter, food and potable water (George, 2008, p.82).

Globally, festivals of various kinds bring large numbers of people together, often to a rural area not equipped with facilities for safe disposal of human waste. Again, sanitation has traditionally not been prioritised, an unglamorous adjunct to entertainment.

The similarities between festivals and migrant camps have not gone unnoticed. Both involve large amounts of people being placed into a situation with limited power, water and sanitation options, with the added psychological difficulties associated with having to share traditionally private resources with a cross-cultural demography. Hamish Skermer, owner of Natural Event composting toilets, puts it well:

‘They’re the same...[except] one is a group of people trying to stay awake, and the other is a group of people trying to sleep.’

(Skermer, interview, 2016)

One has to be careful drawing parallels between the two situations; people choose to visit a festival, and are able to leave again after a few days, returning to their own showers and toilets (Clear Haze, 2015); camps might have residents who have been forced to stay there against their will. But from a purely practical viewpoint, when it comes to the provision of sanitation facilities the similarities are clear: they need to be provided for many people, usually in an area with no connection to a usable sewerage network, and they need to be easily cleaned, regularly maintained, well-lit and provide privacy. Gastrointestinal disease outbreaks at open air festivals are frequently attributed to inadequate sanitation (Botelho-Nevers and Gautret, 2013); the potential for more serious disease outbreaks as a result of improper disposal or treatment of human waste was demonstrated in the aftermath of the Haiti earthquake of 2010 with over 9000 cholera-related deaths (Sandler Clark and Pilkington, 2016), lending strength to the argument that the end of the sanitation chain can be as important as the beginning.

This research dissertation looks at how advances in waterless, containerised dry toilet technology in use at festivals might benefit similarly large gatherings of people in a migrant camp, by looking at current festival technologies, the sanitation situation in northern Greek migrant camps, the user interface of toilets in use (in festivals and camps), and the potential for some or all of the festival technology to be used in a camp setting.

1.3 Current situation in northern Greece

The commonly-used phrase ‘Syrian Refugee Crisis’ is perhaps a misleading term. Those using it are usually referring to the influx of migrants who have been arriving in Europe since

the war in Syria prompted people to leave. The crisis is in Europe (and middle-eastern countries abutting Syria); furthermore, the people involved are not just Syrian, but also Afghans, North Africans, Iraqis, Pakistanis, and Kurds. Some do not have refugee status. Perhaps a more accurate descriptor might be 'European migrant crisis,' although the term 'migrant' is politically-loaded in itself, implying migration for economic reasons only.

Whatever the terminology, the fact remains that many people have entered Greece in the past two years, intending to travel on to countries such as Germany, the UK and the United States. The largest concentration of refugees until March of this year was around areas abutting the Former Yugoslav Republic of Macedonia (FYROM). This was because refugees attempting to travel onwards through Europe had been stopped by a closed border. Camps included large unofficial ones, such as the EKO Gas Station Camp, and Eidomeni. In March and again in May 2016 these were largely cleared by the Greek government and many refugees relocated to official camps in the industrial area surrounding Greece's second city of Thessaloniki (Kingsley and Smith, 2016), including former military bases (such as Diavata and Alexandreia), and large 'warehouse' camps (such as Oraiokestra and the Softex 'hot spot' transition camp, a former toilet paper manufacturing plant).

Camps differed in size, conditions and population demographics. The main camp studied for this report, Camp 1, had a mostly Syrian population, with about 15% Afghans and an overall population of 1,728 during the fortnight the author visited. It had a high percentage of women and children, and was generally regarded as being a relatively 'safe' camp (it was also 'open', meaning refugees could come and go, and small enough that strangers were recognised). The Softex Camp, visited briefly towards the end of the field trip, held 2000 refugees in tents pitched either in the open or in a warehouse, with no running water and restricted access.

1.3.1 Sanitation in camps

All toilet facilities were initially provided by the Greek military, and consisted of chemical loos, except where the camp already had working facilities. There were very few *squat* chemical toilets provided, although more were introduced over summer 2016. This is an important point, as most migrants passing through Greek camps were of Muslim origin, from Syria, Iraq, Afghanistan and North Africa, with particular sanitation habit and expectations. It would be expected that not providing appropriate toilets would lead to abandonment or abuse of those facilities, and, indeed, this was proven to be the case.

1.4 Sanitation technology transfer

The phrase 'technology transfer' in this report refers to the taking of a technology from one context, and using it in another: ie taking toilets that have been successfully used in a UK festival such as Glastonbury, and inserting them into a refugee camp setting elsewhere in Europe.

The idea that toilets being pioneered in a UK festival setting might be taken to a refugee camp is not a new one, but it is something that has been happening on a relatively underground basis until now. The author struggled to find any documented cases, and, indeed, only came across one example: that a company using IBCs (Intermediate Bulk Containers, usually used for transporting foodstuffs in bulk) for an excreta container had installed their toilets in the migrant camp at Calais. This example hasn't been included in the body of the work for the simple reason that the company in question did not respond to contact attempts, and there was no way of independently verifying they had actually managed to take their toilets to a camp, or, indeed, how successful the venture was. What it does illustrate is that the counter-cultural element of festivals might not lend itself to being documented in a traditional academic manner.

This dissertation will investigate current waterless festival toilet solutions and explore how appropriate they might be if located in Greek migrant camps, through the Aim, Objectives and Research Questions outlined below.

1.5 Aims and Objectives

1.5.1 Aim

The aim of this thesis is to answer the following research question:

What potential is there for container-based toilet technology transfer between UK festival settings and the European migrant camp context?

1.5.2 Objectives

The research question can be divided up into the following objectives, which will be attained by literature- and research-based investigations:

- 1) To use specific UK-based festival toilet companies as examples of container-based toilet solutions***

- 2) *To investigate the context of contemporary Greek camps in order to ensure that any solutions recommended be appropriate***
- 3) *To investigate the limitations and influences upon technology selection in migrant camps***
- 4) *To analyse the potential for the above companies' technologies to be used in migrant camp settings***

1.5.3 Research questions

The research questions changed as work on the dissertation progressed. The questions listed below are roughly in order of how they were investigated.

- 1) What container-based solutions are being used at festivals?*
- 2) How prepared / motivated are festival companies to take their technology to a humanitarian setting?*
- 3) What is the current sanitation (toilet) set-up in Greek camps as a result of the Syrian crisis?*
- 4) Are current toilets in Greek migrant camps appropriate for the users?*
- 5) Are SPHERE standards being adhered to?*
- 6) Is the waste being appropriately disposed of?*
- 7) What innovations are there currently in the European migrant camp toilet scene?*
- 8) How appropriate might specific festival technology be for different Greek migrant camp situations?*
- 9) What lessons can be learned regarding toilet solutions for migrant camps in Greece?*

2 Literature Review

2.1 Literature review - methodology

2.1.1 Literature review - structure

The structure of this literature review is illustrated by the egg-timer diagram below, showing that reading on the wider subject of sanitation tightened into waterless toilets in the field, before opening up into politics and advocacy:

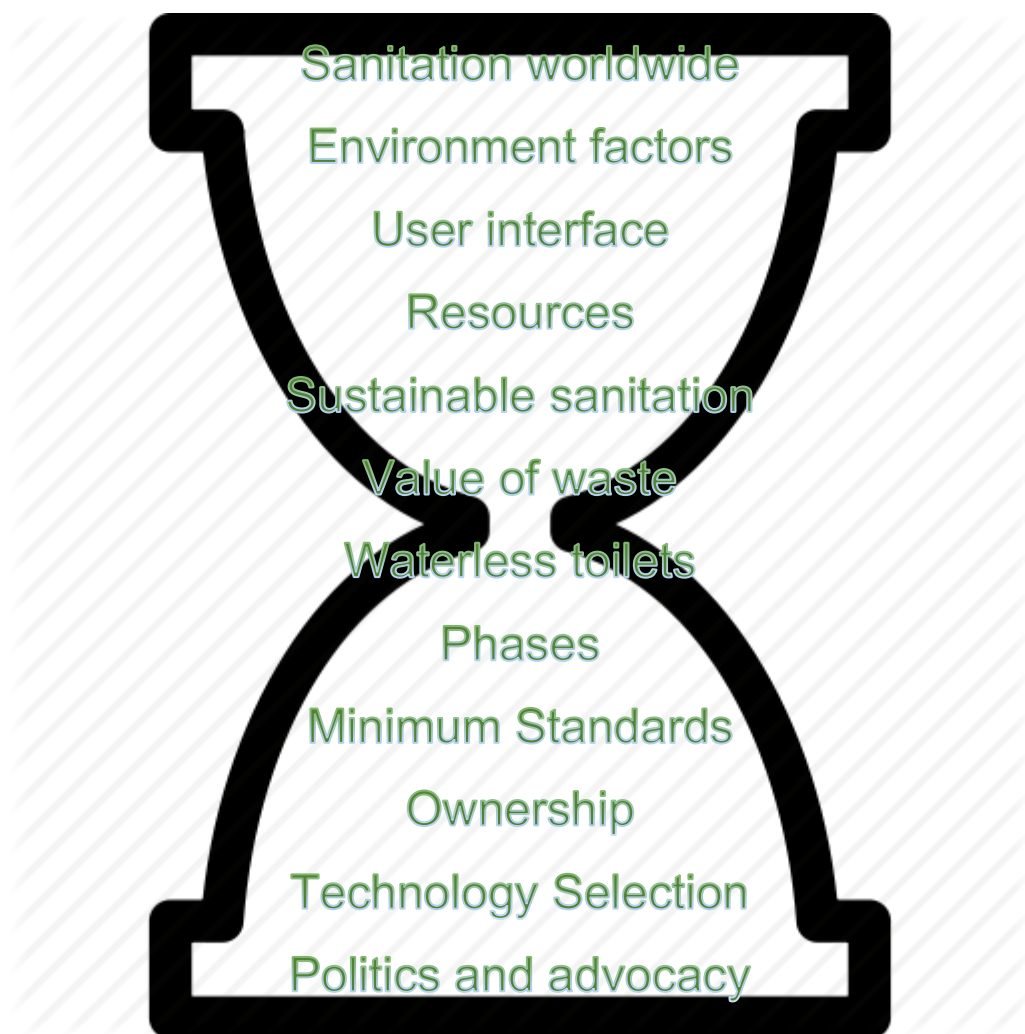


FIGURE 1: STRUCTURE OF LITERATURE REVIEW

This was reflected in the way research was carried out, with wider reading leading into a subject-specific fieldwork phase, then opening up again so that results could be linked back to wider issues (Godwin, 2015, p.8).

2.1.2 Information collection

The author owns a collection of sanitation-related books, which provided some of the background material. Perusal of the shelves in the WEDC resource centre led to emergency sanitation material (searched through WEDC's Knowledge Base).

A traditional search strategy did start to come into play once the above texts had been explored, initially undertaken through the Loughborough University Catalogue Plus system. All material was searched (journals, conference papers, books), using standard Boolean operators, truncation of terms and wildcards.

As an aside, it should be noted that the university library's search facility does not work quite as expected: each individual search box in Library Catalogue Plus (advanced) will *not* search for a phrase automatically (each box searches for all words entered). Quotation marks are required for exact phrases.

Keywords and phrases initially used included the following:

- refugee AND sanitation
- migrant AND sanitation
- refugee AND ecosan
- refugee AND toilets
- sanitation AND Greece
- waterless AND toilets
- compost AND toilets
- "urine diversion" AND refugee
- squat*

Something to be borne in mind whilst searching is that an unintelligent search data system such as Catalogue Plus (rather than a semantic search system) only returns results as good as the terms entered. This means that the user has to anticipate what other subjects and terms might impede on their search. In recent years semantic systems have become more common, often featuring anticipatory searches, or disambiguation options ("bow – do you mean bow of a ship, *or* bow and arrow, *or* bow (knot)?"). These systems are most often found in wikis and photographic libraries, although aspects are creeping into the now-ubiquitous Google (Berners-Lee et al, 2001). For this project, the author had to be aware that use of wildcards and truncated terms might bring in unexpected results: for example, entering squat* (expecting results concerned with the sitting versus squatting discussion) returned papers discussing squatters' rights in abandoned properties.

It soon became apparent that a valuable search technique is to use your eyes. Specifically, to do so when retrieving resources from the (physical) shelves of the library or resource centre, where browsing is still possible and useful. It should also be noted that “virtual browsing” is an option offered by the Catalogue Plus system, so it is possible to see what related texts are nearby the one you are interested in. Both of these strategies are made possible due to the Dewey Decimal Classification System, which ensures that, as far as possible, resources on specific subjects are located next to one another.

Another strategy adopted was the ‘snowball’ technique, where reading a paper could lead the author to further cited relevant papers. This was particularly useful when searching for good peer-reviewed material.

The search tactics above meant a fair amount of resources were being amassed in both physical and digital form: a method of selection was necessary. Table 1, below, was used to assess resources on their quality and relevance, with quality relating to source (reliable?) and citations (good integral use of citations? If a paper, is it cited itself?).

A good source of information on sanitation in emergencies came from WEDC tutor Brian Reed, who had amassed a collection of papers and grey literature on the subject the previous year with the assistance of a WEDC MSc student.

As work on the dissertation progressed, it became apparent that a main source of information on Greek migrant camps was going to be news reports, as the situation on the ground was so fast-moving. Indeed, towards the end of writing, one report (Chrysopoulos, P., 2016) was cited the same day it appeared in the *Greek Reporter*. The author was aware that news reports may not be the most reliable form of information, but in the fast-moving world of the Greek migrant crisis, they were often the *only* source of data. Nevertheless, the author always tried to triangulate newspaper sources with known reliable data sources, such as UNHCR’s regularly updated Refugees / Migrants Emergency Response Site (UNHCRb, 2016).

The table below shows how important newspaper articles were; it also shows that websites were a key source of information, again because they were up-to-date and relevant to the current situation. The review revealed some surprising gaps in the literature, particularly regarding cultural habits and the user interface with toilets.

TABLE 1: LITERATURE REVIEW - SOURCES

Source	Resources found: number	Relevance / quality (acceptable out of total)	Types of acceptable resources
Catalogue Plus	7000+	20 then 9	Journals, books, conference papers, magazines, theses
Brian Reed's emergency sanitation literature collection	85	42 then 7	Journal articles, grey literature
Mendeley citation search	10,000+	2	Journal articles
Library, browsing (physical and digital)	30	4	Journal articles, books, pamphlets
Web: Google	10,000+	29	Newspaper reports, websites, conference proceedings, reports, videos, radio programs, theses
WEDC resource centre	20	8	Books, grey literature
Citations within above sources	3	2	Open letter, journal article
Author's library	8	4	Books

2.1.3 Cataloguing and summarising of literature

At the start of the project, data was separated by topic, and physically catalogued using notes to create a 'mind map' – this helped the author understand elements required to be discussed in the Literature Review, as well as starting to give a direction in which the data collection element of the project might head. This also enabled the author to make connections between ideas in different articles, work and books published over recent years (Hart, 1998, p.143).

It was decided to give the reader a background summary of toilets, leading into a discussion of open defecation and pit latrines, as these topics form the basis of sanitation provision in most refugee camps around the world, although upon completion of the project these topics looked slightly incongruous, as pit latrines are simply not a part of the Greek migrant camp set-up. They were kept in as it was felt important to show some of the background to sanitation management in refugee camps. Abandoned topics included pour-flush latrines and various septic tank set-ups, as they were considered irrelevant (although it should be borne in mind that septic tanks and cess-pits are, in themselves, container-based systems).

Sustainable sanitation and the sanitation value chain were definite topics for exploration considering the nature of the festival toilets being explored. Exploration of the user interface was also seen as essential, as the author had learned about the importance of appropriate toilet facilities during WEDC's Small Scale Water Supply and Sanitation module. Later sections to do with politics and advocacy were added upon return from the field, once the author had gained a better sense of the importance of these topics.

Although the literature review was primarily undertaken from the perspective of provision of facilities at refugee camps, wherever possible research was done to reveal any mirroring of findings in a festival context, as this would back up similarities that might support potential technology transfer.

2.2 Background

2.2.1 History of toilets

Printed books about toilets abound. Most of them focus either on unusual flush toilets, or quirky toilet locations. Historically, using water to remove excreta is a relatively recent innovation in the UK (discounting Roman advances), with large-scale references to WCs, or Water Closets, not occurring until the 18th century (Eveleigh, 2008, p.29). They came about as a direct result of typhoid transmission (ibid, p.28), and were effective largely because they reduced the chances of users coming into contact with other people's waste. They were predated by the chamberpot, which would be emptied into the street, with consequent health risks to passers-by, and nightsoil collection for agricultural purposes.

The WC ran into difficulty not long after its widescale adoption, in that its technology started to outpace the sewerage facilities it was designed to feed into (ibid, p.17): in 1851 50% of London's houses lacked access to sewers, with the majority of WCs draining into unprotected cess pits. This underscores the importance of ensuring waste is deposited somewhere appropriate, as part of an all-encompassing sanitation chain.

Dry privies (earth closets), with the addition of soil or ash as a soak, very nearly became as popular as WCs, with one proponent, the Rev. Henry Moule, discovering that "a single cartload of soil would serve two or three people for up to twelve months" (ibid, p.19). The dry privy ultimately fell out of use in the late 19th century, mainly because it was a way of storing excreta, rather than exporting it immediately, but also because it stank (ibid, p.25).

2.2.2 Open Defecation

The most basic way of “visiting the toilet” is to squat above the ground, and then either leave the resulting waste there, or cover it up with dirt (the ‘cat’ method). This can have hygiene and subsequent health implications, and is a situation that is generally avoided as much as possible, apart from in wilderness areas which are able to cope with relatively small amounts of human excreta compared to their own vast area. Even here, however, it is often recommended that shallow holes are dug (Meyer, 1994, pp.13-29) or that faecal matter is packed out (ibid., p.55). Meyer points out that the main reason for this is to avoid contamination of waterways (ibid., p. xiv) – in urban or migrant camp contexts, the primary reason would probably be avoidance of direct faecal contamination.

Open defecation (OD) also occurs regularly in areas of developing countries where toilets might not be a traditional feature of life. This may not be an issue in remoter communities, but in countries with growing populations, open defecation starts to pose a risk to an increasing number of people. The Indian subcontinent provides good examples of both open defecation, and a reduction of the practice. Much of the work behind this is detailed in Mehta and Movik’s classic collection of CLTS tales, *Shit Matters* (2011). Open defecation is on the decline throughout the world, partly due to successes of schemes such as CLTS. Some of this reduction is due to residents’ increased pride in their surroundings: communities are often encouraged to reach Open-Defecation Free (ODF) status, and it is possible that lessons may be drawn from this when applied to migrant camps.

Open defecation in a humanitarian situation can be controlled or uncontrolled. A grid system is recommended if controlled OD is desired in the initial stages of a new camp being formed. This enables specific areas to be fouled in a systematic way and reduces spread of faeces, although this approach should only be used in the very initial stages of a camp undergoing Phase 1 formation (see 2.7); defecation trenches should be dug as an alternative wherever possible (Harvey, 2007, p.53). It may be unlikely that such tactics would be appropriate in a European camp setting.

OD in a UK festival setting appears to be rare, and only tends to occur where provided facilities are perceived as inadequate or not maintained correctly (see Appendix B). The author posits that uncontrolled OD in a refugee camp might be for similar reasons.

2.2.3 Pit systems

Throughout the world pit systems have been adopted as a basic way of keeping excreta in one place. Pits vary in design and quality from holes in the ground without a building, to ‘VIPs’

– Ventilated Improved Pits – which incorporate buildings with a ventilating chimney used to draw both flies and odours away from the user.

Pits are generally adopted after controlled open defecation and trench systems (ibid, p.68). They would ideally be separated by gender, and have some form of canvas or cloth erected for privacy. Disadvantages include potential disease transmission through faeces (they are difficult to keep clean), and through insect vectors (they are open to the elements). Again, it is unlikely that pit latrines would be seen as suitable in European camp settings due to local habituation to flush-style toilets.

2.3 Context

Why should we, in the early 21st century, be looking at waterless, container-based solutions, especially in a migrant camp where the risk of disease is multiplied? There are multiple reasons why a non-flush toilet might be appropriate, and most of them are context-specific.

Context is a recurring theme in sanitation literature, as so many solutions might only be appropriate for limited situations, depending on a number of factors outlined below. These contexts might include:

- local environmental factors (temperature, rainfall, physical geography)
- cultural preferences (sitting or squatting, wiping or water for anal cleansing)
- resources (human, financial, and material)

Compendium of Sanitation Systems and Technologies (Tilley et al, 2014, p.15)

All the above factors should be considered when installing toilets in a camp setting; it is likely that ignoring just one could lead to misuse, lack of use, or breakdown of facilities.

2.3.1 Physical environment

High bedrock or a high water table are both common reasons (in non-sewered contexts) to install a raised latrine, which may or may not integrate a container for excreta. High bedrock or unstable sandy soil limits the physical potential of digging a pit, whilst a high water table risks being polluted by excreta from pits, thereby limiting its future potential as a water supply (Harvey et al, 2002, p.27). Arid areas negate the likelihood of flush solutions being appropriate.

2.3.2 User interface

Provision of sanitation facilities should always take into account the particular idiosyncrasies of the intended users. Ignoring cultural mores in toilet design can give rise to abuse of facilities, or abandonment of them altogether, leading to open defecation – an example being in India, where users will not use new pit latrines as they regard the build-up of faeces as ‘unwholesome’ (Nathoo, 2015). People can feel at their most vulnerable when visiting strange toilets, especially public ones, so it is important to ensure that facilities are as familiar to the target audience as possible: this is most easily achieved by consultation (Harvey, Baghri, and Reed, 2002, p.59).

2.3.2.1 Squat or sit?

Most people worldwide squat to defecate: the provision of pedestal seats to a culture used to squatting could lead to confusion and improper use. This can be solved by provision of extra squatting facilities, as the Australian tax office recently did for some of its workforce (Kayhan, Í, 2016). Alternatively, recent months have seen innovative squat / pedestal combinations, which are intuitive for both squatters and sitters, specifically designed for refugees who were struggling to cope with pedestal seats (Breitenbach, D., 2016). The author posits that *not* providing appropriate squat toilet facilities in a camp setting could lead to open defecation, although no literature on this topic could be sourced.

2.3.2.2 Water or dry cleansing materials (wash or wipe)?

As with sitting or squatting, toilet users can be divided into those who use water for anal cleansing, and those who use dry materials (commonly toilet paper, although sticks, stones and leaves are not unknown). Cleansing habits are relevant to this report because toilets have differing abilities to cope with various materials: WEDC’s poster ‘A Guide to Sanitation Selection’ has ‘method of anal cleansing’ as the first criterion in a flow chart algorithm, showing how important this cultural habit can be in sanitation choice (Franceys, Shaw and Davey, 2013). The issue also appears as a first-stage selection issue in EAWAG’s sanitation selection diagrams (Figure 3).

2.3.2.3 Urinals

Urinals are ubiquitous at festivals; they allow a greater throughput of people, and discourage contamination of watercourses (Glastonbury Festival, 2016b). The author could find no literature on urinals in refugee camps, and further research revealed that a Muslim population

prefer to squat to urinate. They would not appreciate the provision of urinals due to religious beliefs that splashback on clothing would render it unclean (there are also privacy issues) (Münch, 2016b).

2.3.2.4 Religion

Religion may seem an odd topic to raise in the context of toilets, but in the current refugee crisis it is relevant as so many migrants in Greek camps are from predominantly Muslim countries. Ritualistic washing is an integral part of the religion for many, meaning availability of water is even more essential than in a usual WASH context. Furthermore, the action of going to the toilet might be bound by the Qadaa' al-Haajah, a code described in the hadith literature giving specific guidelines regarding ablutions. The most relevant to this report is the one concerning the direction that a person is facing when squatting: they should not face, or have their back to, the Qiblah in Mecca (Ünlü, 2016). Although this is usually only applicable when squatting in the open, it should be borne in mind when positioning toilets in camps with an Islamic majority.

2.3.2.5 Disgust

What brings most 'ecosan' or 'WTV' sanitation solutions together is the fact that, to some degree, they are designed to give faeces and urine a value. Unfortunately, another commonality is that what this means is that at some point, humans are going to have get involved in order to move, treat, or use excreta. People dislike the thought of contact with shit (the colloquial term has been used in this section to emphasise the shock / disgust value). Dellström Rosenquist (2005) suggests that although cultures swing between faecophobics (eg Hindus, and nomadic Saharan Africans with no culture of fertilising crops) and faecophilics (eg Chinese, who have used human faeces for cultivation for centuries), overall, there is a general (and appropriate) disgust associated with the topic. Cultural repulsion towards human waste could have notable consequences for the successful running of a sustainable sanitation system, in that it might either cost more to employ someone to operate it, or it may be difficult to find anyone in the first place.

2.3.2.6 Gender, safety and accessibility

'Gender' can be seen as an unhelpful term when referring to sanitation management decisions, as what is really meant is 'women' (Reed and Coates, 2002). Refugee camps are not the safest of places, and toilets are recognised as locations where women and girls are at

risk of serious assault. Some are reported to have dug holes at the back of their tents where they feel provided facilities are not adequate (Spencer, 2014). New WASH facilities in camps should take this into account when being built, by adopting such techniques as ensuring that male and female toilet block entrances do not face each other, they should be well lit, well maintained, and as close as possible to households (Hartmann, Krishnan, Rowe et al, 2015). It is likely that allowing households to adopt toilets would go some way to alleviating concerns in this area (see also 2.9.2).

A proportion of toilet users are certain to need additional features in order to use the facility safely. These users might be less-able for various reasons, including life-long conditions, injury, pregnancy and old age. Not every toilet needs to be able to cater for such users in a communal setting: Sphere standards (section 2.8.2) state that individual facilities can be provided, although they may need to be adapted for specific needs (ie provision of a seat might be necessary, even in a squatting culture, for certain disabled people) (The Sphere Project, 2011).

2.4 Sustainable sanitation

Waterless toilets are generally promoted for arid areas, where the excreta produced is seen as valuable in some way, or for areas that are regarded as 'off-grid' from water and power. The phrase 'dry toilet' is slightly misleading, in that such toilets might well be able to cope with water for anal cleansing. Nomenclature is an ongoing issue in this area: one dry toilet might have one or more different descriptive terms attributable to it, such as:

- composting toilet
- eco-san
- raised latrine
- dry toilet
- UDDT (Urine-diverting Dry Toilet)
- container-based toilet
- bucket latrine

All dry toilets have in common the fact that no water is used for flushing. In many cases there is an expectation that the waste will be treated as something of value, and will ultimately be used to provide something of benefit. There are a huge variety of technical options available in this field; the one chosen is usually dependant on the context.

2.4.1 Urine diversion

Urine diversion features in almost all 'ecosan' technologies; it is a much-studied topic, with over 200 papers in peer-reviewed journals mentioning the subject. Benefits of diverting urine at source include the fact that optimum treatment processes differ for urine and faeces, salt and ammonia produced by urine can disrupt the composting process, odours produced by urine get worse as time passes, and diverted urine can be useful for fertilising purposes (Harper and Halestrap, 1999, p.53). Most UDDTs will employ a system that utilises human physiology: there will be a route for urine at the front of the squat-plate, and a separate route for faeces. This assumes that in pedestal systems men will sit down to urinate.

Diverting urine has its issues, with the main one being that users will often be unfamiliar with the system and use it incorrectly (urine diversion channels can become blocked with toilet paper or faeces). There are also difficulties associated with persuading users to use new toilet technologies that they are unfamiliar with, and it is recommended that their design be as intuitive as possible, and their introduction be accompanied by education in correct use (Rieck, von Münch, and Hoffmann, 2012, pp.7-8). Use of UDDTs by people who practise anal cleansing with water is complicated by the fact that the anal cleansing water should not enter the urine route (as it will faecally contaminate the urine) *or* join the faeces (as they intended drying process will be disrupted) (ibid, p.25). This means that a toilet for Syrian refugees used to using water for anal cleansing would need to provide three routes away from the squat plate: for urine, faeces and cleansing water; the author posits that complications may arise from such a system.

2.4.2 Composting

Del Porto and Steinfeld's classic text *The Composting Toilet System Book* very much pushes the water-saving benefits of composting toilets, but the main benefit from an 'ecosan' perspective is that they produce humanure, or composted human waste. Many composting toilets use some kind of UD device in order to reduce moisture levels, although some drain from the base where there is no desire to use urine for fertilisation. Carbon-rich soak such as sawdust is usually added to aid the process (Berger, 2011, p.6). Composting is most advisable where there is a clear need for fertiliser: certainly there should be somewhere to store it once a toilet vault fills up, as secondary composting is usually required.

2.5 Human 'waste' – potential value

2.5.1 Waste-to-value

The 'waste-to-value' (WTV) concept is a relatively recent one, yet it has always been around under different guises (Reed, interview, 2016). Composting human waste is generally seen as a key element of WTV methods, which also now encompass the use of human waste to produce electricity (through biogas), gas, char or pellets for cooking, and fertiliser. The term is most used in the American context: its basic premise is that waste should be processed in some way in order that it has a re-use or further-use value, so closing the 'sanitation loop'. The concept is promoted by large funding organisations such as UNHCR and the Bill and Melinda Gates Foundation, who give grants to organisations willing to research waste to value in various settings including humanitarian ones (Münch, 2015a). This will potentially cause WTV influences to filter down to technology choice in the field, although there may be potential conflict between environmental desires and the humanitarian situation (Reed, *Interview*, July 2016), with issues including difficulty in worker recruitment and high turnover of NGO staff (Delmaire and Patinet, 2012).

2.5.2 Sanitation Value Chain

The *Sanitation Value Chain* is a diagrammatic way of looking at the whole sanitation process from start to finish (see Figure 2). It is linked to WTV, in that it also looks for sustainable use of resources, although this could appear anywhere in the chain (ie by involving local people in cleaning or maintenance of facilities, or in the transportation and processing of faecal sludge). Once a particular chain has been explored and illustrated, it can be used to find appropriate household solutions, encourage businesses to explore appropriate avenues, and lobby governments to establish safe sanitation policies (Bill and Melinda Gates Foundation, 2010).



FIGURE 2: THE SANITATION VALUE CHAIN (INCLUSIVEBUSINESSHUB.ORG)

2.5.3 Shit-flow diagrams

Shit-flow diagrams (SFDs) push the diagrammatic representation of a sanitation chain even further, by utilising the data on faecal sludge amounts in a particular scenario. Largely built around urban sanitation scenarios (although potentially transferrable to temporary camp settings), SFDs allow managers to analyse likely waste output in order to predict appropriate facilities for faecal sludge management (FSM). There is an extensive methodology associated with the creation of SFDs, which emphasises the importance of sourcing good data by structured observational studies and involvement of key stakeholders – this is in order to build up a bank of recorded SFDs that can eventually be used for decision-making and advocacy purposes (Sustainable Sanitation Alliance, 2015, p.A-3).

2.5.4 Faecal Sludge Management

FSM is concerned with the whole sanitation chain, but is especially centred around collection, treatment and disposal of material – the term is oriented around systems where sewers are not involved, so is especially relevant to sanitation in both festivals and refugee camps. An integrated approach is at the heart of FSM, meaning that solutions at every stage of the sanitation chain should be complementary. Other aspects of FSM the reader should be aware of include the importance of stakeholder engagement, and awareness of cost - transport of sludge over long distances being particularly cost-heavy (Strande, Ronteltap and Brdjanovic, 2014, p.4) - From a technology transfer perspective, any festival toilet company wishing to

take their product into a different context should be aware that all the above aspects are likely to be different from a UK setting.

2.5.5 Environmental considerations

2.5.5.1 Environmental considerations: festivals

Festivals produce large amounts of waste of all kinds. One of the reasons that there are so many issues with sanitation is that a festival is essentially a city in a rural or semi-rural setting without the usual waste disposal routes (i.e. sewers). Some, such as Glastonbury, have adopted a 'green' policy, which includes a specific reference to compost toilets alongside other policies to do with energy use and waste disposal / recycling (Glastonbury Festival, 2016a).

Legislation in this area revolves around ISO 20121, which supersedes BS 8901, which itself grew out of an awareness that the 2012 London Olympics required a high standard of environmental accountability. ISO 20121 is applicable to all events, but is particularly relevant to festivals, with their transient, and sometimes large-scale nature accompanied by a consequently high risk of impact on their surrounding environment. The international standard looks at resource use, (such as water) and energy (many festivals use generators), and also covers management techniques for dealing with waste (ISO Central Secretariat, 2012). It has been suggested that adoption of the ISO standard by festival managers might be utilised for 'inter-sectoral posturing', but there is a probability that eventually all festivals will have to adhere to the standard (Fletcher, 2013, pp.22-23).

2.5.5.2 Environmental considerations: refugee camps

Refugee camps are also notorious for the amount of waste produced; they are similar examples of temporary cities, with the associated technical waste disposal problems. When it comes to environmental considerations, the major difference between a festival and a refugee camp is planning: festivals are normally planned years in advance, whereas a refugee camp might appear overnight. This would mean that environmental considerations need to be rapidly executed alongside humanitarian concerns.

One way of doing this is to undertake an environmental assessment, or, in rapid-onset emergencies, a rapid environmental assessment (REA). The guidance produced by CARE International and UNHCR explains how REAs can allow for the assessment of a camp within 72 hours; being able to do this at the start of a camp's existence can ensure that mitigation

measures reduce potential environmental damage throughout the rest of that camps lifetime (UNHCR and CARE International, undated, pp.1-5).

The author suggests a camp manager is likely to prioritise humanitarian needs before the environment – although the two are not mutually exclusive. Hammond (2007, p.123) suggests that existing Environmental Indicator Frameworks cannot be integrated into Sphere-style sanitation checklists, although Sphere does include environmental considerations throughout. The presence of waterless toilets in a camp (rather than pit latrines or open defecation) would certainly tick environmental assessment boxes – whether they are likely to be available in a Phase 1 situation is another matter.

2.6 Waterless toilets in the field

2.6.1 Waterless toilets: innovations in UK festivals

Over the past few decades, sanitation provision at UK festivals has included pit systems, 'long-drops' over sealed tanks, and chemical toilets, some of which add chemicals at every flush, and some which re-circulate the waste / chemical mixture – an unpleasant technique, which does not lend itself to an enjoyable user experience (Jones, 2009, pp. 205-206).

All of the above systems are 'waterless' by definition – the driver for such facilities comes from a lack of ability to plumb into a sewerage network or septic tank of adequate capacity, due to festivals generally being set up in rural locations.

A change in the world of festival toilets has been happening in recent years, with the arrival of flat-packable wheely-bin toilets which collect waste for onward transportation to a composting site. This system was first imported from Australia by Natural Event Ltd., and heralded a sea-change in toilet provision at festivals such as Glastonbury (Festival Insights, 2015), which up until this point had relied solely on chemical toilets and long-drops into slurry tanks (cess pits). Chemical toilets had presented issues for users: Jane Healey, Sanitation Manager at Glastonbury Festival, stated in an *Independent* article that users were so disgusted with these toilets they didn't want to touch anything, even the flush handles, so 'pyramids of poo' would build up. She is also quoted as saying that chemical toilets don't work in Glastonbury's high-intensity environment (Merrill, 2014). Natural Event provided 1,111 toilets in 2015 to Glastonbury (TEDx, 2015).

Other companies promoting composting toilets at festivals include Thunderbox, who utilise an IBC to contain solids in their two-person loos (Thunderbox, undated), and Festival Loos, who use a Natural Event influenced design.

Hullabaloos are an upmarket 'posh loos' company who use a patented vacuum system for minimal amounts of flush water (half a litre per use). Although this system does require water, according to their website amounts used are significantly less than comparative flush systems (Hullabaloos, 2016).

Loowatt Ltd. are a company which utilise a waterless 'flush' using a biodegradable film, enabling excreta to be transferred into barrels or cartridges below, removing it from the view of any following user. Waste can be utilised for biogas (Shaw, 2014, p.22). They are currently operating a luxury loo trailer version at UK festivals every summer, charging customer to use facilities by either selling them a wristband for the weekend, or charging per visit (Loowatt, 2016).

2.6.2 Waterless toilets: innovations in the humanitarian sector

There have been a number of organisations promoting waterless toilets in refugee camps over the years, with various degrees of success. Most of these have been in the African or Asian context (the 'global south') (Wirmer, 2014, p.26), where the ecosan solutions provided can be a noticeable improvement on the defecation trenches or pit latrines already present. According to Münch, Amy and Fesselet (2006), achieving a sustainable solution is not necessarily dependent on reuse of excreta in the first instance, but installation of such facilities at an early stage can often prove useful at a later date if the camp proves to be a long-term one. These authors posit that introduction of a sustainable sanitation system in an emergency could potentially be used as a 'catalyst' to spread the concept further in the host country.

They also developed a criteria table that looks at when ecosan is most applicable in an emergency situation: it includes recommendations to make the system more sustainable. One of the criterion for recommendation of ecosan is that there are standardised UD slabs available locally: this makes the assumption that sustainable solutions always utilise urine diversion (ibid).

The author could find no literature on waterless toilet enterprises in a European refugee context. The below examples may have differing degrees of relevance to the situation in Europe, but share an innovative approach.

2.6.2.1 Example: ESOS

The Emergency Sanitation Operation System is a concept which includes options for the entire sanitation value chain (including toilets, a collection vehicle tracking scheme, a coordination centre, and a communication and management system). It is very tech-heavy (providing real-time information on urine levels, volumes of service- and grey-water, UV interior disinfection, nano-paint coated interior, smart-card entry, panic button and software for monitoring, data collection and optimisation), but the concept is flexible, allowing squatting or sitting, urine diversion or flushing, and various options for storage and desludging (Brdjanovic, Zakaria, Mawioo et al, 2015). It appears not to have been carried forward since the concept was mooted in 2014, which may be related to over-engineering aspects.

2.6.2.2 Example: GOAL Kenya and Sanergy's mobile waste transfer station

A HIF-funded project, the mobile waste transfer station (mWTS) was designed for informal settlements around Nairobi. A prototype hand cart was designed for collection of human waste from a variety of toilet systems, with the ability to collect urine separately. Following trials in 2015, an improved version was tested for a month in early 2016. This system largely concentrates on the waste-transference stage of the sanitation chain, and emphasises community participation (Sanergy and GOAL, 2016). It does not address the start of the sanitation chain (ie toilet technology), but it is a good example of a solution for areas with user-led bucket latrine systems.

2.7 Phases

The timeline of a refugee camp is often described in 'phases.'

Phase 1, or immediate phase consists of the initial stage of a camp, usually the first weeks. There may be no electricity, water, sanitation or drainage. Sanitation priorities are to prevent disease outbreaks.

Phase 2, or short-term refers to the intermediate stages of a camp, when there might be a period of stabilisation. This could be the first few month or two of its life, with sanitation programmes aiming to reduce morbidity and mortality.

Phase 3, or long-term camps will often appear more like peri-urban housing solutions, with semi-permanent facilities throughout. Sanitation priorities will be to promote health and well-being, as well as encourage sustainability and 'ownership.'

(from Harvey, Baghri and Reed, 2002, pp.2-3)

Some camps will only last for one or two phases; it can be difficult to predict how long a camp will last for, which may affect infrastructure planning decisions.

2.8 Minimum standards

2.8.1 Minimum standards: festivals

Festival organisers in the UK are bound by minimum standards enforced by the Health and Safety Executive, and guidance on sanitation provision is issued in their publication *The Event Safety Guide* (1999) (this has now been superseded by a subscription-only service, but basic guidelines remain the same). For sanitation at events, they recommend that facilities should:

- be evenly distributed throughout the site
- be well-lit
- have stable floors, ramps and steps
- be regularly maintained
- be accessible to maintenance vehicles (ie for desludging)
- take consideration of peak usage regarding emptying needs
- provision should be made for less-able users

Trenches and open urinals are seen as acceptable at some events, depending on advice from environmental authorities. Minimum standards regarding numbers of toilets using a ratio basis are relatively flexible for outdoor events, although some basic guidance advises the following for events over six hours long:

TABLE 2: TOILET RATIOS FOR UK OUTDOOR EVENTS

<i>Female</i>	<i>Male</i>
1 toilet per 100 females	1 toilet per 500 males, plus 1 urinal per 150 males

This should be adjusted according to the weather and the projected amount of liquids consumed. One toilet per 500 males appears to be wholly inadequate, and in actual fact most toilet companies recommend a minimum of one toilet per 100 people overall (source: ratio calculators on various toilet company websites). The above table is almost certainly not anticipating medium- or long-term usage of toilets.

2.8.2 Minimum standards: emergency situations

Most NGOs and governments try and adhere to some minimum standards when providing sanitation facilities for refugee camps. The most-commonly referenced standards are those provided by The Sphere Project (2011). As with the HSE guidance above, this publication gives guidelines on various aspects of sanitation provision, including minimum numbers of toilets using a ratio principle (for shared facilities, the handbook suggests there should be a minimum of 1 toilet per 20 people).

TABLE 3: MINIMUM NUMBERS OF TOILETS AT PUBLIC PLACES AND INSTITUTIONS IN DISASTER SITUATIONS

Institution	Short term	Long term
Market areas	1 toilet to 50 stalls	1 toilet to 20 stalls
Hospitals/medical centres	1 toilet to 20 beds or 50 outpatients	1 toilet to 10 beds or 20 outpatients
Feeding centres	1 toilet to 50 adults 1 toilet to 20 children	1 toilet to 20 adults 1 toilet to 10 children
Reception/transit centres	1 toilet to 50 individuals; 3:1 female to male	
Schools	1 toilet to 30 girls 1 toilet to 60 boys	1 toilet to 30 girls 1 toilet to 60 boys
Offices		1 toilet to 20 staff

The Sphere Project (2011), adapted from Harvey, Baghri and Reed (2002)

Other Sphere guidance regarding toilet provision includes ensuring they:

- can be used by all sections of the population, no matter their age or mobility
- are sited so that security threats are minimised to women and children
- provide the amount of privacy appropriate to users
- are easy to clean, and do not present a health hazard
- allow for the disposal of menstrual hygiene materials
- maximise vector control by reducing fly and mosquito breeding
- maintenance (desludging etc) is possible
- minimise risk of contamination of groundwater
- are less than 50 metres from dwellings

- have usage arranged by sex, households or similar segregation
- are provided to communities that have been properly consulted, and know how to properly use them
- are provided alongside hygiene and handwashing is promoted

The above guidelines are seen as a good overall guide by most NGOs in the field, although it should be borne in mind that they were developed with a developing-world context in mind, and this may not necessarily be appropriate for a European setting with different environmental laws and cultural values.

2.8.3 Minimum standards: Greek camps

In Greece, following the onset of the refugee crisis, a national-level WASH working group was set up with the dual intention of coordinating WASH interventions and communicating with the Greek government (UNHCR, 2016a). This group, which encompasses NGOs such as IRC and Samaritan's Purse, as well as UNHCR and the Greek government, created minimum standards WASH guidance tailored for the Greek migrant situation (Appendix A). Clearly derived from Sphere standards, differences from the standard Sphere checklists include the following indicators, all of which are seen as essential in the Greek context:

- a networked sewer or septic tank
- locks or latches on toilet doors
- illumination of toilets (interior and exterior)
- a presumption of working towards a networked sewerage system
- minimum of two cleaning attendants per day, with one per 10 units
- anal cleansing provision (hose, receptacle, toilet paper if necessary)
- [toilets / buildings] should be vandal-proof
- the above issues should be checked twice-weekly

This Minimum Standards document also contains a listing of hardware considerations, which includes chemical toilets (with a preference towards squat versions), new UNHCR containers, other containers, 'Derveni'-style lightweight containers, construction of facilities, repair of existing toilets, and (notable for this report) consideration of alternative excreta disposal technologies, such as composting.

Regarding ratios, the working group has an aim of working towards a toilet / person ratio of 1/20, but the document has an acceptance that up to 1/50 might be the reality.

2.9 'Ownership' and payment for facilities

2.9.1 Ownership: festivals

One way of ensuring that toilet facilities are kept clean and usable is to encourage 'ownership' by specific groups of people. This could be difficult to encourage in a festival setting, as attendees are usually only there for a limited period of time, although backstage toilets tend to be kept cleaner as access to them is restricted to a certain group. One example of ownership in such settings is driven by economics: one German rock festival encouraged people to rent individual 'personal' toilets for the duration of the festival, at a cost of 120 euros (141 USD) plus 25 euros (28 USD) to have the toilet cleaned. According to the festival, all 150 toilets were booked within four hours (Dietvorst, 2012).

2.9.2 Ownership: refugee camps

Communal toilets in a camp setting are inevitable in the first stages, but it is generally accepted that moving towards adoption of toilets by families or specific groups is desirable. Increased levels of ownership can lead to improved cleanliness and better maintenance, and is often accompanied by facilities being sited closer to users' households. It is possible that camp authorities would discourage this approach, as it implies that residents will be staying for the long term (Harvey, Baghri and Reed, 2001, p.59). Ownership can be taken to a literal level when families are encouraged to build their own facilities. It is likely that such facilities would be of poorer design and construction than toilets built by an NGO or another outside organisation (ibid, p.62-63).

Phase 1 camps are more likely to introduce communal facilities, but later Phases should generally consider 'ownership' of toilets by families or related groups (Harvey, 2007, p.32).

2.10 Technology selection

Tilley, Ulrich, Lüthi et al's *Compendium of Sanitation Systems and Technologies* (2014) comprehensively informs the reader as to what technology might be acceptable in a particular situation, utilising a 'system template' matrix, with situational aspects ('functional groups', such as user interface, collection and storage system) in columns, and 'products' (such as urine, faeces, flush water) in rows.

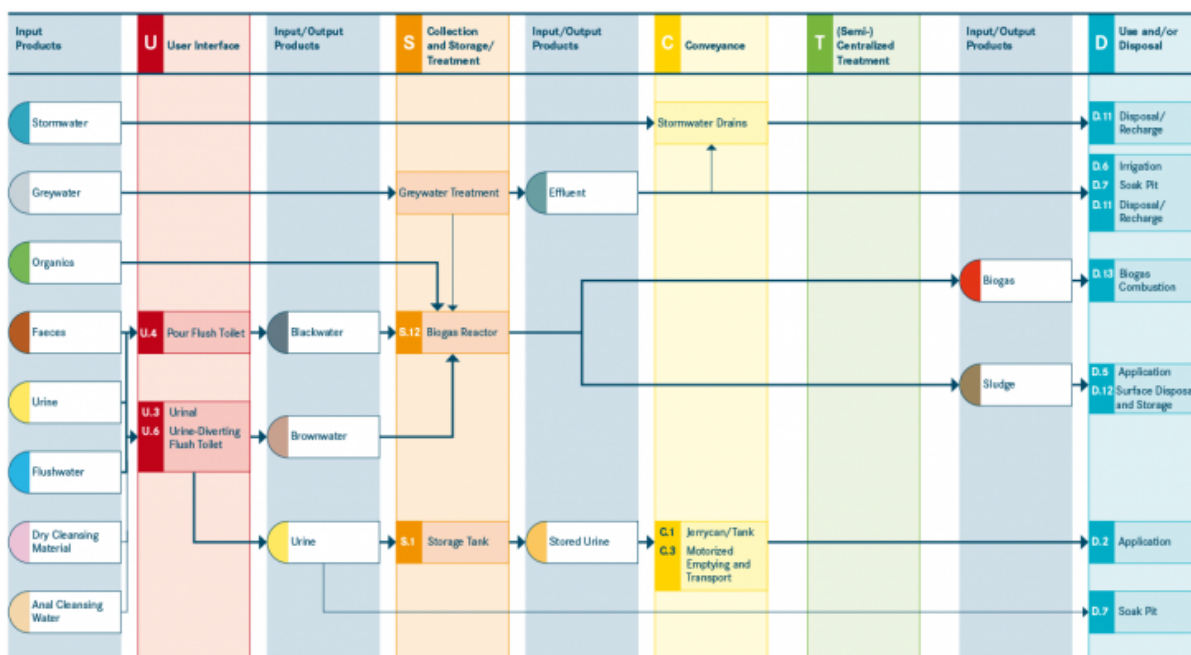


FIGURE 3: EXAMPLE OF A SANITATION SELECTION MATRIX - BIOGAS (EAWAG)

Nine system templates are outlined, with the most relevant to this report being System 5 (Biogas – Figure 3), due to potential research with Loowatt. The fact that only nine systems are explored is telling, as there are non-urine diverting container-based solutions available and in operation, but the *Compendium* is a useful guide to options available at various stages of the sanitation chain, and may prove useful for WASH camp managers considering their options.

The same managers may have turned to *Appropedia*, a web-based technology database which has a wealth of sanitation technologies (Appropedia, 2016). Being a wiki, the author suggests it is perhaps not the most comprehensive or neutral of sources, although it may lead the reader towards some interesting technological options.

2.11 Technology transfer between scenarios

Technology transfer in a WASH context has a mixed history. Byars (2013) categorises technology transfer by splitting it into three categories: the Linear approach to Technology Transfer (LTT), the Appropriate approach (ATT), and the Synergistic approach (SATT). The LTT is marked by being a top-down approach, often used by smaller NGOs with engineers who just want to ‘do something’. The ATT is a completely opposite bottom-up approach, ensuring that all stakeholders (especially users) are involved, whilst the SATT ensures that a healthy compromise between the other two is reached, allowing engineers and users to reach

a solution using a mixture of appropriate hardware and software. This report will try and avoid recommending LTT approaches to festival toilet technology transfer, as that would run the risk of introducing a technology to an inappropriate place, with inappropriate users.

The creation and sharing of appropriate technology within the sanitation sector has been mapped by Wirmer (2014), who, on behalf of Dutch organisation WASTE, outlines a structure that enables the organisation to make better decisions when linking stakeholders. In an emergency context, this involves looking at the demand from humanitarian organisations, and their links with private suppliers, research centres (universities), and aid providers, all in a context of increasing numbers of disaster situations. The structure is consolidated into a document – Guiding Sustainable Innovations in the Sanitation Chain (ibid, Appendix 2) – which enables the reader (WASTE employee) to use the Functions Approach to Innovation Systems (FIS) to help select and guide stakeholders appropriately.

One company which is investigating the potential of transferring their existing technology into the sphere of refugee camps is Loowatt Ltd., who have already promoted their technology in the two very different settings of UK festivals and peri-urban Madagascar. They have been awarded a Humanitarian Innovation Fund grant to investigate how appropriate a version of their technology might be in a humanitarian setting, which parts of this report is likely to feed into. They feel it is important that solutions in this area tackle the whole sanitation value chain: the Loowatt waste treatment concept is energy-generating, kills pathogens, and ultimately produces a product that can be used for fertiliser. They are of the opinion that existing practices in the humanitarian sector (health, financial and human-related) might affect how any new technologies are designed and rolled-out (Humanitarian Innovation Fund, 2015).

2.12 Politics of hosting refugees

The decision of what kind of sanitation technology should be adopted in a particular camp or scenario is also driven by forces from high up on the political ladder. The large numbers of refugees in the country at present are there mainly because other European countries have recently taken the decision to close their borders to all migrants. NGOs have been vocal in their disapproval of this policy, pointing out that it has resulted in large numbers of vulnerable people being incarcerated in closed detention centres, and calling for nations to provide systems for opening borders, and halt the practice of tying aid provision to migration control measures (11.11.11., ACT Alliance EU, ACF et al, 2016). These detention centres do not even reach the minimum standards of the United Nations Minimum Rules for the Treatment of Prisoners (Kotsioni, 2016).

At the time of writing, official refugee camps in Greece range from open camps with a range of facilities, to closed detention centres. NGOs such as MSF are not comfortable with providing aid in such surroundings, and if they do engage it is at an emergency level only, to the extent that they will not improve sanitation and other facilities - even if the state of them is making residents ill. MSF have been working in Greek detention centres since 2004: the unpleasant conditions associated with them are by no means a recent phenomenon (ibid, 2016). It seems that the most likely place to find unsuitable sanitation facilities would be one of these centres; unfortunately, these are also the places with least chance of the author being allowed access. NGO policies against improvement of infrastructure in these places (such actions would be a tacit acceptance of the conditions) also count against the likelihood that new technology might be adopted.

In one of the few papers alluding to the current refugee crisis in Europe, Morgan (2015) points out that rapidly fluctuating migrant numbers can affect planning of sanitation, as can the uncertainty of how long a camp will stay open. He quotes Chiara Montaldo (MSF) as stating that perhaps what NGOs really need to do is move with refugees – migrants might be in Greece now, but tomorrow they could be in the Balkan states. This is clearly linked to political influences on border control.

2.13 Advocacy in WASH

Clearly, provision of sanitation in camps should be done with the full cooperation of all stakeholders. But it is also important that those stakeholders communicate well with each other, and use their joint influence to lobby governments and large funding organisations on behalf of the users of sanitation facilities. Following the introduction of the SDGs there is increasing cross-sectoral collaboration with actors outside the WASH sphere (in areas such as health, nutrition, gender and education), because these areas are co-dependent on successful WASH outcomes: coordinated lobbying with such disparate groups is likely to improve results (Global Health, 2015). An example of coordinated lobbying is the joint statement released by 131 organisations, demanding governments change their European migration policy (11.11.11., ACT Alliance EU, ACF et al, 2016). Although not directly linked, WASH interests are represented in that clearer migration policies would mean NGOs might be able to better organise camp planning.

3 Data collection: methodology

3.1 Methodological strategy

The subject being investigated has many strands, including toilet technology, faecal sludge management, user interaction with toilets, and political influences on the siting and longevity of migrant camps. For this reason a range of methods were used to collect data in order to try and build a comprehensive picture of the situation, and use that to arrive at some relevant and useful conclusions. The table below outlines methods adopted.

TABLE 4: DATA COLLECTION METHODS

Method of collection	Source
Reading*	Books, journals, grey literature, radio and TV programs. WEDC resource centre, Pilkington Library, internet
Working with toilet systems	<ul style="list-style-type: none"> - Worked with Natural Event (summer 2015) - Worked with Loowatt (summer 2016) - Built own waterless toilet systems (up to summer 2016)
Unstructured interviews	WEDC staff (in person): Rebecca Scott, Brian Reed
Email questionnaire	WASH actors, Greece (UNHCR, IRC, RC, Samaritan's Purse)
Structured interview (telephone)	Owner, Natural Event (Europe) Ltd.
Email questionnaire	Owner, Loowatt Ltd
Email - discussions	IRC staff (various), UNHCR staff
Skype interviews	UNHCR staff, academic researcher
Semi-structured interviews	2 x IRC WASH officers, Camps 1 and 2. Cleaners, Camp 1.
Tours of camps	Camps 1 and 2
Unstructured interviews, Camps 1, 2 and 3	<ul style="list-style-type: none"> - IRC staff (in person): 4 x WASH officers, 2 x camp co-ordinators, Environmental Health (WASH) co-ordinator - UNHCR Snr. WASH assistant - Manager, Alba chemical toilet company (in person) - Workers, Alba chemical toilet company (in person)
Large-scale baseline WASH survey (IRC)**	Refugees, Camps 1 and 2
Questionnaire (paper)	Northern Greece WASH working group - managers
Focus group discussions (with assistant and interpreter)	Refugees (Kurdish, Syrian and Afghan), Camp 1
Accompanying Alba chemical toilet crew for the day	Chemical toilet workers, Softex Camp, Thessaloniki Port Camp, Sindos Wastewater Treatment Plant
Photography	UK festivals, N. Greece refugee camps

*Methodology outlined in Literature Review

**Not undertaken by author, but observed / participated in, over two days at camps 1 and 2

The mix of methods used reflected the range of data required for the project. The Literature Review had revealed that up-to-date information about the situation in Greece was limited, so the author needed to use people at the source: hence the email questionnaires sent to WASH actors in Greece, and follow-up Skype calls. Semi-structured interviews with camp employees were the only possible source of information about WASH developments; likewise, focus groups with residents were the only feasible way of getting data on user – toilet interaction.

The location was chosen because of information received about it being particularly busy with refugees: the particular camps were selected because the author was welcomed by IRC. This latter selection decision ‘through no real choice,’ was seen as valid because it offered a unique opportunity for access and working with both employees and residents of the camps – a tactic approved by Denscombe (2003, p.35).

3.2 Background research

3.2.1 Working with toilet systems

Perhaps one of the best ways to understand a system in the field is to work with it, enabling one to understand its advantages and shortcomings over other options; experiential learning was seen as one of the most valuable routes to understanding a technology. To this end, the author immersed himself in the world of waterless toilets.

During summer 2015 the author assisted in assembling Natural Event’s scalable flat-pack composting toilet systems in a workshop, and followed this by building, operating and packing-down the system at two UK festivals: Glastonbury, with 1,111 composting toilets, and a smaller-scale event near Kendal. A summary of the experience as it relates to this research dissertation can be seen in Appendix B.

The author joined Loowatt Ltd as an independent contractor in summer 2016 whilst writing this report, operating their toilets at UK festivals in order to further understand their biodegradable-film sealing technology.

The two companies were seen as suitable case studies for this research dissertation because they were both innovators in the field of waterless toilets, as well as having informally expressed a desire to expand into a humanitarian setting. Informal user feedback at festivals was used to back up some assertions about toilet design.

3.2.2 Research guidance: Brian Reed and Rebecca Scott

The structure of the dissertation changed throughout the writing process, but was kept on an even keel through regular discussions about emergency sanitation with Brian Reed and Rebecca Scott, WEDC lecturers. These tutors were able to assist with contacts in the field, suggest alterations of style and content, and help with sourcing grey material (Reed had supervised a student the previous year as she collected material on emergency sanitation).

3.2.3 Location choice: email questionnaires to WASH managers, Greece

Initial information gathering on a suitable location for study is outlined here: there were many factors to account for in the rapidly-changing situation. The literature review gave a good indication of both the general methods used to gather information about emergency sanitation and the relevant areas of research. Initial information collection on the wider topic of emergency sanitation revolved around several informal interviews with WEDC lecturers Brian Reed and Rebecca Scott. These conversations helped the author understand the subject of waterless sanitation solutions in emergency contexts, enabling later construction of relevant questions.

It quickly became apparent that the subject was a fast-changing, dynamic one, and news reports were going to become important sources of up-to-date information. Further research on selection of an appropriate location to study was conducted through the internet, with contemporary news reports being particularly important. One example is an article from the BBC: *Thousands moved from Idomeni camp* (BBC, 2016a), which intimated that the toilet situation was inappropriate.

Information with those in the field was seen as important, and a Skype conversation was initiated with Katerina Rozakou, an associate of Virginia Gardiner – she was an academic researching the effect of Greek migration policy on refugees, and was mainly based on the island of Lesbos, a key crossing-point for refugees attempting to travel into Europe. She discussed three camps: Moria, which was now closed, Pikpa, a camp for minors, which might be closed soon, and Kara Tepe, run by the local municipality, for vulnerable refugees. The toilet situation on all was generally good. Furthermore, at the time of the conversation in May, the EU had struck a new deal with Turkey to return refugees (Amnesty International UK, 2016), so it was expected that all camps would be wound-down.

It was now seen as important to garner information from WASH actors in the field to gain further information on an appropriate study destination. Loowatt were able to provide a list of such personnel: this had been given to them in order that they might further their report for the Humanitarian Innovation Fund. Information required from them was two-fold:

- assistance in gaining access to camps
- further information on the sanitation situation in Greek refugee camps

The provision of the above information would enable the author to increase his knowledge of sanitation requirements in the Greek context, indicate areas for potential further study, and allow him to access camps for further research. An email was sent out to those on the list asking for the above information. The survey was constructed to give a baseline idea of sanitation on the ground.

TABLE 5: INITIAL QUESTIONNAIRE FOR WASH ACTORS IN GREECE (EMAIL)

0.5. What camp/s are you working at?

1. What type of toilet provision is at your camp?

- a. Chemical toilets
- b. Dug pit latrines (with superstructure)
- c. Dug pit latrines (ditches)
- d. Open defecation
- e. Raised composting latrines
- f. Other (please state)

2.1 Who is responsible for cleaning and maintaining toilets?

2.2 Who is responsible for removal and disposal of faecal sludge? Where do they take it?

3. Have residents at your camp expressed disquiet at the quality of toilets? Has this been demonstrated by alternative defecation practices (eg open defecation, "flying toilets", individual latrine digging)

4. What kind of toilet provision are the majority of residents at your camp used to (back home)?

- a) Squat
- b) Seat (pedestal)
- c) Water for anal cleansing
- d) Dry wiping materials (toilet roll, vegetation)
- e) Flush toilets / pour-flush toilets
- f) Latrines

Responses to the initial email were recorded in a table structure, enabling speedy analysis of responses. It showed that some questions were perhaps naïve, and might be more appropriate to an African or Asian setting: ie those asking about controlled open defecation, or pit latrines. For results of this questionnaire, see Appendix F. For discussion of the results, see 4.1.

3.3 Field research

3.3.1 Semi-structured interviews (in person) with WASH officers, Greece

Positive affirmation of help from an NGO – the International Rescue Committee – came relatively late in the process. When it was confirmed, the author was able to instigate the next stage of data collection: namely, on-site semi-structured interviews that would investigate toilet provision at two or three case study camps. This was conducted upon first meeting key informants (IRC WASH managers), and was followed up with unstructured interviews.

TABLE 6: QUESTIONS FOR WASH EMPLOYEES ON CAMP SET-UPS (IN PERSON)

How long has the camp been in existence?
What is its capacity, and current population?
What are the demographics (sex, family groupings, cultural background)?
What are the toilet facilities?
<ul style="list-style-type: none">- Chemical toilets?- UNHCR toilets? [<i>Isobox' shipping container toilets</i>]- Built toilets?
Who cleans toilet facilities?
Who carries out desludging?
Who pays for desludging?
Where is the faecal sludge taken?

The aim of asking the above questions was to give the author a baseline insight into the WASH situation in these particular camps. It was intended that the answers to these questions would give an impression of the current sanitation value chain. Results were recorded in a notebook before being transcribed to a Google Doc every evening.

3.3.2 Initial tours of camps

These tours, given by IRC environmental health officers and engineers, allowed the author to get a general idea of the set-up of camps, and in particular their WASH facilities, past, present and future. They could be equated to an informal transect walk, giving first impressions of the situation, and were geared towards finding out what sanitation facilities were available, how accessible they were to camp residents, how they were maintained and operated, and what plans were in place for upgrading facilities. The first tour, at Camp 1, gave an indication of the unpredictability of life in a refugee camp, as the author and several IRC staff were detained behind the toilets whilst a protest took place. See 4.3 for data resulting from camp tours and the questions in Table 6. Semi-structured interviews also took place with IRC-employed cleaners at Camp 1.

3.3.3 Semi-structured interviews, UNHCR staff member and IRC EH (WASH)

Coordinator

The initial toilet set-up for all camps in the area was coordinated by the Greek military, with chemical toilets being chosen for their ability to be swiftly deployed. UNHCR and individual NGOs then took on responsibility for improvement of facilities, and the author felt it was important to discuss with decision-makers what their approach was. To this end, two interviews were set up: one with an employee of UNHCR responsible for WASH in the area, and one with the IRC WASH coordinator for northern Greece. Both interviewees were giving their personal views on the subject; key points from the conversations can be seen in section 4.7.

3.3.4 IRC baseline survey

An unexpected research opportunity presented itself in the second week, when the author was able to accompany a large IRC delegation conducting a baseline WASH survey of refugees. Results were entered onto tablets, following a morning training session. The author observed and participated in the survey at Camps 1 and 2. There were some issues with the survey methodology, outlined below, but it should be borne in mind that IRC were attempting a large-scale baseline WASH survey with limited human resources, tackling a subject which is perceived as sensitive in all cultures. It should also be noted that all these issues were discussed within the survey team, with running solutions being put in place as the survey progressed.

- those asking survey questions were unused to the process, which caused some frustration with both interviewees and interviewers
- there were issues with translation between Greek, Arabic and English
- some of the questions were very blunt (ie “Did you wash your hands last time you went to the toilet?”); these questions had the potential to upset interviewees, so interviewers would alter the question, skewing the result. Other questions were difficult to translate (ie the question asking about distance to the nearest bathing facility caused confusion: there are no baths on camp, but there are showers)
- the technology being used (survey on a tablet) had glitches, and was difficult to use in bright sunlight

The IRC survey covered six camps across northern Greece, and questions were constructed to discover whether specific sites met the Northern Greece WASH Cluster minimum standards (see Appendix A). A total of 349 respondents were interviewed across six sites in the course of a week, with a 53% / 47% male / female split, and an average age of 32. The intention was to pick 97 households from each camp, although this was thwarted by the dynamic situation at camps.

The purpose of the questionnaire was to take a snapshot of the state of WASH facilities across all IRC’s Greek camps, and, as such, it was a useful exercise. From the author’s perspective, and that of this report, it backed-up the theory that it was essential for camp residents to have access to good WASH facilities. It also gave an insight into how to approach and interact with camp residents. Sanitation specific questions can be viewed in Appendix D, the completed survey report is shown in Appendix C, and discussion of results can be seen at 4.4.1.

3.3.5 Focus group discussions

It was seen as essential to get some user feedback on the toilet experience in camps; there has been research on this topic before, but little was found by the author on mixed-background camps in a European setting. Focus group discussions were seen as good potential methods of gathering information because the ensuing discussion can generate more in-depth views about the topic (Denscombe, p.168, 2003). The drive to conduct group interviews was increased following the shadowing of the IRC baseline survey (above); If the author had conducted household surveys with structured questions on such a similar topic so soon after a large survey had just passed through camp he would undoubtedly have met with some resistance from camp residents (as evidenced by some of their reactions to the initial WASH survey).

It was intended to interview a large cross-section of refugee camp residents using focus groups based in one area, and providing snacks and drinks as a thank you / possible incentive. This didn't go to plan for the following reasons:

- it was difficult to plan ahead to publicise focus groups as there was no guarantee of the author gaining access to camps
- when in camps the situation might change quickly; the author was present during two security incidents in which NGO workers were either kept in a safe area or evacuated from camp
- sourcing translators proved difficult, and when they were found they were often required for pressing or emergency situations
- WASH officers related how they had planned focus groups in these camps before, only for no-one to turn up (lack of motivation)

Therefore, the decision was taken to conduct group interviews in refugees' tents, and in the womens' safe-space area (where males were not permitted). These latter groups were facilitated by a female assistant with experience in community participatory techniques who had specifically flown out to help the author in this area; this proved especially fortuitous as some valuable data came from groups in the women's safe space area.

Sourcing translators was always going to be an issue. There were several issues with pre-booking a translator for help in camps

- the author was never sure if access to a camp was going to be guaranteed
- the fieldwork stage had restricted funds available to it
- at least two translators might be needed, perhaps three, because of the mixed nature of the camps
- the changeable nature of camp politics and security might have meant a translator would be sitting doing nothing whilst waiting for respondents to become available

In the event, translation services were not always needed, as some Syrians spoke good English. The project was further assisted by IRC providing a translator for two days running, who was available when there was nothing else she could assist with. Partly due to this, most information came from Afghani women and men (a conscious decision had been made to target women if possible because of their specific WASH needs and their ability to give an

insight into the WASH needs of children). About 15% of camp 1's residents were of Afghan background; information from this potentially-marginalised group was seen as valuable.

Topics to be explored included:

- how respondents felt about the chemical toilets in the camp
- how they felt about the new UNHCR / IRC Isobox toilets
- whether they used toilet roll or water for anal cleansing
- whether facilities for disposal of menstrual hygiene products were sufficient
- whether facilities were accessible for children / less able people

These topics were chosen to give the author a better idea of what design elements might be important in a camp setting.

It should be noted that although these data gathering exercises might have been called 'focus groups' at the time, because of the flexible siting, the variety of group sizes, and the occasional outspoken respondent suppressing other views, they might also be referred to as 'group interviews'.

See 4.4 for focus group discussion results.

3.3.6 WASH cluster meeting: questionnaire

For further insight into decision-making processes a multiple-choice questionnaire about toilet technology was distributed on paper at a local area WASH cluster meeting in Thessaloniki at the Ministry for Macedonia and Thrace, on Friday 22nd July 2016 (see Appendix G for this questionnaire, and Appendix H for minutes of the meeting). This targeted WASH managers working for such diverse organisations as UNHCR, Samaritan's Purse, IRC, MSF and NRC – these people were likely to make decisions about what technology would be most useful in the field. The meeting was kept short, and people were busy, which meant only four questionnaires were completed.

3.3.7 Photography

Over 200 photographs were taken during the Greek phase of the project. The author carried a Canon SLR out with him, but didn't use it once, preferring to rely on a touchscreen mobile phone. This was mainly because all official camps in Greece are run by the military (with help from the police), and carrying a large camera around tends not to lend itself to easy relationships with the army. Also, the author felt that carrying an expensive camera around in

a refugee camp would not engender trust and open discussion. The mobile phone was more than adequate for its purpose; it is a ubiquitous tool used by all (including refugees).

Photography priorities were examples of toilet technology in use (and misuse!), evidence of ongoing sanitation works, as well as evidence of open defecation which might be resulting from poor provision of facilities. Evidence of the destination of chemical toilet faecal sludge was also seen as important. Permission was asked of subjects before taking any photographs. Images of refugees have been blurred in this report in order to protect their identity.

3.3.8 Telephone interviews / email questionnaire: festival toilet owners

Two follow-up semi-structured telephone interviews with owner Hamish Skermer were conducted in August 2016, exploring design issues and company motivation. Conducting the interviews after the field trip meant that the author was able to discuss the situation in Greece, and frame the questions appropriately.

Several unstructured interviews were carried out with Virginia Gardiner, CEO, before the trip, and one email questionnaire asking similar questions that had been put to Skermer.

Questions can be viewed in Appendix E; discussion of interview results can be seen at 3.3.8.

3.3.9 Information analysis

Initial questionnaire results sent out by email were collated on an excel document, with details of each respondent and a summary of their responses. This enabled a quick overview of responses.

During the Greek phase of data collection notes were taken by pen, and typed up every evening. These notes were saved onto a live Google Drive document, which was accessible by Rebecca Scott, supervisor of this project, Virginia Gardiner, Loowatt CEO, and the UNHCR contact who had proven so helpful in previous weeks (this meant they could contact the author during his time away, and provide support and advice regarding data collection). The system worked well until the author's laptop died, towards the end of the Greek trip. The resulting 12 pages on Google Docs were an invaluable asset when analysing data, as the chronological order meant the author was able to access data readily, and the fact it was held electronically meant it was easy to search retrospectively.

Sanitation Technology Transfer: from UK festivals to migrant camps in Greece

Follow-up emails ensured that the author was kept in touch with the results of the IRC baseline survey. There was also further communication about the new Isobox toilets in Camp 3, which the author had not been able to visit.

4 Data collection: results

4.1 The Greek context

After being contacted with the short questionnaire (Table 5), some WASH managers entered into email discussions with the author: these proved useful in three ways:

- they enhanced the author's knowledge of the WASH situation in northern Greek camps
- they gave current information on where the refugee 'hotspots' were
- some respondents became useful contacts during the fieldwork phase

It became apparent through email correspondence with UNHCR and IRC staff that the latter body was a key player in certain camps northern Greek camps. IRC are responsible for the WASH programmes in four camps near Thessaloniki, and the author concentrated his research on two of these camps, largely because of the ease of access and improved security associated with working with this NGO.

A few initial responses to the questions in Table 5 indicated that respondents saw some of the questions as not relevant to the European refugee context, in particular references to pit latrines and provision of open defecation areas. On the same theme, some were surprised at the intimation that sludge was not being disposed of correctly, again because of the European context and associated environmental legislation. This theme was continued during unstructured interviews with key WASH informants, who whilst accepting that in Greece laws can be seen as flexible, and there might be some aberrations, were of the opinion that in general it was likely that waste from camp toilets was being disposed of legally at the wastewater treatment plant.

Most respondents pointed out that chemical toilets were prevalent in camps, and that most camps were moving towards tailor-made squat units in prefabricated buildings, commonly provided by UNHCR (the "Isobox container toilets"). When it came to the wash / wipe, squat / sit question, it was apparent that most refugees anally cleansed with water, and were from a squatting culture, with some using toilet paper. See Appendix F for an abridged summary of email responses.

4.2 Location of fieldwork

UNHCR responded with the most information as a result of the questionnaire, with one respondent in particular being very forthcoming in his reply - this was largely because of a personal interest in alternative technologies in the field. It was partly through correspondence with this respondent that the location of Northern Greece was chosen over Lesbos: he emphasised that the refugee crisis was winding down in Lesbos, and that the sanitation situation was largely solved. This source proved a mine of information about the refugee camp WASH situation in Greece, and was exceptionally helpful throughout the entire period, with several long unstructured Skype interviews imparting information on both the situation on the ground and practical ways in which the author might go about data collection. This source also wrote an email introducing the author to NGOs operating in the area.

Northern Greece was chosen as a destination for the following reasons, many of which were outlined by the ex-UNHCR source:

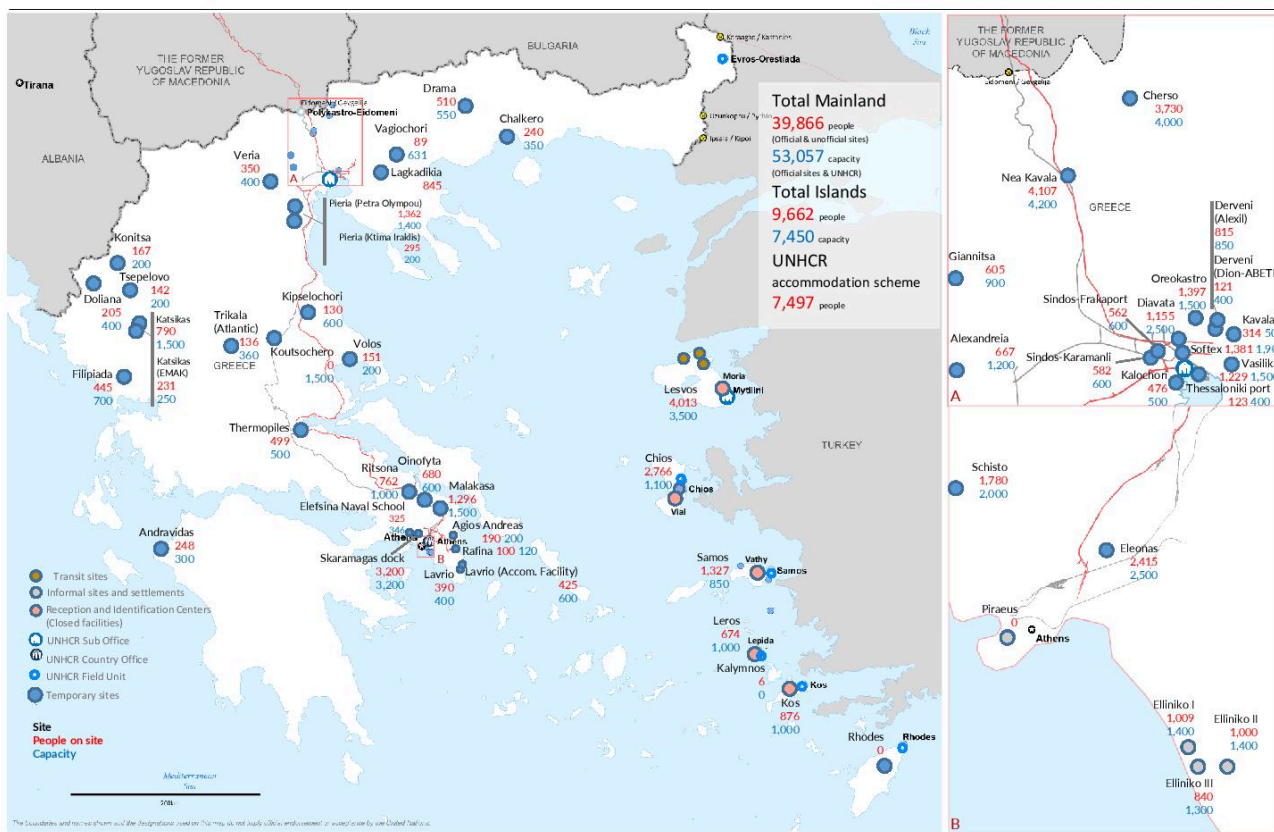
- It was a constantly changing environment, meaning it was likely that a variety of toilet solutions might be needed
- There was a high concentration of refugees in the area at the time (over 50,000)
- All of the official camps used chemical toilets, the majority of which were pedestal-based, which would almost certainly be inappropriate for the Syrian refugees who made up the majority of the population.

The UNHCR map below (Figure 4) shows that there was a high concentration of camps around the port city of Thessaloniki. This was for two reasons: the city was a logical place for processing of new arrivals, and there was a government policy in place to move camps away from borders. It quickly became apparent that the situation was constantly changing; this fundamentally affected research methodology. For instance, early on in the process (May 2016), the northern camp of Eidomeni was chosen as a likely potential research location. Two days later, it was entirely cleared by the Greek military, and many residents moved to camps based in industrial areas around Thessaloniki (BBC, 2016b). This was a key reason for ultimately choosing Thessaloniki as a base to visit camps from, backed up by advice from the above-mentioned ex-UNHCR source (see box in top right of Figure 4 for details of camps around the city).

Europe Refugee Emergency

Daily map indicating capacity and occupancy (Governmental figures)
As of 4 August 2016 08:00 a.m. EET

As of 4 August 2016 08:00 a.m. EET



Presence and capacity are based on Governmental figures from the Coordination Centre for the Management of the Refugee Crisis, as of 04/08/2016 08:00 a.m. Eastern European Time. Online map with additional information: <http://www.unhcr.gr/sites>

FIGURE 4: MAP SHOWING REFUGEE CAMP DISTRIBUTION (UNHCR)

4.3 Camp WASH infrastructures

Answering research questions:

3 - What is the current sanitation (toilet) set-up in Greek camps as a result of the Syrian crisis?

4 - Are current toilets in Greek migrant camps appropriate for the users?

The informal tours of camps revealed more information about current and planned sewerage / water infrastructure, planned improvement of WASH facilities, and gave an idea about physical distances between camp residents and WASH services. Only two camps, Camps 1 and 2, were toured methodically, as Camp 3 initially refused entry.

During and after the tours, there were opportunities to informally interview IRC Camp Coordinators, and Environmental Health Managers and Officers – these were the people responsible for planning and implementing improved WASH facilities at camps. These interviews gave insight into conditions the camps were in when WASH responsibilities were taken over, as well as what was being done to solve some of the issues. Alongside maps of the camps, detailing WASH facilities and their proximity to tents, this enabled a good overview of the situation (facilities highlighted in yellow, blue and pink below, with S standing for showers and T for toilets). The lack of scale on the map below hides the fact that there was quite a substantial walk for some people visiting the improved UNHCR toilets (located mid-right on the map); this situation is likely to be improved with the introduction of more toilet facilities in the months to come.



FIGURE 5: PHOTOGRAPH OF MAP OF WASH FACILITIES AT CAMP 1

The following table summarises the information gained from IRC EH officers during the initial camp tours (see 3.3.2). Camp 3 information was imparted at the gates of the camp following refusal of entry.

TABLE 7: SUMMARY OF CAMP DEMOGRAPHICS AND FACILITIES

	Camp 1	Camp 2	Camp 3
Capacity / population	unknown / 1728	unknown / 800	800 / 600
Male / female / children	55% male. Large proportion families	50% male. Large proportion unaccompanied children	50% male. Mostly families.
Toilet / user ratio	1/36 (wk.1), 1/26 (wk.2)	1/20	1/20 (wk.1), 1/10 (wk. 2)
Refugee background	85% Syrian. Also Kurds, Afghani, Yazidi.	Syrian	Afghani, Syrian
Number of toilets: chemical	48 (all pedestal)	40 (all pedestal)	30 (all pedestal)
Number of toilets: UNHCR (plumbed-in)	20 (week 2 of visit)	0	40 (week 2 of visit)
Where is sludge taken?	Sewage treatment plant (previously stored in septic tank on site)	Sewage treatment plant	Sewage treatment plant
Future toilet provision plans	Semi-permanent structures plumbed into improved sewerage system	Semi-permanent structure plumbed into improved sewerage system	New UNHCR toilets seen as sufficient

4.3.1 Camp 1 – chemical toilets, supplemented by UNHCR containers

This camp was in the process of adopting the UNHCR toilet containers that had been mentioned by respondents in initial emails (Figure 6, and see section 4.5.5 for further discussion of these facilities). Up until this point, the only toilets provided for residents (by the military) were pedestal chemical toilets, cleaned and desludged up to three times daily.

Desludging of the chemical loos was carried out by chemical toilet contractors Alba, and faecal waste was taken by the small sludge trucks directly to the sewage treatment plant at Sindos, Thessaloniki (see Figure 21 for map giving an indication of journey distances). Previously to the author's visit sludge had been stored in an interim septic tank on site, although according to the IRC camp co-ordinator this was closed off following sludge from other camps being pumped into it, causing an overflow.

The tour revealed occurrences of open defecation along the fenceline, behind trees, and behind the new Isobox toilets (which had not been opened yet) (Figure 31). There were also frequent instances of defecation in showers - in A21 shipping containers and those housed in individual chemical-toilet style pods (Figure 8). Semi-structured interviews with cleaners

revealed that open defecation levels dropped markedly in week 2, after UNHCR toilets had been opened.

During the first week of the author's visit, IRC were only responsible for cleaning around the general camp area and WASH stations, as chemical toilets were generally cleaned by Alba employees when they were desludging. However, by the second week, Greek IRC cleaners were not only cleaning the new IRC / UNHCR container toilets (they had been donated to IRC as a 'gift in kind'), but also the donated A21 showers (see Figure 9). These showers had fallen into a filthy state, with doors removed, blocked drains and excrement in cubicles: they were a reminder of the dangers of donating hardware to an emergency situation without ensuring that an adequate management plan is put in place (Figure 7).

Future plans revolved around a new sewerage network being installed on camp, with intentions in the near future to install semi-permanent metal-framed toilets which could be craned off (and back onto) a flat-bed truck. It is notable that this camp was seen as one which is likely to remain open in the foreseeable future, hence the large-scale investment in sewerage infrastructure by IRC.



FIGURE 6: IRC / UNHCR ISOBOX TOILETS (T McMANMON)

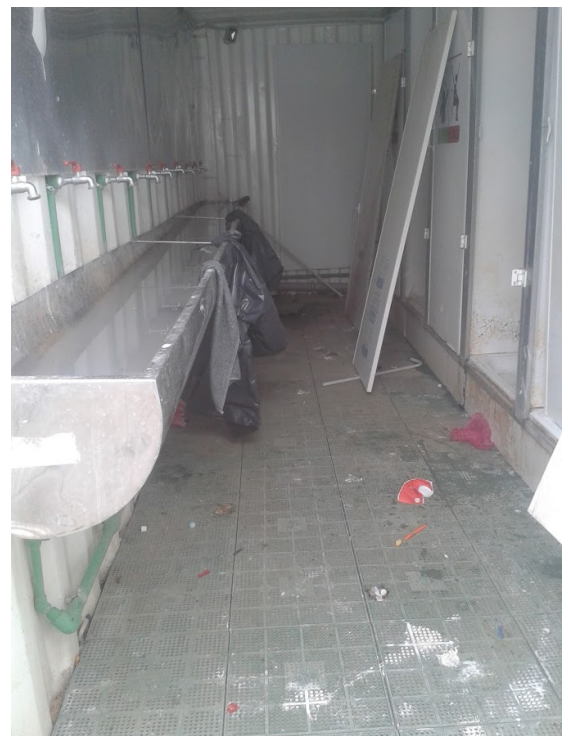


FIGURE 7: A21 SHOWER STATION, CAMP 1, WEEK 1 (T McMANMON)



FIGURE 8: INAPPROPRIATE DEFECATION IN PORTABLE SHOWER, CAMP 1, WEEK 1



FIGURE 9: IRC CLEANING A21 SHOWERS, CAMP 1, WEEK 2

4.3.2 Camp 2 – chemical toilets

This camp only had army-supplied chemical toilets, again desludged by Alba up to three times daily. The toilets were not popular with those on camp (refugee opinion during IRC survey). Like Camp 1, there were plans to transform the toilet facilities, with semi-permanent buildings and improved sewerage networks in the pipeline (see Figure 10)

Camp 2 had clearly also had issues with defecation in showers, as was demonstrated by clear signage on each shower door (Figure 11). The lack of facilities to dispose of menstrual hygiene products and diapers meant that users would put these into the toilet itself (Figure 13).

This camp was also likely to remain open for some time, explaining the large intended investment in WASH infrastructure by IRC.



FIGURE 10: INTENDED SITE FOR NEW WASH / TOILET FACILITIES, CAMP 2 (T McMANMON)



FIGURE 11: SIGNAGE WARNING AGAINST DEFECATION IN SHOWERS, CAMP 2 (T McMANMON)

4.3.3 Camp 3 – chemical toilets / replaced by UNHCR containers

The author was unable to access Camp 3 on the intended day of visiting due to security restrictions. However, several rewarding in-person conversations were had with the IRC Environmental Health Officer for the camp, during which she outlined the situation and plans for the future.

The camp was undergoing a toilet transformation during the week visited, with all 30 chemical toilets being replaced by the UNHCR container toilets. An interesting aspect of this camp was the level of ownership of toilet facilities by camp residents (see 4.6).



**FIGURE 12: NEW IRC / UNHCR CONTAINER
TOILET CUBICLE, CAMP 3 (E DÖMSÖDY)**



**FIGURE 13: DIAPERS / MHM PRODUCTS
DISPOSED INTO CHEMICAL TOILET, CAMP 2 (T
MCMANMON)**

Only Camp 1 did not have the WASH Working Group desired toilet / user ratio (at 1/36), although this changed during the visit as the new UNHCR / IRC Isobox toilets were opened. At this point, most people in the camp started using the 20 new toilets, which, ironically, meant that they were probably being over-utilised.

4.4 Cultural habits / user interaction with technology

*Answering research question:
4 - Are current toilets in Greek migrant camps
appropriate for the users?*

4.4.1 IRC baseline survey – results

The IRC survey being undertaken whilst the author was on site had its results collated and presented by 9th August 2016. The final document revealed that the survey coordinators were

aware of shortcomings with procedures; nevertheless, useful data was collected. The report authors' comments on limitations encountered with sampling ability are telling:

'In order to achieve a representative sample with 95% confidence and 10% precision, 97 randomly selected households were supposed to be interviewed per site. However, in the sites in Northern Greece it was not possible to implement the sampling strategy due to a number of reasons. Most importantly, because of insufficient numbers of community translators some teams were without translators, ending up interviewing beneficiaries who spoke English instead of randomly selected ones. Furthermore, another IRC survey on general beneficiary satisfaction through an external data collection firm (HQ pilot) took place in the same week, which reduced beneficiaries' availability to participate.....In Cherso and Diavata, the baseline survey could not be completed as staff had to be evacuated due to security incidents. Because of these limitations, the sample for Northern Greece cannot be considered as representative in the statistical sense.'

IRC WASH Baseline Report, August 2016

These limitations were the same as those encountered by the author, namely: lack of translators, other surveys being undertaken, and security incidents.

Relevant results to this project included –

- only two camps out of the six IRC were studying were open-defecation free, compounding the author's suspicions that some provided toilet facilities are inadequate or inappropriate
- only three sites out of the six met the IRC's toilet / user ratio target of 1/20
- just over 50% of respondents reported satisfaction with provided toilet facilities (bearing in mind at least one camp had just had upgraded facilities installed)
- between 61% and 100% of toilets were regarded as clean upon inspection, depending on the camp visited
- No camp met minimum standards (as set by the WASH Sector Inter-Agency National Level Working Group)

See Appendix C for the complete survey report.

4.4.2 Author- and assistant-led focus group discussions - results

Participants in the focus groups responded positively, probably because they were encouraged to expand upon their thoughts on the subject rather than just answer closed questions. The fact that the camp had new toilets opened that week also probably helped with willingness to talk about the subject (one translator said “people only want to talk about toilets this week!”).



FIGURE 14: FOCUS GROUP – AFGHAN REFUGEES, CAMP 1 (A BOULTBEE)

Some of the results of the focus groups are outlined in the table overleaf.

TABLE 8: FOCUS GROUP FEEDBACK, CAMP 1, JULY 2016

Discussion point	Women	Men
What are your opinions of the chemical toilets?	<p>'they are really bad because we have to sit on them'</p> <p>'they make us feel dirty because it feels like stuff like bacteria is sticking to our skin'</p> <p>'children can't use them because they are too small [to reach the seat]'</p> <p>'we don't like sitting on them because of the faeces below'</p>	<p>'not that great, but we are used to them'</p> <p>'good for adults, but not for children'</p> <p>'no water in them for washing [anal cleansing]'</p> <p>'they are very bad; we don't like to sit - we prefer to squat'</p> <p>'they are very bad; the new ones are 100x better'</p> <p>'no-one uses the chemical toilets [now there are squat ones]'</p> <p>'some [men] do still use the chemical toilets'</p>
What are your opinions of the IRC / UNHCR Isobox container toilets?	<p>'Arabic' [squat] toilets are better [than chemical toilets]'</p> <p>'better than the chemical toilets, but too far away from some pregnant women'</p> <p>'easier for children to use'</p> <p>'bins for [Menstrual Hygiene Management] are just bags [in cubicles] that break easily'</p> <p>'they need steps up to the entrance'</p> <p>'there is a gap in the door, so when you are using the toilet people can see you. The water on the floor acts like a mirror so they can see in'</p> <p>'they are safe because they have locks, although the locks are broken in some'</p> <p>'good hand washing facilities but they need soap: should distribute soap and let people keep it in their tents'</p>	<p>Afghan: 'Arabs break the toilets. The children took everything from the new toilets last week'</p> <p>'we prefer [these] squat toilets'</p> <p>'squat plates are the wrong way round! But it's not a problem.'</p> <p>'gap in bottom of door means people can see you when they come in'</p> <p>'[residents] are keeping the new toilets very clean'</p>
Anal cleansing habits: issues raised re: new toilets	<p>'we use toilet paper in the new toilet – we are used to using toilet paper'</p>	<p>'there is a problem with people using toilet roll and putting it down the hole'</p> <p>'50% of people use toilet paper, the rest use water'</p> <p>'toilet paper should go in the bag, but children put it down the hole. Even so, it wouldn't make sense for kids to have separate toilets'</p>

Cleaning and maintenance: issues raised re: new toilets	<p>'everyone should be responsible for cleaning'</p> <p>'there should be separate toilets for Afghans and Syrians, because the Syrians say "here are the Afghan women to clean the toilets"'</p> <p>'the Afghans and the Syrians should each appoint someone every day to clean the toilets'</p>	
Comments on other WASH facilities that affect toilets		<p>'showers are very dirty'</p> <p>'showers have no lights'</p>

4.5 Toilet technologies

Answering research questions:

- 1 - What container-based solutions are being used at festivals?*
- 2 - How prepared / motivated are festival companies to take their technology to a humanitarian setting?*

See Appendix E: 'Questions for owners of Loowatt and Natural Event'.

4.5.1 UK, Natural Event: composting toilets

One of the benefits of being able to work with both Natural Event and Loowatt was that it enabled an appreciation of the practicalities of setting up each system in the field.

Natural Event operate a flat-packable toilet system which uses steel or alloy frames, with waterproof 'fabric' walls between each cubicle. The user sits on a platform above a 200L wheely bin, and adds a carbon-based product (usually sawdust) to the mixture below after defecating. Liquid is drained from the base of the bin to an Intermediate Bulk Container (IBC).

Natural Event offered the following features (✓ = positive feature, ✗ = negative feature, selected on author's opinion after working with the company):

- ✓ - swift erection of superstructure frames, at scale (up to 50 erected in a day by a three-person team)
- ✓ - lightweight and flat-packable frames

- ✓ - containers for excreta were standard wheely-bins with minor drainage adjustments
- ✓ - easily convertible to squat-toilets (Skermer, 2016)
- ✓ - can cope with excessive amounts of liquid as all bins drained out to IBCs (with potential to drain to ground in correct conditions (ibid, 2016))
- ✓ - changeovers of bins at a busy festival required every two to three days
- ✓ - roughly 400 uses per bin (it is unclear whether this includes visits for urination – if not, the amount is considerably more)
- ✓ - able to compete with chemical toilets on price, depending on a good management system being put in place (ibid)
- ✓ - cleaning can be done quickly and easily with a jet-washer (see although it should be noted that this method is generally not recommended due to the risk of aerosol-borne faecal contamination (Mendip District Council, 2015))
- ✗ - users can see others' excreta (although smell and visual issues are reduced by the addition of a soak material, and there are options to install some kind of flap or hinge mechanism to reduce visual issues (Skermer, 2016))
- ✗ - not particularly robust; could be subject to vandalism, or stealing or 'borrowing' of materials to make other facilities.

Whilst working with these toilets user feedback to the author on cleanliness and pleasantness of use was consistently high, frequently because of previous bad experiences with chemical toilets (informal conversations with customers, Glastonbury Festival, June 2015).

They require a small amount of power to run the drainage pump, although this could be provided with a small solar panel. If lights are provided (as they should be), it should be easy to use the same power source for the pump.

Waste removal is undertaken by tipping the wheely bins into a standard garbage truck, and driving the truck to a private waste treatment facility for ongoing grading and composting (endorsed with a permit from the Environment Agency). Faecally-contaminated liquid is pumped out of IBCs by suck-trucks and transferred to sewage treatment plants.

The potential for transferring a version of this system to a refugee camps setting was explored in two telephone interviews with Hamish Skermer. In them, he stated that the importance of setting up a good management system was crucial, as was finding an appropriate place to process 'waste' produced. He has explored bringing his system to refugee camps: this included recently being asked by GIZ to quote for installation of 1200 toilets at various camps located between Macedonia and Austria. He is also looking into providing his toilets to camps

at the end of the 2016 UK festival season, whilst ensuring that an adequate management policy is put into place; preferably one that empowers camp residents to be responsible for cleaning and maintenance.



FIGURE 15: THE AUTHOR JETWASHING NATURAL EVENT TOILETS (DOORS REMOVED), GLASTONBURY (T McMANMON)

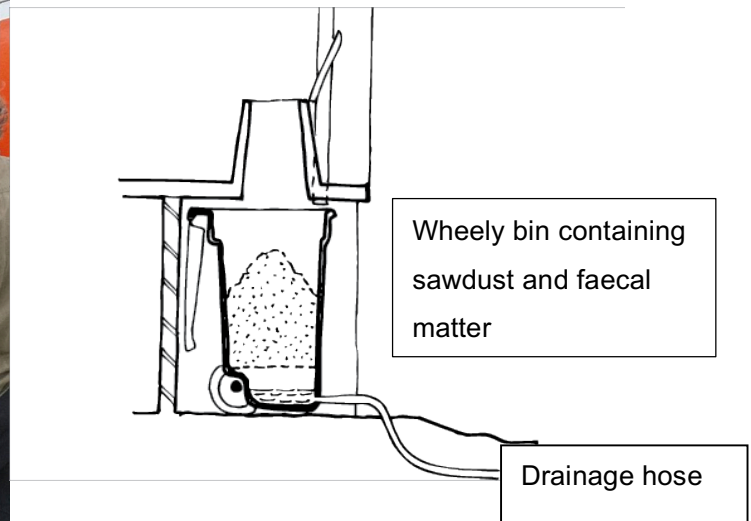


FIGURE 16: WHEELY BIN DESIGN SIMILAR TO THAT ADOPTED BY NATURAL EVENT (AUSTRALIAN GOVT.)

4.5.2 UK, Loowatt: biodegradable bags to biogas

The author worked with Loowatt Ltd over the course of two UK festivals in summer 2016. The information below derives from that experience, as well as an email questionnaire sent to CEO Virginia Gardiner.

The system utilises a rubber belt based sealing unit combined with a starch-based 'plastic' liner, which takes waste into 60L plastic barrels. The technology has the following features:

- ☑ - previous visitors' excreta hidden from user
- ☑ - waste separated from maintenance operators by bag system
- ☑ - impossible to insert foreign objects such as plastic bottles into system
- ☒ - can be 'fiddly' to maintain
- ☒ - requires high manpower levels to operate



FIGURE 17: LOOWATT TOILET SHOWING BIODEGRADABLE LINER (LOOWATT LTD)



FIGURE 18: BARREL BEING CHANGED AT REAR OF LOOWATT TRAILER, LEICESTERSHIRE (T MCMANMON)

The infrastructure surrounding the basic mechanism varies by setting. Their UK festival trailers featured the following:

- ✓ - water and power stored within trailer to enable autonomous operation for the first 1 – 2 days
- ✓ - unpleasant odours extracted by fan through seat
- ✓ - minimalist white design enabling soiling to be spotted easily
- ✓ - largely self-contained trailer-based system
- ✓ - includes water-based handwashing system. Water can be plumbed-in, stored in the trailer, or stored externally in a large bladder
- ✓ - users kept facilities clean, backing up the principle that a clean toilet tends to stay clean
- ✗ - trailers are not robust, featuring thin plastic walls – this is possibly in order to keep weight down for legal towing weight restrictions
- ✗ - can only provide a maximum of six (potentially eight) toilets per trailer, potentially limiting the potential for deployment at scale

Their Madagascan designs use a hand-crank instead of a powered motor to operate the sealing units. It should also be noted that the basic mechanism has the potential to be retro-fitted to a wide variety of toilets, increasing the potential of large-scale deployment. It is estimated that each barrel can cope with 160 'toilet visits', although this might be skewed downwards if users were using water for anal cleansing.

Whilst the author was working with these toilets, user feedback on the festival trailers was exceptionally high, despite all users paying £3 per use. Users commented on the privacy,

quiet, cleanliness, and the fact that it was 'like being in a spaceship'. One user stated a wish to have her wedding in the toilets (informal conversation whilst working with Loowatt, June and July 2016).

Power is required in the trailer version for lighting and running the sealing mechanism, although if there is enough power for lighting there will certainly be enough for the toilet system (as with the Natural Event toilets).

Waste removal at the UK festival level is conducted by transporting individual barrels to a sewage treatment works, where the contents are added to the existing sewage stream to biogas production. In Madagascar they are able to process the waste into biogas at a household level, for cooking or production of electricity.

The email questionnaire with Virginia Gardiner (Appendix E) revealed that the company does have an ethical drive behind it, although as with most private enterprises they would be unable to survive without ensuring business opportunities are viable. As part of their interest in the humanitarian sector they have investigated converting their pedestal-based system to allow it to integrate squat plates, and they are also flexible about the buildings that house their system, with non-axled containers or shipping containers being considered. Retro-fitting their sealing system into existing toilet systems, such as chemical toilets, might also be a possibility. Depending on estimated usage, they believe they would be able to compete cost-wise with chemical toilet providers.

4.5.3 UK, chemical toilets

Despite their shortcomings, it is undeniable that chemical toilets have been ubiquitous at festivals over the years, perhaps mainly because festival organisers are able to hand sanitation over to a third party without having to be concerned with sewerage or removal of faecal sludge. The author witnessed standard small suck-trucks being used at most festivals, where desludging would normally only occur between 6am and 10am, usually the quietest time (see Figure 19).

Advances in this sector include the installation of recirculation chemical toilets inside trailers. These trailers are perhaps an example of technology transfer *within* a sector, as they have the outward appearance of a flushing 'luxury loo' (which they can be, if plumbed in to water and a sewerage network), yet they utilise the recirculating technique often used in chemical toilets upon operation of a standard flush handle (AndyLoos, 2014). Author experience is that they look much better than they smell. See Figure 20.



**FIGURE 19: DESLUDGING AND CLEANING
CHEMICAL TOILETS, NOISILY FESTIVAL (T
McMANMON)**



**FIGURE 20: RECIRCULATING CHEMICAL
TOILET, 'POSH LOO' TRAILER, SIDMOUTH (T
McMANMON)**

4.5.4 Greece, chemical toilets

Answering research question:

3 - What is the current sanitation (toilet) set-up in Greek camps as a result of the Syrian crisis?

Chemical toilets are a feature of all the refugee camps across northern Greece. In many camp settings worldwide the ubiquitous pit toilet reigns supreme – in Europe these are seen by NGOs, governments, and refugees as inappropriate (one IRC worker posited that refugees expect a high standard of facilities because they are now in Europe). It is not surprising the chemical toilets have proven so popular as a first-phase sanitation solution, as they can be rapidly installed, and are quick and easy to clean and desludge.

However, they have issues, which were revealed through personal inspection, discussions with IRC staff, and the day spent with Alba toilets. Discussions and focus groups revealed that users in camp 1 had a deep dislike of the chemical toilets. Some of the reasons are outlined below:

- they were all sitting (pedestal), rather than squat toilets
- they were perceived as dirty
- the user could see other users' excreta

Other issues revealed during visual inspection and discussion with IRC and UNHCR staff included:

- they had no provision of water for anal cleansing
- there was no provision for disposal of nappies or menstrual hygiene products (so they were being dropped into the vault – although this did not cause huge problems when desludging, in general dropping such items into toilets cannot be seen as a good habit to encourage)
- they are seen as being very expensive to rent and manage, costing up to 680 euros (770 USD) per toilet, per month (including cleaning, desludging and removal of waste to an appropriate destination)

The chemical toilets used in refugee camps throughout northern Greece come from a variety of companies; the author concentrated on one, Alba, who had their headquarters located between two camps.

Notable features of these toilets were:

- they were overwhelmingly pedestal-based, although large amounts of squat-conversions had been ordered by the company – see Figure 23
- they required desludging two or three times daily, although this lessened in areas where alternative squat toilets were being provided (an advantage of this was that they were regularly cleaned when being deslugged)
- in camps 1 and 2 the cleanliness of toilets would often deteriorate quickly: this was probably due to the disliked pedestal system
- in camps where *squat* chemical toilets were being used (such as the Softex camp), they were kept very clean by users. They needed very regular desludging due to the combination of large amounts of water utilised for anal cleansing, and the fact that their capacity was less than a pedestal toilet
- although in camps 1 and 2 handwashing facilities were provided, they were often some distance from the toilets. Alba had a facility for camps with no running water (such as Softex) which involved a tank of water and soap attached on to the end of a row of toilets (Figure 24). Alba workers said it was difficult to keep water and soap

available, as both were quickly used up. Whilst at Softex camp, the author witnessed several users spending some time washing their hands after visiting facilities.

- Refugees did not use the (pedestal) chemical toilets at camps such as Thessaloniki Port, where there were alternative squat facilities already built in. This meant that the provided chemical loos were very clean, and required no real maintenance!
- faecal sludge management was undertaken by small suck-trucks, which transferred the sludge directly to Thessaloniki's sewage treatment works (Figure 25). This was the only real option, as the presence of toilet paper in the chemical loos meant that emptying it into the system before the treatment works would risk blocking the narrow sewerage pipes. Faecal sludge was weighed by driving the vehicle onto a weighbridge: the company was charged to desludge per kilo of waste. A worker at the treatment plant took a sample of the effluent, probably to test for the strength of chemicals as these can be hard to treat (Figure 22) (Mikhael, Robbins, Ramsey et al, 2014, p.88).
- Later research showed that there is a biogas production facility at Sindos wastewater treatment plant, although it apparently only treats food waste (Sioulas, 2011, p.17).

Alba were running up to eight small sludge trucks daily, covering camps within a 30km radius of Thessaloniki. Many of the journeys to the wastewater treatment plant were relatively short, meaning one team could desludge and clean at two or three camps in a day, before returning to do a second trip. See the illustration below (Figure 21) for an indication of distances; the blue lines show routes taken by the author the day he followed one sludge truck as it went about its business. The proximity of camps to each other and the treatment plant at Sindos demonstrates how it was possible for Alba to use such small trucks, a benefit when accessing camps with restricted turning space.

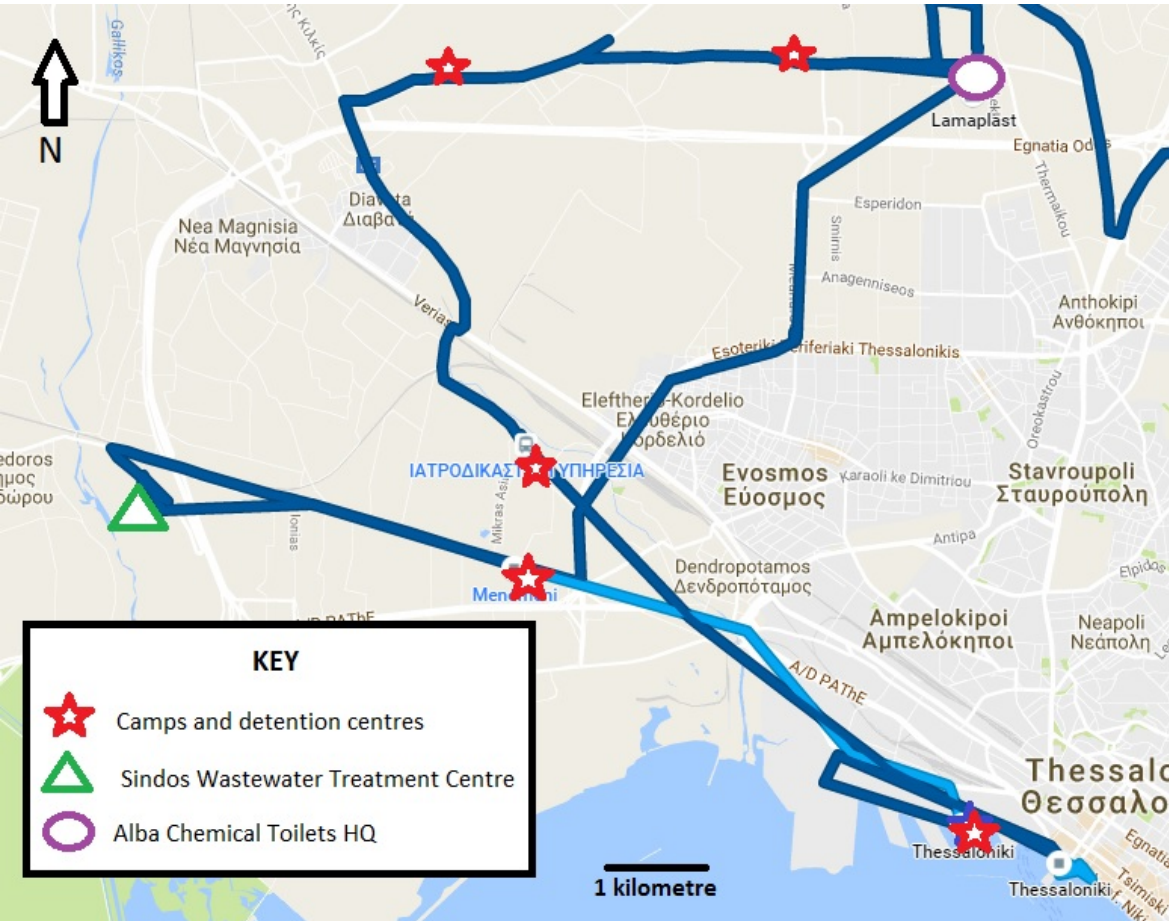


FIGURE 21: MAP OF ROUTES TAKEN BY ALBA SLUDGE TRUCKS, THESSALONIKI (FROM PERSONAL GOOGLE MAPS TIMELINE 23RD JULY 2016)



FIGURE 22: SAMPLE OF EFFLUENT BEING TAKEN FROM SLUDGE TRUCK AT WASTEWATER TREATMENT PLANT, SINDOS, THESSALONIKI (T McMANMON)



FIGURE 23: NEW SQUAT-TOILET CONVERSIONS ORDERED BY ALBA TOILETS, ORAIOKASTRO (T McMANMON)



FIGURE 24: WASH STATION ATTACHED TO ROW OF CHEMICAL TOILETS, SOFTEX CAMP (T McMANMON)



FIGURE 25: DESLUDGING AT WASTEWATER TREATMENT PLANT, SINDOS, THESSALONIKI (T McMANMON)

4.5.6 Greece, UNHCR / IRC Container toilets

Answering research questions:

3 - What is the current sanitation (toilet) set-up in Greek camps as a result of the Syrian crisis?

7 - What innovations are there currently in the European migrant camp toilet scene?

UNHCR commissioned the conversion of 'Isobox' containers into toilet buildings as a substitute for the pedestal chemical toilets. They required major groundworks in order to provide electricity for lighting, water for flushing and hand basins, and a sewerage network to remove waste. With five cubicles in each container, each one contained a porcelain or metal flush squat-toilet plate, a small shower providing water for anal cleansing, lighting, and a rubbish bag for toilet paper and menstrual hygiene products (see pictures). They were very well received by users, as they were seen as an improvement on the chemical toilets, although there were some issues:

- the squat plates had been installed back-to-front (this was an error only present in some cubicles)
- the above error meant that users would be facing Mecca when squatting (although this was not brought up as an issue by users)
- there was a large gap at the base of the door, which might not have been an issue with pedestal toilets, but is for squatting as users feel they can be seen when on the toilet (reflected in focus group feedback)
- there was no substantial bin for menstrual hygiene products or toilet paper
- there was no signage instructing people to put toilet paper into rubbish bags rather than the squat hole (camp residents who used toilet roll were used to putting it into the hole in the chemical loos)
- there were no steps meaning children had difficulty accessing facilities (see figure: clearly teething problems as toilets are being installed)
- No receptacle was provided for water for anal cleansing, but it may be that people prefer to bring their own or just use the hose with shower attachment

The Skype interviews with the UNHCR WASH contact before travelling had revealed that these toilets were part of an 'exit strategy' from chemical toilets, and, although they cost upwards of 7000 euros (7922 USD) per building (5 toilets), they were generally seen as a worthwhile investment when compared to the price of hiring chemical toilets and associated

desludging (presumably a reduction in open defecation would also be seen as a benefit). The same contact had also discussed 'Derveni' style toilets (named after the migrant camp they were tried out at), which were similar, but cheaper to produce and not as robust.

New IRC / UNHCR toilets, Camp 1



FIGURE 26: UNHCR / IRC CONTAINER CUBICLE SHOWING REVERSED SQUAT PLATE (T McMANMON)



FIGURE 27: IRC STAFF CLEANING NEW IRC / UNHCR TOILETS (T McMANMON)



FIGURE 28: CHILD BEING HELPED INTO NEW TOILETS DUE TO LACK OF STEPS (T McMANMON)

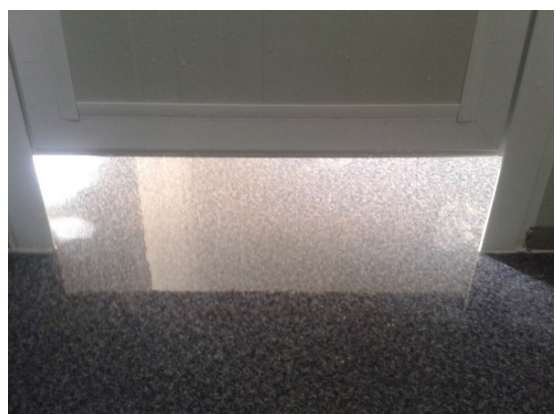


FIGURE 29: GAP AT BOTTOM OF DOOR SHOWING MIRROR EFFECT (T McMANMON)

4.6 Empowerment of residents / 'ownership' of facilities

*Exploring research question:
7 - What innovations are there
currently in the european migrant
camp toilet scene?*

When IRC took over WASH responsibility for Camp 3 from the military, they found that individual chemical toilets had been allocated to particular tents, so giving those families responsibility for those facilities. This was seen as beneficial to refugees, as there was now a greater degree of privacy and more likelihood of toilets being kept clean and usable. Upon installation of the new UNHCR container loos it was decided to continue this practice; during the week of the author's visit the EH Officer had plans to conduct educational focus groups to a) establish who was responsible for which toilets, and b) discuss with refugees some practicalities of toilet usage (such as disposal of toilet paper and menstrual hygiene products).

Such empowerment has happened to different degrees elsewhere in Greece – in Camp 1 there were reports from WASH officers that residents of two tents had persuaded the army to lock two toilets and give them the key, on the proviso that the families kept them clean. There were also anecdotal accounts of similar occurrences in another northern Greek refugee camp.

An unusual case of ownership was related to the author by the IRC EH Coordinator, who shared photographs of a self-built toilet and wash station in Cherso camp. The self-building had been prompted by inadequate facilities at the camp. The toilet used a syphon system to take excreta through the camp fence, where it essentially became open defecation, but is an example of the resourcefulness of camp residents when faced with conditions that are unhygienic, or are perceived as inadequate in some way (other examples of resourcefulness observed included informal hook-ups to power supplies in order to charge mobile phones, and children's utilisation of bed frames and tarpaulins to make swimming pools).



FIGURE 30: SELF-BUILT TOILET, CHERSO CAMP (H VEERDIG)

4.7 Managing toilet technologies, Greece

Exploring research questions:

7 - What innovations are there currently in the european migrant camp toilet scene?

8 - How appropriate might specific festival technology be for different Greek migrant camp situations?

9 - What lessons can be learned regarding toilet solutions for migrant camps in Greece?

The two semi-structured interviews referred to in 3.3.3 provided further information on the higher-level machinations of state and NGOs when trying to provide adequate WASH facilities for over 50,000 refugees. The UNHCR contact, who emphasised that their opinions were their own, was particularly interested in specific details of the festival technologies being investigated, as well as being highly sceptical about their usefulness in the Greek context. The contact emphasised that the less ‘steps’ that are involved when introducing technologies, the better: ie, it was seen as a major disadvantage to provide a basic technology, followed by a middling one, followed by a final ‘solution’. This was because each technology would require users and maintainers to be retrained, and utilising lots of technologies could prove expensive. The flip side of this is that it could be very hard to work out how long a camp might remain open - known as the ‘Eidomeni effect’, following the unexpected closure of this large camp back in May – meaning that it might be difficult to choose the appropriate technology.

This leads on to the core thrust of this contact’s argument – whichever technology is adopted, it should be *cost-effective* – organisations responsible for paying chemical toilet fees are

reeling from the cost, which, when multiplied across all camps, is substantial. Furthermore, they were very strongly of the opinion that should a festival toilet company come to Greece, cooperation with existing toilet companies such as Alba should be high in their agenda.

When it came to specific aspects of the festival toilet companies' toilets, the contact was initially wary of Natural Event's frame-based structures, regarding them as 'easily destroyed', but was impressed with the potential for rapid deployment at scale, especially with new camps. They were interested in the following aspects of Loowatt's technology: 1) the fact that foreign objects could not enter the system through the flush mechanism 2) the fact that users could not see the previous user's excreta, and 3) the possibility (in the future) for the system to be self-sufficient through production of its own biogas.

Renting versus buying technology was also discussed, with the contact firmly of the opinion that renting was the only way forward, as 'the crisis might all be over next year' (although the author should perhaps have pointed out that the main solution to problems with chemical loos in the region has been solved by UNHCR designing and installing their own Isobox container toilets, and that NGOs do own their own equipment (including tents and toilets) which they fly out to emergencies in containers).

The second in-person conversation referred to in 3.3.3 provided an even more over-arching view of the situation. This IRC contact made the point that every camp situation in Greece was different, with different solutions applicable to each one, and it would be unwise to come out to a scenario ready-armed with a solution and looking for a problem to fit it (the 'engineer mentality') – mainly because that scenario might change the following week. Being familiar with the context was vital. One interesting point made was that perhaps one of the most valuable moves an NGO could make when trying to improve WASH facilities involves *lobbying* – in the Greek context this means persuading the government to move camps closer to the municipal area of a city in order that they could be plumbed into water, power and the sewerage network (indeed, this is one of the reasons that NGOs such as IRC feel they can invest in camps such as Camp 1, which is on the outskirts of Thessaloniki, within easy reach of services). This confirms discussion in the Literature Review about how vital advocacy is (2.13).

They were of the opinion that there was no need to reinvent the wheel when it came to sanitation, and repeated the first contact's assertion (above) that there might never be a European refugee crisis again.

Pilot schemes were discussed, and here the contact quoted Bob Reed, former WEDC lecturer:

'Pilot schemes always work.'

This alluded to the idea that it was in everyone's interest to ensure a pilot scheme was successful: the users (because they were getting access to 'improved' technology, the companies or NGOs promoting the scheme (if it didn't work it would be perceived as a waste of resources), and those backing the scheme financially.

Timescales were discussed, with the contact emphasising that things took time, no matter how urgent the situation, with negotiations required between NGOs, UNHCR, the Greek government, municipal governments, and the military. In a similar vein, they were doubtful of the value of rapid deployment, mainly because of the ready availability of chemical toilets in the first instance.

When it came to specifics regarding management in the Greek context, the contact argued that it is essential to get facilities up and running as soon as possible after they arrive on site. They explained that in Cherso camp the Isobox toilets had been vandalised after arrival, but before opening: this is because they sat there, locked, whilst they were being plumbed in, meaning that camp residents were able to see the facilities but not use them (this backed up the author's theory of why there was so much open defecation around the (closed) Isoboxes in week one of the visit to Camp 1; it amounted to a dirty protest).



FIGURE 31: OPEN DEFECTION AT REAR OF NEW ISOBOX TOILET CONTAINER, CAMP 1 (T McMANMON)

5 Discussion and recommendations

5.1 Analysis of results

The preceding sections show that data came from a variety of sources. It was seen as important to look at results in the context of the original study objectives. Therefore, prioritised information included:

- Technical information on Loowatt and Natural Event systems
- Background information on migrant camps in Greece
- Information on appropriate technology selection
- Information on the appropriateness of Loowatt and Natural Event's systems for a migrant camp setting

5.2 Context

The 'European Context' was a term frequently heard by the author, both in the lead-up to travelling to Greece, and whilst actually there. Questions asked of WASH actors about pit latrines and open defecation drew shocked responses; equally, intimating that chemical toilet waste might be disposed of in landfill or rivers also returned the response 'but this is Europe!' This hammers home the fact that a refugee crisis on such a scale hasn't been witnessed in Europe for a long time, and how governments and NGOs react to it should not be entirely dictated by traditional 'developing world' emergency response models.

5.3 The current sanitation situation

A notable disjunction between this report's Literature Review and the Results section is to do with both flush and chemical toilets. The literature review barely considered flush toilets as an option, as they are not traditionally provided in emergency settings. The fact that they are becoming more popular in the northern Greek refugee crisis is to do with two factors: the movement of camps closer to major centres of population (so they can be 'plumbed in'), and apparent availability of water (this is surprising, given the arid conditions in Greece – and water may not be as freely available as first appears, as demonstrated by it being cut off in Cherso camp during the author's visit to Greece (see Appendix H – WASH cluster minutes)). Chemical toilets, endemic throughout Greek refugee camps and detention centres, are also rarely referred to in emergency sanitation literature: probably because of lack of availability and expense in non-European settings. The real issues with user interaction that were

revealed by this report may also discourage camp managers from adopting them, although, theoretically, they are probably more hygienic than pit latrines with their associated vector issues.

The Phase 2 decision by UNHCR to replace or supplement army-installed chemical toilets with flush-squat toilets wherever possible is unsurprising, given the wholesale dislike of the pedestal version witnessed by the author, and the consequent high rates of open defecation (it is notable that there were no instances of open defecation noticed by the author at Softex camp, which only had squat chemical toilets, although a thorough tour was not conducted). Installation of the UNHCR toilets was only possible at camps that either had a modicum of sewerage infrastructure in the first place, or were located close the city's sewerage system, backing up the IRC contact's assertion that perhaps one of the most important roles of a WASH-focused NGO was advocacy, to bring camps closer to such facilities (as well as other services).

The importance of lobbying in this setting should be borne in mind by any company wishing to enter the humanitarian sphere in Greece – collaborative working with other organisations is one of the most efficient ways of encouraging governmental support, as was demonstrated at the Thessaloniki WASH cluster meeting when rapid decisions were made with government approval (Appendix H).

5.4 Design Considerations

5.4.1 User interaction

It was apparent from focus groups and interviews that the disquiet felt by refugees at the thought of using chemical toilets contrasted with positive feelings towards the UNHCR toilets (although there were comments made that the new toilets were 'too good,' with a negative implication that this meant refugees were unlikely to be moving on any time soon). These sentiments, and the fact that the new toilets were opening the very week of the author's visit, meant that they were used as a focus for discussions, having the dual effect of giving indications as to what preferences users had regarding toilets, and highlighting any issues with the UNHCR toilets that could be avoided in future installations (of *any* sanitation technology).

The sit / squat issue has been much discussed over recent years, for good reason. Before the new UNHCR squat toilets were opened at camps 1 and 2, the author witnessed multiple evidence of open defecation: by week two, when the new toilets had opened, this had almost

completely stopped, and it is easy to come to the conclusion that this was at least partly as a reaction against the pedestal-style chemical toilets.

The 'wash or wipe' discussion has its place in the Greek scenario as well, not least because of the further complication that toilet roll should not be placed into the Greek sewerage system lest it cause blockages. There are several cultural issues here:

- refugees, when first introduced to chemical toilets, were given toilet paper in order to discourage massive amounts of anal cleansing water (and water bottles) entering the chemical toilet tank
- once they had adopted the practice of using toilet paper (although some Afghans were using it beforehand), they were encouraged to put that toilet paper 'down the hole' in the chemical loos
- then new toilets were opened (UNHCR Isobox flush squat), where a shower was provided for anal cleansing – but refugees who had already started using toilet roll continued, and proceeded to put it 'down the hole,' leading to blockages

Another complication is that Greek residents, used to putting used toilet paper in bins, will not put it 'down the hole' in a chemical toilet, preferring to place it on a shelf above the toilet (witnessed in Thessaloniki Port) – resulting in a hygiene hazard. As toilets in refugee camps tend to be used by visitors, this is a further cultural issue to consider.

In summary, what this means is that any technological solution in the Greek refugee crisis has to be able to cope with a variety of cultural and personal practices. Clear signage is important, with Arabic translations and pictographs where possible, including:

- clear indications of male and female areas
- instructions on where to put toilet paper

Research in the field, combined with that discussed in the Literature Review, revealed that solutions should be able to provide the following (in rough order of need):

- squat plates
- ability to cope with water for anal cleansing
- accessible facilities for the less-able, pregnant women, and children
- lighting
- ability to provide water for anal cleansing

- ability to provide water for hand washing
- provision of disposal points for menstrual hygiene products
- ability to cope with toilet paper
- pedestal seats (for less-able users and those who prefer seats)
- ability to hide contents of containers from users
- orientation that does not point towards Mecca (although more research should be done to confirm that this is actually an issue)

If the first issues highlighted above are not met, it is likely that toilets would be rejected by users on hygiene and safety grounds, leading to returning issues such as open defecation (or defecation in inappropriate areas such as showers), and increased danger for women and children.

The UNHCR containers reflect a growing movement away from individual toilets, and towards self-contained units with a set number of cubicles. An advantage of these units is that they provide more privacy (in that there is usually some form of entranceway before entering cubicles) – a directly opposing disadvantage is that the hallway may feel unsafe, as it is screened from the camp setting. The container units do feel more like ‘proper’ indoor toilets, which might improve the user experience, depending on what they are used to back home. Issues highlighted during the field trip, such as gaps under doors, lack of steps and orientation towards Mecca should clearly be avoided with any further solutions.

New sanitation solutions should include user training or education upon opening of facilities (as was meant to happen in Camp 3 during the week of the author’s visit, although this was stymied by lack of translators).

5.4.2 Maintenance of toilet facilities – management considerations

The state of the shower facilities in Camp 1 (Figure 7) demonstrates the absolute necessity of ensuring that an ongoing management system is in place for newly-installed WASH facilities. If this is facilitated by negotiation with an NGO on site, there should be assurances that if that NGO were to leave the site, they would ensure that another party managed facilities. A better option, if appropriate, might be to involve camp residents in cleaning and maintenance. Indications from both the literature review, focus groups and ad hoc conversations with refugees are that residents might be willing to take on cleaning (and possibly maintenance) *if* they were given exclusive access to facilities. The examples of empowerment in 4.6 can be seen as encouraging precedence in this area. It is likely that the system used in Camp 3, of

locking toilets and allocating them to specific groups, is one that could be adopted elsewhere – although the danger of locking facilities is that some people could be inadvertently excluded.

All systems require cleaning, and it could almost be seen as an advantage to have a system which requires regular maintenance as well, in that it forces someone to check that everything is clean. This is one of the advantages of the chemical toilets in all three camps studied: the regular desludging ensured that workers were in each toilet two or three times a day, and were cleaning at the same time as desludging.

An alternative approach might be payment of camp residents, although the stigma attached to cleaning public toilets is still very real (see focus group comments: Afghan women complained that they were called ‘toilet cleaners’ by Syrians, Table 8). However, all camps demonstrated that they were very much a trading economy, with stalls selling vegetables and cigarettes, so it is likely that paid cleaning work might be taken up by some. It would be necessary to ensure that both men and women were employed.

Maintenance of introduced waterless toilets might appeal to camp residents interested in engineering; the resourcefulness noted in 4.6 indicates that some may be interested in working with innovative technical solutions.

5.5 Technology transfer

5.5.1 Appropriateness matrix

The four toilet technologies researched - Loowatt, Natural Event, Greek chemical toilets, and UNHCR Isobox containers - each have advantages and disadvantages when placed in the Greek migrant context. It can be seen as helpful to look at some of these in table format, although it should be borne in mind that the factors chosen for ‘desirability’ are perhaps only semi-objective (Table 9, below).

Factors have been chosen according to what was revealed as important during the field trip through interviews and focus groups (with both managers and users), and the importance of those factors has been influenced by responses from the WASH managers’ survey conducted in Thessaloniki on Monday 22nd July. This survey had a poor response rate (only four completed out of 10 distributed), but elements of it are still useful, especially when combined with responses from the initial fact-finding email sent out in May 2016 (see Table 5 and Appendix F).

All factors are chosen, and their degree of appropriateness estimated, with the Greek migrant camp context in mind. If the below table was constructed for an African setting, it might look very different. The factors cover both user interaction with toilets and management desire for a practical choice of technology.

Factors are scored out of 5. The second column for each technology shows the **factor** multiplied by the **importance** (also out of 5) of that factor. Scores in the second column that score 20 or 25 have been darkened; these show elements of a technology which would be particularly useful in the Greek context. It was decided not to total scores as this could be misleading: a cursory total shows that chemical toilets outrank all the others, which given their inappropriateness is surprising. The reason is probably to do with a factor that it is difficult to assess, or give a score to – how ‘comfortable’ users are with a toilet, but it is also connected to the practicalities of managing chemical toilets.

Some technologies are potentially adaptable in order to meet certain factors. This was highlighted during interviews with the owners of Loowatt and Natural Event. In order to cater for this, bracketed scores have been given, indicating how likely it might be that a technology could be adapted in a timely and functional manner to a particular factor. High bracketed scores have been darkened as, despite the fact these adaptations do not yet exist, the companies involved are clearly serious about altering their technologies if necessary.

The table shows that Loowatt score highly with their user interface, with good privacy and an ability to reject inappropriate waste / accept appropriate waste. Natural Event scores well with affordability and ability to be deployed at scale (it should be noted that the affordability score was an estimate based on the author’s experience with Natural Event’s technology – no hard data on costs was available).

An idiosyncrasy of the table (one which highlights the subjectivity of factor weighting) is the line devoted to ‘waste to value’. No company scored highly on this, as the importance given to it was low (3 out of 5). This was because in an emergency setting (certainly Phase 1), the importance of providing good facilities is often prioritised over environmental or financial sustainability, although this is changing with the acceptance that environmental factors should be considered from the start of a project (Hammond, 2007). This factor could be altered according to funder / enabler priorities.

TABLE 9: APPROPRIATE TECHNOLOGY MATRIX: GREEK CAMPS

Factor	Importance of factor (out of 5)	Plumbed option		Non-plumbed options					
		UNHCR Isobox		Chemical toilets		Natural Event		Loowatt	
		factor score	factor x importance	factor score	factor x importance	factor score	factor x importance	factor score	factor x importance
Provides water for anal cleansing	5	5	25	1 (5)	5 (25)	1 (5)	5 (25)	1 (5)	5 (25)
Can't see previous users' excreta	4	5	20	1	4	1 (4)	4 (16)	5	20
Able to receive toilet roll into system	4	1	4	5	20	5	20	5	20
Accessible version available	5	0	0	5	25	3	15	1 (4)	5 (20)
Squat version available	5	5	25	5	25	2 (5)	10 (25)	1 (4)	5 (20)
Can work without sewerage network	4	0	0	5	20	5	20	5	20
Value from waste	3	0	0	0	0	4	12	4	12
Robust / anti-vandal	5	4	20	5	25	3	15	3	15
Easily cleaned	4	5	20	5	20	5	20	5	20
Provides privacy (sound / sight)	5	4	20	5	25	3	15	5	25
Can operate without power	3	5	20	5	20	5	15	0 (5)	0 (20)
Relatively affordable	5	3	15	3	15	4	20	3	15
Can be rapidly deployed	4	4	16	5	20	5	20	5	20
Deployment at scale (> 50)	4	2	8	5	20	5	20	3	12

5.5.2 Ideal scenarios

The likelihood of being able to take an existing festival toilet and 'plugging in' to a refugee camp setting is minimal. Each camp is subject to variables already discussed, such as

resident culture, location, and predicted longevity. It is an interesting exercise to discuss what the ideal circumstances for each of the two chosen festival sanitation technologies might be, although this approach brings with it the danger mentioned by the contact in 4.7: that it might be difficult, indeed inadvisable, to attempt to find the ideal setting for each specific technology rather than approach the situation the other way around. It should also be borne in mind that the top-down LTT approach discussed in 2.11 should be avoided: festival companies hoping to enter the humanitarian sector should ensure there is ongoing discussion with *all* stakeholders, including NGOs currently working in the Greek WASH sector.

Scenarios that both technologies would be able to cope with (assuming relevant adaptations) include sites with lack of services, and situations where the technology might need to be moved at short notice. Both technologies would work best with long-term populations that might be able to become involved with cleaning or maintenance. It should be noted that although sites researched in this report were all 'plumbed in' to services (or about to be), that does not necessarily negate the need for waterless solutions. Indeed, there were no indications that chemical toilets were about to be removed wholesale: this would be for the very good reason that camps might well suffer power or water outages in the future, or, indeed, severe sewerage blockages.

Interestingly, both companies provide a solution that is *not* urine-diverting, unusual in the world of 'ecosan' toilets, with Loowatt's waste all being kept together in the recipient containers, and Natural Event draining their excess 'shiss' (an unpleasant but self-explanatory term) from the base of the bins. This has to be a positive move, as urine diversion (rather than separation) can be fraught with difficulties (see 2.4.1).

Advantages of both technologies in the Greek context (assuming the use of Natural Event in a Phase 1 situation, and Loowatt in a Phase 2 or 3 situation) include

- rapid deployment at scale (as well as rapid redeployment)
- ability to meet funders' environmental and financial targets for waste-to-value
- standalone potential, without electricity, water or sewerage / septage system
- ability to cope with toilet paper
- ability to reject / cope with plastic bottles
- potential squat conversions
- potential for resident management of systems (not possible with chemical toilets)
- potential for resident cleaning of systems
- meet stringent WASH cluster area minimum standards, as outlined in Appendix A

5.5.3 Suitable scenarios: Natural Event

It became apparent to the author through the process of researching this report that Natural Event's system might be most suited to a Phase 1 situation with no chemical toilets available, for the following reasons (see also Table 9, page 75):

- it is relatively cheap
- it is quick to deploy
- it meets the need to immediately contain excreta and prevent spread of disease
- it has the ability to cope with water for anal cleansing (much better than other container-based solutions, due to its drainage system)
- it can operate without a sewerage network

An appropriate situation might be the formation of an unofficial or illegal camp, where the government is unwilling or unable to provide chemical toilets. An effective squat toilet conversion (or a dual-purpose squat / sit system, as described by Hamish Skermer) would be necessary, and a system hiding excreta from users desirable (as revealed through focus groups). A solar power supply to the pump used to remove excess liquid might also be necessary, in case of power outages.

An appropriate destination for faecal waste would need to be found – it is possible that rural settings might be more appropriate for disposal / composting of such waste. Natural Event currently compost their product in a dedicated area – it would fall to them to arrange transportation of faecal waste to an appropriate composting facility; this might prove one of the more difficult aspects of introducing their technology.

It would be essential that any installation by Natural Event be accompanied by training of camp residents or NGO workers in the ongoing maintenance of the system (ie changeovers, checking of bin levels, topping up of provided soak material). Advantages of this system, in this context, would include the fact that it could cope with anal cleansing water (as long as it were syphoned out to an IBC), and there would be no problem with toilet paper going into the system. See also the Table 9 matrix.

5.5.4 Suitable scenarios: Loowatt

Loowatt's technology might be suitable for any phase, although it is perhaps better suited to Phases 2 and 3, as the 'fiddly' aspects of its technology (author experience, summer 2016)

might cause problems in a developing Phase 1 situation. Depending on which aspects of Loowatt's technology is chosen, the most appropriate scenario might be a camp where chemical toilets are being rejected by residents, and there is no conceivable access to a sewerage network or appropriate septic tank. Assuming a system similar to their festival trailers were in place, the housing would have to be robust. In order to cope with potential power outages, the 'flush' system would probably require to be a hand crank such as that utilised in Madagascar. Many refugees use water for anal cleansing: Loowatt's current system would struggle with this, so they would potentially have to either install a drainage system similar to that used by Natural Event, or create one large tank for regular desludging (this would also reduce maintenance (barrel changeover) requirements dramatically). See Table 9 for further exploration of appropriateness.

5.5.5 Technology sharing

Collaboration and technology-sharing with Greek companies is recommended (see discussion with UNHCR contact, 4.7). This is for two reasons: 1) it would be practical, with existing companies able to deal with the labyrinthine world of Greek law and logistics, and 2) it would ensure that local people were still being employed (an important aspect of keeping the Greek public onside regarding the controversial topic of refugee camps) (see comments by the UNHCR contact, 4.7). An alternative to technology sharing would be to set up a company locally: some Greeks are against the idea of a commercial company from outside the country potentially making money from camps in the Greek setting.

There is a real opportunity for Loowatt to collaborate with a chemical toilet company. Chemical toilets are being replaced by flush toilets in camps around Thessaloniki, and a company such as Alba might be open to technology sharing. Chemical toilet superstructures are all fairly similar - perhaps Loowatt could develop a squat adaptation. This might use the squat-toilet conversions manufactured in Italy (Figure 23), or something similar to that developed by the aforementioned Global Fliegenschmidt (Breitenbach, 2016), which also would cater for users that prefer sitting (below, Figure 32).



FIGURE 32: GLOBAL FLIEGENSCHMIDT SQUAT / SIT PORTALOO CONVERSION

It should be noted that this kind of adaptation is primarily an example of technology transfer between systems, rather than transfer from one context to another – similar to the installation of a chemical recirculation system into flush toilet trailers (Figure 20).

It is hard to see how Natural Event could similarly share technology with existing companies abroad, as their product is so different from other sanitation solutions currently in use in refugee camps. However, there are certainly opportunities to employ local people to assemble, build and maintain toilets, using a similar format to their UK operation (Appendix B), which is managed, to some extent, from Australia.

5.5.6 Product management – the end of the sanitation chain

Natural Event currently transport their product by garbage truck to an agricultural setting. This could be done in Greece, although they might struggle to find a company willing to hire out a truck to be filled with (potential) humanure. A better solution might be to secure bins once full, and find somewhere on-site (or close by) to store them until a truck becomes available.

Alternatively, bins could be loaded onto a flat-bed truck and hand-tipped at a predetermined composting area. As noted in 4.5.1, Natural Event have precedent for large scale composting in a European setting, so the legality of doing this should not be an issue. It is possible that with good compost management humanure could be used on site for growing vegetables, as there is anecdotal evidence of gardening in camps (conversation with IRC employee, July 2016). This approach may meet with opposition from faecophobic managers or residents, and

would need to be a long-term one given the recommended minimum one-year compost aging process (Jenkins, 1999, p.173).

With Loowatt, it is unclear if the wastewater treatment plant at Sindos could cope with their faecal sludge (their biogas treatment section appears to concentrate on food waste). It could, of course, enter the sewage system (at the sewage works; the lack of carrying water might cause problems if the waste entered the system any distance from a treatment plant) and be treated with the rest of Thessaloniki's waste, but this might remove any claim that their system creates waste-to-value. If Loowatt wished to have their sludge processed at the treatment works, the cost of doing so would need careful consideration, including vehicles, fuel, and desludging costs (the map at Figure 21 gives an indication of distances between camps and the treatment plant at Thessaloniki).

Loowatt's best move might be to look into on-site or small-scale biogas production, especially as 1) there can be a real need for reliable electricity by refugees and 2) this might make units self-sustaining. They have set a precedent for this with their operation in Madagascar.

5.5.7 The view from the field

Rather than looking at which situations might be most appropriate for ready-made solutions, it makes sense to look at camp sanitation from the viewpoint of those already there. Around Thessaloniki, NGOs such as IRC have been working with UNHCR to improve the situations they have been presented with, most of which involve chemical toilets and, when the NGOs took over WASH responsibility, no water or sewerage and limited power. The solution seemed obvious from an engineering point of view – connect up to the sewerage system and install flush squat toilets. This is being done, at considerable expense, and despite the risk that camps could be closed at a moment's notice. Whether it was the *right* choice remains to be seen (this is dependent on camp longevity, the robustness of the municipal sewerage system, and continued education of users regarding the destination of their toilet paper). The choice was further influenced by user expectations ('this is Europe, so refugees expect European standards' – conversation with IRC worker, repeated by UNHCR contact). What is indisputable is that for the refugees in these Phase 2 camps, flush toilets are a much appreciated improvement, and from a management perspective they are very low-maintenance (virtually nil, apart from cleaning and sorting the occasional blockage).

The drive to install waterless options is likely to come from three sources. The first is funders, who increasingly expect value and sustainability from their investments, whilst closing the sanitation loop:

‘Our goal is to encourage the development of business models and technologies that make sanitation without sewers the preferred solution for millions of people’

(Bill and Melinda Gates Foundation, 2010)

It should be said that this antipathy towards sewers is understandable: flush toilets use vast amounts of water, and make little sense in dry countries such as Greece. The sustainability argument against sewerage networks is not so clear-cut now, though, as modern treatment plants such as the one at Sindos process sludge for onward agricultural application, and there is research into utilising wastewater for crop irrigation around Thessaloniki (Eyath, 2010). The author posits that in emergency situations, the value of completely closing the sanitation loop can be negated by other, more pertinent issues – such as disease control and safety. However, both festival companies being investigated have the potential to meet sustainable sanitation targets whilst also providing a practical service in a camp setting.

The second argument for waterless toilets is directly related to water availability, and centres around what would happen if the supply to a camp ran out or was turned off (as happened in Cherso (see Appendix H – minutes of WASH cluster meeting)). Although flush toilets could perhaps become pour-flush toilets, such a situation could rapidly escalate into a full-blown health emergency – unless camps retained chemical toilets as a back-up, which would be unreasonably expensive.

The third centres around longevity of camps. If the three camps being studied were closed down, and refugees moved elsewhere (as happened at Eidomeni), 600,000 euros (679,050 USD) worth of sewerage works would remain dug into the ground, and the next tenants would have an excellent sewerage system readily-supplied (cost figure from IRC). It is unlikely that these works were done without some kind of reassurance from the government that camps would at least remain for the medium-long term, but political situations change – as do governments. Waterless solutions such as those promoted by Natural Event and Loowatt are flexible enough to be moved when required.

Of course, sewerage-based systems are much easier to maintain – once they are installed, they can be virtually forgotten about. When they go wrong, the issues can be serious.

5.6 Further study: recommendations

Two weeks in and around Thessaloniki flew by, and, although the author felt he gathered a good amount of data, more research would be recommended, whether that be by festival toilet companies wishing to bring their product to the humanitarian sector, or by NGOs interested in environmentally-friendly alternatives to chemical or flush toilets.

Monitoring of the sanitation situation in camps which have had flush toilets installed should continue (the baseline survey conducted by IRC is continuing on a six-weekly basis), and there should be specific monitoring of the UNHCR Isobox toilets – in particular, their robustness, issues with blockages, and how well they act as pour-flush toilets in the event of water shortages.

There is scope for more research into where the effluent from chemical toilets goes, and whether the chemicals have an adverse effect on the wastewater treatment plants at Sindos and elsewhere – if so, this might provide support for non-chemicals based waterless toilets. The inference that some effluent might *not* end up in the treatment works is not necessarily a scurrilous one, as there is legitimate scope for burying it or sending it to landfill – around 40,000 tonnes of Greek sewage was sent to landfill in 2012 (Eurostat, 2016).

It was unclear how efficient the biogas production plant at Sindos wastewater treatment plant is – and what sludge or wastewater it processes. More research in this area could be done at the treatment plant. This would require Greek translators and someone with a working knowledge of treatment plants and biogas generation.

There is also scope for research into taking a specific technology – say, the Loowatt sealing mechanism – and slotting it into pre-made chemical toilet housings (in collaboration with a local company), although it should be borne in mind that due to poor lighting and security these housings are not popular in general with camp residents (IRC, Appendix C). It may be better to concentrate on adapting Isobox or shipping containers, especially as these tend to be raised, allowing more room underneath for collection barrels or tanks, and there is a clear working precedent showing their functionality (see 4.5.5).

Once camps have become more established, or theoretically permanent (and this is, sadly, beginning to look likely (Polychroniou, 2016, and Chrysopoulos, 2016)), there may be scope to run a pilot project using Loowatt technology – using any relative stability to recruit camp residents as maintenance workers (probably not possible in a camp with constant throughput

of residents), or at least ensure that NGOs are involved, bearing in mind potential issues with their staff turnover (see 2.5.1).

It may be difficult to create a pilot project with Natural Event technology, as it seems more suited to unofficial Stage 1 camps, although if NE were to insert themselves into an *unofficial* camp setting there is no reason why the situation could not be studied; indeed, there could be real scope for new data on sanitation systems in camps which are *not* officially governed.

Any pilot study should first have a comprehensive site assessment taking into account impacts the sanitation technology might have, including health and hygiene issues, socio-cultural issues, and technical concerns (Harvey, 2007, pp.9-21). Environmental concerns could be alleviated by conducting an Environmental Assessment or REA (see 2.5.5.2). Furthermore, in order to avoid Reed's prediction of 'every pilot study works' coming true (section 4.7), neutral observers should be employed to assess the success of the scheme. Funding of such a study may be available from a source such as the Humanitarian Innovation Fund.

5.7 Reflections on the dissertation

A good question to ask is 'if you were to do it all again, what would you change?' Hindsight can be misleading, but the author felt that it would have been useful for the purpose of the report to be able to visit more secure camps (which had less WASH future-planning), or unofficial camps, which have a more haphazard way of operating, and perhaps less appropriate sanitation solutions. Neither option was practical in the timescale available, or with the contacts that had been made.

It would have been good to have had more comprehensive focus groups at Camp 1, with a greater cross-section of respondents (although IRC staff did their best to help, providing translators and suggesting people to speak to, for which the author is grateful). The unpredictable nature of camp life meant that organising groups in advance was impracticable. Running them in an ad-hoc manner resulted in less control over respondent demography.

Finance was a particularly difficult area to get hard figures on, especially with the UK festival companies. This was mainly because it was difficult to put a cost on bringing an adapted version of their technology to a non-specific future setting. The importance of cost was emphasised by all management-level interviewees and respondents, in both the festival and humanitarian spheres.

The discussion with the IRC contact in section 4.7 raised a particularly troubling issue: that the research the author was conducting was centred around a basic premise of finding a problem to fit the solution. This has hopefully been taken into account in the body of the work (5.5.7), but it underlined the danger of taking a design and presuming it will slot into a problem, a classic scenario in the world of engineering.

6 Conclusion

The research objectives of this dissertation were centred around the following four areas:

1) *To use specific UK-based festival toilet companies as examples of container-based toilet solutions*

The companies chosen, Natural Event and Loowatt, both use containers to hold excreta, but in very different ways, with the former's composting system utilising large bins with drainage from the base, and the latter's biodegradable sealing system using barrels before going to biogas production. Both systems require relatively high levels of ongoing maintenance, but this is offset by flexibility when it comes to moving to new locations.

2) *To investigate the context of contemporary Greek camps in order to ensure that any solutions recommended be appropriate*

The three camps investigated around Thessaloniki were all in the process of shifting their sanitation hardware from chemical toilets to flush systems; they were able to do this because of their proximity to municipal sewer systems, and a level of security regarding longevity. Waterless toilets would not be essential in these particular camps (although they might still be useful as a back up), but this does not mean they would not be appropriate in other camp settings.

3) *To investigate the limitations and influences upon technology selection in migrant camps*

Investigations showed that a mainly Muslim camp population would require squat toilets, and the ability to use water for anal cleansing. Safety and ease-of-access are two further issues. Provision of inappropriate toilet facilities leads to open defecation. There was evidence of 'ownership' of facilities in two camps (1 and 3), which lends support to the theory that management of facilities by residents might be possible. Uncertain longevity of camps can affect technology choice.

4) *To analyse the potential for the above companies' technologies to be used in migrant camp settings*

Natural Event and Loowatt both have potential to expand into the Greek humanitarian sphere, but this is with several caveats, including appropriate adaptation of the user interface, collaboration with NGOs and other actors in the field, potential collaboration with existing Greek companies, and a working management plan for operations and maintenance.

Festival sanitation is in the process of moving on from chemical toilets. This is probably because of a combination of increased environmental awareness, as is the case at Glastonbury (Glastonbury Festival, 2016b), and a realisation that customers were not happy with what had been provided. Chemical toilets have never been popular sanitation options at refugee camps, usually because they are too expensive, or are difficult to source outside Europe (Harvey, 2007, p.63), but they became the go-to solution in Greece. Their integral problems with user interface and cost means that a flush solution is being widely adopted where possible, but perhaps now is the time to seriously consider waterless options, especially considering Greece's arid nature and the uncertain longevity of camps.

The two companies highlighted in this report have the ability and the desire to move into this field; whether they are successful will depend on the above adaptations and collaborations – and the desire to make a difference.

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8 Appendices

A. WASH Sector Inter-Agency National Level Working Group for Greece: minimum standards

WASH SECTOR INTER-AGENCY NATIONAL LEVEL WORKING GROUP FOR GREECE

MINIMUM STANDARDS

The WASH Sector Inter-Agency National Level Working Group recommends that a comprehensive and timely WASH package is provided at all sites. Whenever possible it recommends that a single agency takes responsibility for delivering the full package to maximise efficiency and on-site coordination with other sectors, in particular Health, Food and Shelter. The WASH agency must ensure that funds, capacity and expertise are available to deliver minimum WASH standards against assessed WASH needs.

A comprehensive WASH package includes water supply, excreta disposal facilities, run-off water management, solid waste management, operation and maintenance, cleaning, and hygiene promotion. It is recognised that without the provision of WASH hardware facilities it is unrealistic to successfully meet minimum standards in hygiene.

1. ΕΚΧΡΕΤΑ ΔΙΟΡΘΩΣΗ/ΤΟΙΛΕΤΣ		
ΠΑΡΟΧΗ		
1:20 where possible but no less than 1:50		
1:500 everywhere for disabled toilets		
Minimum distance from users: 150m		
HARDWARE OPTIONS/CONSIDERATIONS		
<ul style="list-style-type: none">Chemical toilets (Western sit or Turkish squat type) – Turkish squat type always preferable if available.UNHCR WASH Containers (5 toilets per container).UNHCR Disabled Toilet Containers (1 seat per Container).Other WASH Containers e.g. AIS."Shower" site style lightweight WASH containers (combined shower/WC)Hard Construction.Repair of existing in-building toilets.Other excreta disposal technologies e.g. composting (not yet investigated)		
Essential	Desirable	Needs based
<ul style="list-style-type: none">Sewerage connection or on-site biotrap septic tank.Discharging as required (minimum of 1 discharging truck/40 toilet units) with many access for discharging trucks.Septic tanks to be lined and to comply with Greek laws.Provide privacy.Gender segregated spatially and with signage.Illuminated internally and externally.Locks/fences on individual doors.	<ul style="list-style-type: none">Family segregated.Discharging based on month, emptying when ¾ full.Whenever possible, separate grey and black water.	<ul style="list-style-type: none">Consider physical orientation in strong winds (risk of doors blowing off).Depending on location toilets and septic tanks should be at least 30m from groundwater sources and any

B. Working with Natural Event, summer 2015 (T McManmon)

Natural Event – Technology

Tommy McManmon, Loughborough, May 2016

Introduction

In the summer of 2015, the author worked for several weeks for Natural Event, a company with its origins in Australia, but now making major in-roads to the UK festival scene. The company designs, builds and operates a flat-pack wheely-bin toilet system. This short report reflects on the technology used by Natural Event. It should be noted that this is not a detailed discussion due to intellectual property reasons.

Origins

Natural Event is the brainchild of Hamish Skermer, who adapted the Australian wheely-bin dunny into a system that was flat-packable following the adoption of the system at his own festival. Hamish is assisted by an able crew of technically-aware and practical people, and has managed to bring his toilets across the world to the UK, and operate them at scale (most notably with the provision of 1,111 toilets at Glastonbury Festival).

Cost

Cost of production has not been discussed; neither has potential charges for hire. It is expected that hire of the system would be not dissimilar to chemical bin charges, as Natural Event's composting system has completely usurped chemical toilets at several festivals.

Units – transport / materials

All units consist of flat-packable frames made from either steel or alloy. They are linked together with coloured waterproof fabric sides and roofs. Doors are lightweight ply surrounded by a steel or alloy frame. Steps are alloy or steel, and are also flat-packable. The only element of the units not flat-packable are the wheely-bins, although it could be argued that they are, in that they are stackable (all wheels are removed).

Upwards of 45 units can be transported on a 7.5T truck, enabling rapid deployment at scale.

Units – technology

Power is required only for lighting (if desired), and a small pump for extracting liquid from the bottom of the wheely-bins into an Intermediate Bulk Container (IBC). It may be that power is not necessary even for this latter purpose if there are nearby sewerage facilities, or a substantial slope enabling the IBC to be located downhill of the units.

All units can be linked together, providing facilities from three to thirty (and upwards) in a row. There are limited amounts of disabled units, or units designed specifically for children.

Units – set up

C. IRC Baseline Survey – final report (IRC – August 2016)



WASH Baseline Report IRC Greece
August 5, 2016

Zoi Diamantakou (M&E Officer) and Vera Wedekind (M&E Manager)

D. Sanitation-related questions in the IRC Baseline Survey

	Question/Instruction	Responses	Indicator
11	Is there anyone five years of age and over in your household who sometimes doesn't use a toilet/latrine to urinate or defecate?	No, Yes, Don't know/no answer	% households in which the sanitation facility is used by all members of household whenever needed
12	<i>[Ask respondent to point out the toilet/latrine they use; after the interview check it and answer the following question.]</i> What type of toilet/latrine does the household use?	<ul style="list-style-type: none"> • Chemical toilet • Toilet in a container • Toilet in a permanent building 	% households with access to an improved latrine or toilet
13	Where is the nearest working toilet/latrine located?	<ul style="list-style-type: none"> • Around 50 m away from household • More than 50 m away from household 	
14	How do you feel about the toilet/latrine design and location? <i>[Read all responses and let respondent select one]</i>	<ul style="list-style-type: none"> • Very satisfied • Satisfied • Unsatisfied • Very unsatisfied • Don't know/no answer 	% people reporting satisfaction on toilet design and location and toilet use
15	<i>[If "male member of household", skip to 18]</i> Do you have any concerns for your safety when you use the toilet/latrine during the day?	No, Yes, Don't know/no answer	% females reporting that they felt safe when using the toilet facilities day or night
16	Do you have any concerns for your safety when you use the toilet/latrine at night?	No, Yes, Don't know/no answer	
17	<i>[If no for both questions, skip to 18, proceed with 17 if one of the two questions was answered with yes]</i> <i>What are your main concerns? [Do not read responses; circle all that apply]</i>	<ul style="list-style-type: none"> a. Toilet/latrine is not well-lit b. Toilet/latrine is isolated c. Toilet/latrine not lockable d. Distance is too long e. Toilet/latrine not in a safe place 	

E. Questions for owners of Loowatt and Natural Event

These questions were asked by telephone to Hamish Skermer (Natural Event (Europe) Ltd) and by email to Virginia Gardiner (Loowatt Ltd). See 4.5.1 and 4.5.2 for more details.

- Have you considered taking your product to refugee camps / a humanitarian setting? What motivations does the company to expand into this sphere? Is there an ethical drive?
- Would it be possible to adapt the toilet-trailers to a squat system? Has this been considered? What about putting a water supply into the cubicles of the toilet trailer cubicles?
- What is the maximum number of toilets you could fit onto a flatbed truck / articulated lorry? (*Natural Event*)
- How many toilets could realistically fit into a trailer system? Have you considered using a shipping-container type housing? (*Loowatt*)
- The chemical toilet companies in Greece charge on average 650 euros per toilet, per month, for hire, cleaning, desludging and disposal of waste. Do you think that (if an appropriate management system were put in place, with Loowatt / Natural Event paying employees) Loowatt would be able to compete with this?
- Have you considered selling rather than hiring the product (toilet trailers)? Thoughts?
- Have you considered working with companies abroad to integrate the sealing technology into existing toilet systems? What about integrating it into a chemical toilet structure? Thoughts? (*Loowatt only*)
- How many uses do you estimate is possible per barrel / wheely bin?

F. Questionnaire results from initial emails to Greek WASH actors

Project Name	Timeline & Milestones		Resource Allocation		Budget & Financials		Risk Management		Performance Metrics	
	Start Date	End Date	Team Lead	Team Members	Budget (USD)	Actual Cost (USD)	Risk Level	Mitigation Strategy	Completion Rate (%)	Client Satisfaction Score (1-5)
Project Alpha	2023-01-15	2023-06-30	John Doe	Jane Smith, Bob Johnson	\$120,000	\$115,000	Low	Regular communication with stakeholders	95%	4.5
Project Beta	2023-02-01	2023-07-15	Alice Brown	Charlie Davis, Eve White	\$85,000	\$88,000	Medium	Proactive risk identification and mitigation	88%	4.2
Project Gamma	2023-03-10	2023-08-31	Frank Green	Grace Hill, Henry Lee	\$200,000	\$198,000	Low	Thorough testing and quality assurance	92%	4.7
Project Delta	2023-04-05	2023-09-10	Ivy Black	Jack King, Karen White	\$95,000	\$92,000	Medium	Clear communication and documentation	90%	4.3
Project Epsilon	2023-05-20	2023-10-05	Leo Blue	Mia Green, Noah Brown	\$150,000	\$155,000	High	Regular status reports and stakeholder updates	85%	4.0
Project Zeta	2023-06-01	2023-11-15	Olivia Red	Peter Black, Quinn White	\$75,000	\$73,000	Low	Proactive risk identification and mitigation	98%	4.8
Project Eta	2023-07-15	2023-12-31	Rachel Yellow	Sam Green, Tina Brown	\$110,000	\$112,000	Medium	Thorough testing and quality assurance	80%	4.1
Project Theta	2023-08-01	2024-01-31	Umar Purple	Vera White, Walter Black	\$130,000	\$128,000	Low	Clear communication and documentation	75%	4.4
Project Iota	2023-09-10	2024-02-28	Xavier Orange	Yara Green, Zach Brown	\$90,000	\$89,000	Medium	Regular status reports and stakeholder updates	70%	4.2
Project Kappa	2023-10-01	2024-03-31	Adrian Silver	Bella White, Carl Black	\$160,000	\$162,000	High	Proactive risk identification and mitigation	65%	3.9
Project Lambda	2023-11-15	2024-04-30	Diana Gold	Ethan Brown, Fiona White	\$105,000	\$107,000	Medium	Thorough testing and quality assurance	60%	4.0
Project Mu	2023-12-01	2024-05-31	Greg Silver	Hannah Black, Ian White	\$80,000	\$78,000	Low	Clear communication and documentation	55%	4.3
Project Nu	2024-01-15	2024-06-30	Helen Gold	James Brown, Kelly White	\$115,000	\$116,000	Medium	Regular status reports and stakeholder updates	50%	4.1
Project Xi	2024-02-01	2024-07-31	Ian Silver	Laura Black, Mark White	\$98,000	\$97,000	Low	Proactive risk identification and mitigation	45%	4.4
Project Omicron	2024-03-10	2024-08-31	Jane Gold	Nathan Brown, Olivia White	\$125,000	\$126,000	High	Thorough testing and quality assurance	40%	4.0
Project Pi	2024-04-05	2024-09-10	Karen Silver	Peter Black, Quinn White	\$70,000	\$69,000	Medium	Clear communication and documentation	35%	4.2
Project Rho	2024-05-20	2024-10-05	Leo Gold	Rachel Brown, Sam White	\$140,000	\$141,000	Low	Regular status reports and stakeholder updates	30%	4.3
Project Sigma	2024-06-01	2024-11-15	Mia Silver	Tina Black, Umar White	\$88,000	\$87,000	Medium	Proactive risk identification and mitigation	25%	4.1
Project Tau	2024-07-15	2024-12-31	Noah Gold	Vera Brown, Walter White	\$100,000	\$101,000	High	Thorough testing and quality assurance	20%	4.0
Project Upsilon	2024-08-01	2025-01-31	Olivia Silver	Xavier Black, Yara White	\$135,000	\$136,000	Low	Clear communication and documentation	15%	4.4
Project Phi	2024-09-10	2025-02-28	Peter Gold	Zach Brown, Bella White	\$92,000	\$93,000	Medium	Regular status reports and stakeholder updates	10%	4.2
Project Chi	2024-10-01	2025-03-31	Quinn Silver	Ethan Black, Fiona White	\$165,000	\$166,000	High	Proactive risk identification and mitigation	5%	3.8
Project Psi	2024-11-15	2025-04-30	Rachel Gold	Greg Brown, Hannah White	\$108,000	\$109,000	Medium	Thorough testing and quality assurance	0%	4.0
Project Omega	2024-12-01	2025-05-31	Sam Silver	Ian Black, Julia White	\$82,000	\$81,000	Low	Clear communication and documentation	0%	4.3

G. Questionnaire for WASH managers, Ministry of Macedonia and Thrace

Taylor & Francis Ltd Technology Transfer UK | Institute for Smart Growth impacts

Tony McManus | Wales, Engineering and Development Centre, Loughborough University

QUESTIONING: 18TH JULY 2016 My disputation is based on UK national statistics (see chemicals or materials) and the fact that the UK has no significant oil or gas savings. I would be very interested if you could reply to my observations to highlight those questions. All respondents' answers will be kept anonymous. If you need help for a copy of the final document please email your street address here.

YOUR NAME/SURNAME _____

YOUR JOB TITLE, CAMPUS RESPONSIBLE FOR THE COPY:

PLEASE CHECK THE APPROPRIATE ANSWER OR THE SCALE 2 + NOT REQUIRED...2D = Very Important

ISSUES ABOUT CAPTIVATING AND/OR DISSEMINATION: CURRENT: CURRENT:

1. How important is **MARKETING SUPPORT** to enable it to comply (e.g. can be built and operational within a day)?

Very important	1	2	3	4	5	6	7	8	9	10	Current

2. How important is good **BOUTINESS** is a subtle design [se-aided measures]?

1	2	3	4	5	6	7	8	9	10	
---	---	---	---	---	---	---	---	---	----	--

3. How important is **EASE-OF-CLEANING** is a design [as curved surfaces between floor and walls]?

1	2	3	4	5	6	7	8	9	10	
---	---	---	---	---	---	---	---	---	----	--

4. How important is equal toilet [flushed or "ready"] provision in a design?

1	2	3	4	5	6	7	8	9	10	
---	---	---	---	---	---	---	---	---	----	--

5. How important is that the design enables disabled options?

1	2	3	4	5	6	7	8	9	10	
---	---	---	---	---	---	---	---	---	----	--

6. How important is that the design enables privacy for users [if women separated from men, second private cubicles]?

1	2	3	4	5	6	7	8	9	10	
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7. How important is that there is a four foot air washing?

1	2	3	4	5	6	7	8	9	10	
---	---	---	---	---	---	---	---	---	----	--

ANY COMMENTS ON THE ABOVE QUESTIONS:

NOW PLEASE TURN OVER

H. WASH Working Group North Greece: minutes of meeting Monday 22nd
July 2016

<div>WASH WG North Greece</div> <div>Meeting Notes – 2nd July 2016</div> <div>Agenda WASH Working Group Northern Greece:</div> <div><div>1. Organisational changes on WASH coordination</div><div>2. Municipal Water Supply issues</div><div>3. Update on permanence of all sites in the North of Greece</div><div>4. Hygiene Supplies - NTI</div><div>5. Hygiene promotion technical working group</div><div>6. Any other business</div><div>7. Action Points</div></div>	<div>1. <u>Organisational changes on WASH coordination</u></div> <div><div>- The WASH Working Group will be placed in the Ministry, bi-weekly, every other Friday.</div><div>- The chair of the meeting will be the Ministry of Immigration.</div><div>- It will be hosted in the ministry building as normal.</div><div>- The minutes will be shared in English and Greek.</div><div>- The agenda this week is flexible, but the upcoming meetings will be issued with a specific agenda for the meeting as was done before.</div><div>- The main language of the WASH Working Group will be Greek and the NGOs have to present with one Greek speaker representative.</div></div> <div>2. <u>Municipal water supply issues</u></div> <div><div>- The water company of the municipality (DEYAP) send a letter to the organisations and the army writing that the company will shut off the water of the camp in Nea Karala, because it is not paid.</div><div>- It was stated that it is the army's obligation to provide and ensure that there is water in the camps.</div><div>- Though the water supplies were disconnected the Ministry assured that the services will resume.</div><div>- The responsible from the ministry discussed the issue on Friday with the army. The army called the water company and arranged that they will continue providing water to the camp.</div><div>- Official response about the continuation of the flow cannot be sent as it is communicated interdepartmentally across Ministry sectors.</div><div>- A governmental or municipality service discusses an issue with each another and have no obligation to share the information with Non-Governmental Organisations.</div><div>- The ministry informed the group that the army is not obliged to send official information to NGOs about this issue as well as others that are not only related to the water.</div><div>- Samaritan's Purse is ready to start the installation of WASH containers at Nea Karala once the new pipeline is constructed, but they are unsure how when to proceed without guarantees regarding water payments the pipeline construction timeline.</div></div>
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I. Ethical checklist

Ethics Approvals (Human Participants) Sub-Committee

WEDC

Ethical Clearance Checklist

Project Details

1. Project Title: UK Festivals to EU Migrant Camps: Sanitation technology transfer

Applicant(s) Details

2. Name of Student: Thomas McManmon	6. Name of Supervisor: Rebecca Scott
3. Programme: MSc Water and Environmental Management	
4. Email address: t.g.mcmanmon-15@student.lboro.ac.uk	7. Email address: r.e.scott@lboro.ac.uk
5a. Contact address: 10 Forrest Court, Loughborough LE11 3NT	8a. Contact address: WEDC, School of Civil and Building Studies
5b. Telephone number: 07813294837	8b. Telephone number: 01509228309

Participants

9a. Does the research involve human participants?	Yes
If you have selected No to this question you do not need to complete the rest of the form. Please sign it on page 6 and submit to your supervisor.	
9b. Has the Investigator read the 'WEDC Guidance for completion of Ethical Clearance Checklist' before starting this form?	Yes

Positions of Authority

9c. Are researchers in a position of direct authority with regard to participants (e.g. academic staff using student participants, line manager using junior staff, donor using staff of a recipient organisation)?	No
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Vulnerable groups

10. Will participants be knowingly recruited from one or more of the following vulnerable groups?

WEDC Ethical Checklist_v03(2024)

1

