8th Emergency Environmental Health Forum

12-13th April 2018
Berlin, Germany

Sanitation - A Forgotten Foundation of Health

Acknowledgements

The 8th Emergency Environmental Health Forum was convened by Oxfam, International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies (IFRC), International Rescue Committee (IRC), Action Contre La Faim (ACF), Médecins Sans Frontières (MSF), CARE International, the United Nations Refugee Agency (UNHCR) and UNICEF. The event was supported by the Global WASH Cluster, the German WASH Network, the London School of Hygiene and Tropical Medicine and the German Federal Ministry for Economic Cooperation and Development (BMZ) through the Sustainable Sanitation Alliance (SuSanA) secretariat hosted by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

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Special thanks go to the EEHF Scientific Review Committee members:

- Andy Bastable (Chair), Oxfam
- Dominque Porteaud, Global WASH Cluster, UNICEF
- Melissa Opryzyko, OFDA/USAID
- Arne Panesar, GIZ
- Oliver Cumming, LSHTM
- Ryan Schweitzer, UNHCR
- Lauren D'Mello-Guyett (Coordinator), LSHTM
- Robert Gensch, GTO
- Tim Grieve, UNICEF
- Liz Walker, IRC
- Nick Brooks, CARE International
- Peter Maes, MSF

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Executive Summary

The 8th Emergency Environmental Health Forum (EEHF) took place from April 12th – 13th 2018 in Berlin, Germany. It brought together water, sanitation and hygiene (WASH) experts from organisations such as Action Contre la Faim (ACF), the International Rescue Committee (IRC), Médecins Sans Frontières (MSF), Oxfam, the Red Cross/Red Crescent Movement (ICRC, IFRC), Save the Children, UNHCR and UNICEF as well as academic experts from institutions such as the London School of Hygiene and Tropical Medicine (LSHTM), Tufts University, Brighton University, IHE Delft, University of Buffalo and EAWAG. The forum provided an opportunity to exchange recent field experiences and explore innovative approaches amongst over 175 attendees and discuss ways for future action and interventions for WASH in emergencies.

This year's EEHF explored the themes of:

- Challenges to sanitation use
- Faecal Sludge Management
- Disease outbreaks and WASH-Nutrition intervention packages
- Sanitation Design and Sustainable WASH in emergencies
- Cholera
- Handwashing and Hygiene Promotion
- Waste Water Treatment and Sewers

With increasing numbers of vulnerable populations- both politically and environmentally- there is a need for effective use of interventions for greater impact the health of those affected. The shortfalls in humanitarian assistance funding demand efficient and well considered programmes. The EEHF highlights the need for more evidence-based programming in the WASH sector and the important relationship between practitioners, academia and donors.

In conclusion, there is a need:

- To establish rigorous but feasible research methodologies for emergency settings;
- To record, report and disseminate response experience to the humanitarian audience;
- To build the capacity of local research partners and nations in crises settings;
- To generate research questions at a practice, policy and research level for humanitarian WASH;
- To build new partnerships with donors, practitioners and researchers for research delivery.

All presentations, abstracts and supporting documents can be found at:

Share: www.shareresearch.org

SuSanA:www.susana.org/en/knowledge-hub/trainings-conference-and-events-materials/conferences/2018/676-8th-emergency-environmental-health-forum

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DAY 1: Thursday April 12th, 2018

Opening Address: Andy Bastable, Chair of the EEHF and Interagency Group

The 8th EEHF was introduced by Andy Bastable (Oxfam) who recalled the event's establishment through the informal Interagency WASH group. The objectives of this year's EEHF were to i) share new research and learning, ii) to discuss new approaches and innovation in the sector, iii) to bridge silos between WASH and other humanitarian sectors and iv) to identify research gaps in the emergency environmental health sector.

He noted that the event is an excellent opportunity to disseminate recent information on the topic and to meet practitioners and academia. Key topics of the 8th forum were compiled under thematic titles like Sanitation Challenges, Faecal Sludge Management (FSM), Outbreaks and Nutrition, Sanitation Design, Sustainable WASH in emergencies, Cholera, Handwashing and Hygiene Promotion and Waste Water Treatment and Sewers.

Welcome: Parliamentarian State Secretary of the German Federal Ministry for Economic Cooperation and Development Norbert Barthle

The Parliamentarian State Secretary of the German Federal Ministry for Economic Cooperation and Development, Norbert Barthle, opened this year's forum and welcomed the guests. He highlighted that on an institutional level development cooperation and emergency aid must be brought closer together.

Water and sanitation are key topics for the German Government as both are preconditions for development and peace. They ensure survival and a life in dignity and are a highly cost-efficient catalyst for health, education and development in general. For the German Federal Ministry for Economic Cooperation and Development, this means working with partners along the whole sanitation chain – from toilet to final disposal. At the moment, more than half of the world's population do not have access to safely managed sanitation. The situation is worse in fragile countries. Only 40% of the population in these countries have access to basic sanitation services – compared with 70% globally. Especially in crises situation and conflicts, he acknowledged the need for intermediate and fast solutions, such as emergency relief has provided over recent years. With more than 65 million people on the move consequences for regions, countries and communities around the world are tremendous, especially as refugees often have to remain in camps for decades. Communities in developing countries, where 84% of refugees are hosted, are stretched beyond their limits. In situations like this development cooperation and emergency aid must cooperate even more.

The State Secretary further acknowledged that this year's EEHF is a good opportunity to do that, because it brings together key actors, from the fields of sanitation, transitional assistance and emergency and humanitarian aid. Concluding he congratulated the conveners, wished fruitful presentations and discussions and expressed his happiness that the federal ministry and SuSanA could contribute to this important dialogue taking place in Germany.

Keynote Speech: Sanitation and Health Oliver Cumming & Melissa Opryszko

The EEHF was opened by Oliver Cumming (LSHTM) and Melissa Opryszko (USAID/OFDA) marking the importance and tradition of Berlin as this year's event location as the city which hosted Robert Koch's "conference for the discussion of the cholera question" back in 1884. Fast forward 100+ years and bringing us to the 2018 EEHF, we have over 175 attendees and over 40 agencies and institutions represented and participating in the discussion around emergency environmental health including our very own discussions on cholera.

Sanitation, although sometimes forgotten, has been recognized back to the 1800's as a basis for public health. And, within the past ten years from the International Year of Sanitation in 2008 until now, the evidence base has been steadily growing but, as Oliver and Melissa critically noted, the evidence base for sanitation and health in the emergency context is still lacking. Various systematic reviews of WASH in emergencies have demonstrated that the existing evidence is of limited quality, lacked sufficient rigor and many evaluations failed to adhere to minimum standards for evaluations such as the "WHO Minimum Evaluation Protocol". Likewise, the evidence for other or integrated WASH interventions is scarce and requires more attention.

Briefly presenting recent insights on the association of sanitation and cholera, acknowledging that OCV integrated into WASH interventions might mitigate challenges of OCV, the pair concluded with reference to the past EEHF in 2016. There is a growing consensus between practice and research and it is now widely recognized that effective and efficient WASH-related emergency responses rely on a strong evidence base. Oliver and Melissa finished their speech with reference to a meeting held in June 2017 where the leading response agencies, donors and academic institutions met for the first time to decide on research priorities for emergency WASH and established the nascent "Research and Evidence" Technical Working Group within the Global WASH Cluster to carry forward this momentum.

PLENARY 1: Sanitation Challenges

1.1. Evidence into Action: Introducing a cross-sectoral toolkit for MHM into humanitarian response – David Clatworthy (IRC)

David Clatworthy presented the piloting of a MHM- toolkit, which was built on formative research with girls, women and staff in two emergency contexts (Lebanon and Myanmar) and on interviews with cross-sectoral global humanitarian practitioners. It was then developed and reviewed by a broad range of humanitarian response experts and piloted in an emergency setting (refugee camps in Tanzania with Burundian and Congolese beneficiaries with differing lengths of stays in the camps) with workshops, staff training (on improved toilets, education).

The study aimed to assess the feasibility of the toolkit and to learn about the operational challenges and effective strategies for integrating MHM into response efforts. The six-month piloting revealed that MHM responses must consist of three essential components: 1) materials & supplies; 2) supportive facilities, i.e. safe and private with disposal options; and,

3) information, especially for girls but also adolescent boys to counteract harmful cultural norms related to menstruation.

Figure 1: Content of the MHM Tool Kit for Multi-Sectoral Response (David Clatworthy, IRC, Colombia)

The toolkit underlined the 4 C's of MHM: Coordination, Culture, Communication and Consultation with the beneficiaries, which the pilot revealed to be crucial in emergency setting. David also highlighted how toilets are still falling short for women and girls. The introduction of the toolkit also uncovered some practical gaps or need for further insights, such as (1) culturally appropriate disposal mechanisms and waste management systems (2) laundry and drying of reusable materials (3) operating and maintaining female friendly toilets (4) strategies for better involving boys and males in MHM response and (5) strategies for ensuring coordination on MHM is sustained across sectoral actors and agencies.

1.2. Latrine Lighting: safe access of facilities at night – Brian Reed (WEDC)

Brian Reed (WEDC) and Andy Bastable (Oxfam) presented their investigation on the impact of lighting of latrines on latrine use and on reducing gender-based violence (GBV) among women and men in emergency contexts. Lighting of latrines is a challenge in sanitation design as it is linked to physical problems, e.g. users cannot use the facility properly, and psychological problems, e.g. fears of tripping or falling, snakes and scorpions, sexual assault and voyeurism as well as social stigma with a range of consequences, especially for women.

Investigations were conducted refugee settlements in Iraq, Nigeria and Uganda. Low-density settlements in Uganda were presented as a case study, where building temporary communal latrines was facilitated and solar lamps distributed. Baseline survey results confirmed the assumption that particularly during night-time and especially women (90%) fear to use the latrine at night. Low use resulted primarily in open defecation (close to the tent) or defecation in buckets, which are often reused as household items after emptying and cleaning at a water point. Low usage was also associated with the fact that latrines were not separated or far enough from each other. End line results after latrine lighting was installed suggested that a remaining 40+% of women feared using the latrines at night but building toilets and supplying lights was associated (no causation) with a reduction in crime and GBV in the camp.

In addition, interviewees reported feeling more positive about using the latrines after the installation of lighting. However, challenges remained and included how to address the location and separation of latrines, where to install lighting and other technical and management problems such as coordination of lighting between sectors, choice of panels, theft, location of lighting, decision between torches or lamp posts etc.

Figure 2: Main takeaways from lighting latrines in settlements in Iraq, Nigeria Uganda (Brian Reed, WEDC, Oxfam)

1.3. Mental health in emergency contexts: does poor mental health impair WASH-related behaviours in a vulnerable population of rural Malawi? – Jurgita Slekiene (EAWAG)

Jurgita Slekiene first discussed how populations in emergency contexts often have acute to severe mental health issues arising from their experiences and because these disorders can impair daily activities extra consideration may be needed among these populations when providing interventions. Investigations were conducted in an emergency context in Malawi and the research aimed at investigating the relationship between mental health and WASH-behaviours (latrine construction, handwashing with soap, safe drinking water collection), what determines safe drinking water collection and whether these determinants differed across populations with good/poor mental health.

Jurgita employed the RANAS-Model (Risk, Attitudes, Norms, Ability, and Self-Regulation) as a measurement tool of motivational psychosocial factors and WHO's Self-Reporting-Questionnaire (SRQ-20) to measure mental health issues among 641 households. Findings indicate significant negative associations between mental health and self-reported safe drinking water collection ($p = .01$, $r = -.104$), observed latrine ownership ($p = .01$, $r = -.171$), and self-reported handwashing ($p = .01$, $r = -.106$). Regarding the determinants of specific WASH-behaviour, the moderation analysis revealed eight significant interaction effects of mental health with some WASH-related psychosocial factors. Believed distance, i.e. if people

perceived that the water point is far away, they collect water less often, or the behaviour of other household members or of neighbours, i.e. if people think that a lot of others in the village collect safe drinking water, they also collect more safe water, water was collected more safely.

People showing poorer mental health indicators on the RANAS-model (such as paying attention, showing commitment, being in a vulnerable position) were in addition more strongly associated with a less safe water collection than for those with better mental health. The results suggest that WASH-solutions, especially in emergency settings, might need to be tailored to people with poor mental health and that beneficiaries could be targeted with mental health interventions to make any WASH programme more effective and inclusive.

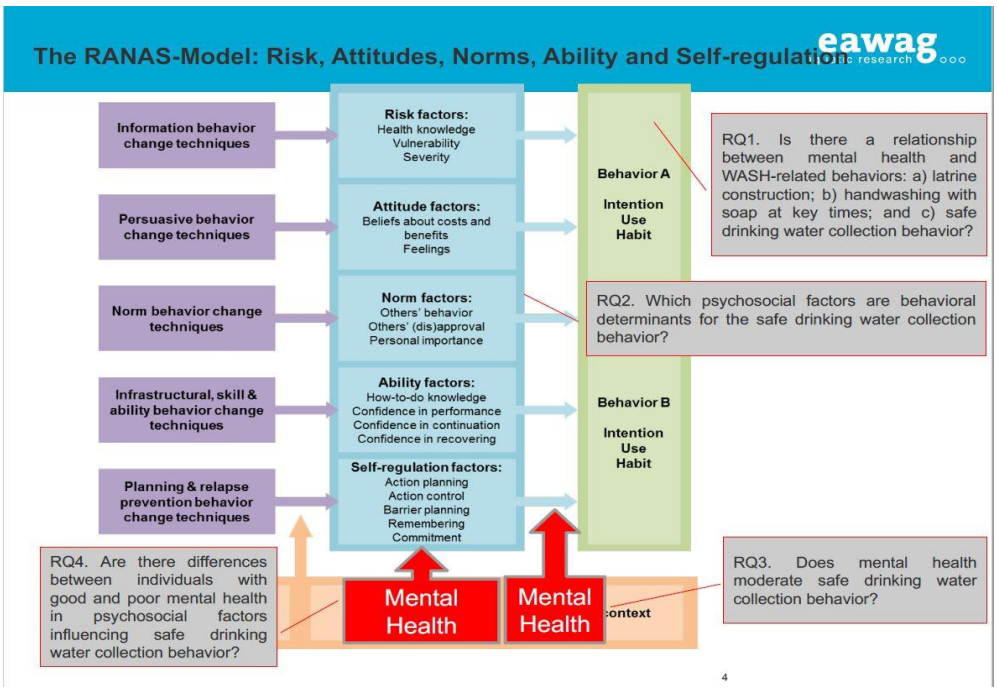

Figure 3: RANAS Model of psychosocial factors related to mental health (Jurgita Slekiene, EAWAG)

Panel Discussion Plenary 1: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Robert Fraser (IFRC). The panel consisted of the speakers: David Clatworthy (IRC/ Colombia), Brian Reed (WEDC) and Jurgita Slekiene (EAWAG).

Regarding the MHM-toolkit, a question was posed whether the toolkit contained guidance on how to tackle MHM in Islamic contexts. Insights from development cooperation showed that too much public communication (one of the '4 Cs of MHM') can have collateral effects. As there is no guidance on the issue in the toolkit, there is certainly potential in developing it further and address specific cultural contexts.

On the topic of lightning latrines, a suggestion was made that it might be useful to place lighting not only in the latrine cubicles and right in front of them but also on the way there (approx. every 500m would be sufficient, as merely seeing the light was reported to be

already important to the interviewees). However, more than a third of the women in camps in both northern Nigeria and in Iraq felt uncomfortable using the toilet regardless of whether it was day or night and did not want to be seen using the toilet. Andy Bastable added that, in addition to lighting, there is a need to sight cubicles and their entrances properly and putting up screens.

Linking the aspect of rural sanitation, time of defecation and mental health, Oliver Cumming commented that, as found in other research studies and programme evaluations, one of the biggest impacts of improved rural sanitation was that people would be able to get up later and defecate privately instead of doing so openly before sunrise and this could have a quantifiable effect on mental health.

PLENARY 2: Faecal Sludge Management

2.1. Integrated mobile approach for faecal sludge treatment in emergencies using microwave irradiation - Tineke Hooijmans (IHE Delft)

In emergency settings, the focus is often on supplying drinking water and not always on sanitation or at least not on the end point of the sanitation supply chain. Nevertheless, refugee camps or settlements face a gap of adaptive technologies that prevent facilities from being filled up rapidly or requiring constant emptying. Fast and efficient Faecal Sludge (FS) treatment technologies are therefore crucial for safe treatment and disposal in such conditions. In a joint research project, IHE Delft, the German Jordanian University, the University of Zagreb and Tehnobiro (Slovenia) assessed the applicability of a mobile treatment device (truck) for FS management in emergency settings in Jordan.

The Microwave Irradiation Unit has been designed to kill off pathogens with microwave (MW) irradiation technology and to be deployable and effective under challenging conditions e.g. high-water tables and flood-prone areas. MW irradiation is a very efficient way of pathogen kill off due to its unique ability for rapid controlled heating, and the high amounts of dipolar molecules in FS are good candidates for MW dielectric heating.

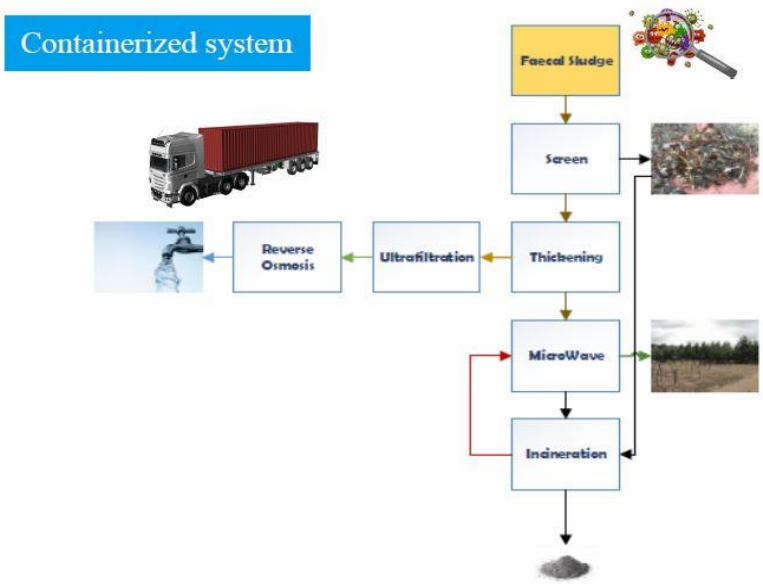

Figure 4: Microwave irradiation in a containerized system (Tineke Hooijmans, IHE Delft)

Tineke also detailed how heating (and thus pathogen inactivation and weight reduction) of the FS could further be enhanced by mixing FS with a (high loss) material/ MW facilitator such as char. The MW system can be applied as a compact and easily portable as well as fast and effective FS treatment package system. And although the primary applicability of the MW unit is for waste treatment, the end product has the potential to be reused as a soil conditioner in agriculture and burnt as a fuel. Despite the MW irradiation mobile device being technically very promising for on-site desludging and FS treatment, further action research on user acceptance and product development with local partners will be necessary.

2.2. Disinfection of human excreta in emergency settings: a comparison of chlorine-based and hydrated lime-based disinfectant solutions – Diogo Trajano Gomes da Silva (Brighton University)

On-site excreta disinfection interventions are key to preventing further disease transmission, particularly in emergency settings. Chlorine solutions and hydrated lime suspensions had been used previously for the treatment of Ebola and during the 2010 Cholera outbreak in Haiti, respectively.

In collaboration between MSF and the University of Brighton, Diogo Trajano Gomes da Silva investigated the efficacy of chlorine (concentrated at 0.5%, 1% and 2%) and of hydrated lime ($Ca(OH)_2$ at 30% concentration) for excreta treatment in order to develop disinfection protocols that can be used in future responses. Disinfection efficacy was determined in bucket-style experiments after contact times of 10, 30 and 60 minutes along three excreta matrices ((1) municipal wastewater (2) municipal wastewater with 10% added faecal sludge or (3) municipal wastewater 20% added faecal sludge. Indicators for disinfection efficacy were the log reduction of faecal coliforms (FC), intestinal enterococci (IE) and somatic coliphages (SOPMH). Generally, there was not significant difference in efficacy between the different contact times after 10-15 minutes disinfection had already occurred. However, lime suspensions demonstrated a more efficient reduction in both FC and IE (with a median reduction values of 3.93 and 3.50, respectively), but no reduction for SOMPH. Chlorine,however, was only efficient with wastewater and not with the other more concentrated forms of human excreta. Moreover, toxic gas was produced when chlorine and excreta were mixed. As hydrated lime suspensions achieved greater disinfection efficacy than chlorine in two of the three indicators and has a longer shelf-life, the investigation showed it may be the preferred choice of disinfectant included in an emergency WASH response. Nevertheless, faecal sludge treatment of contagious waste needs further treatment after the disinfection and more research on large scale treatments, regrowth of microorganisms or gas production is necessary.

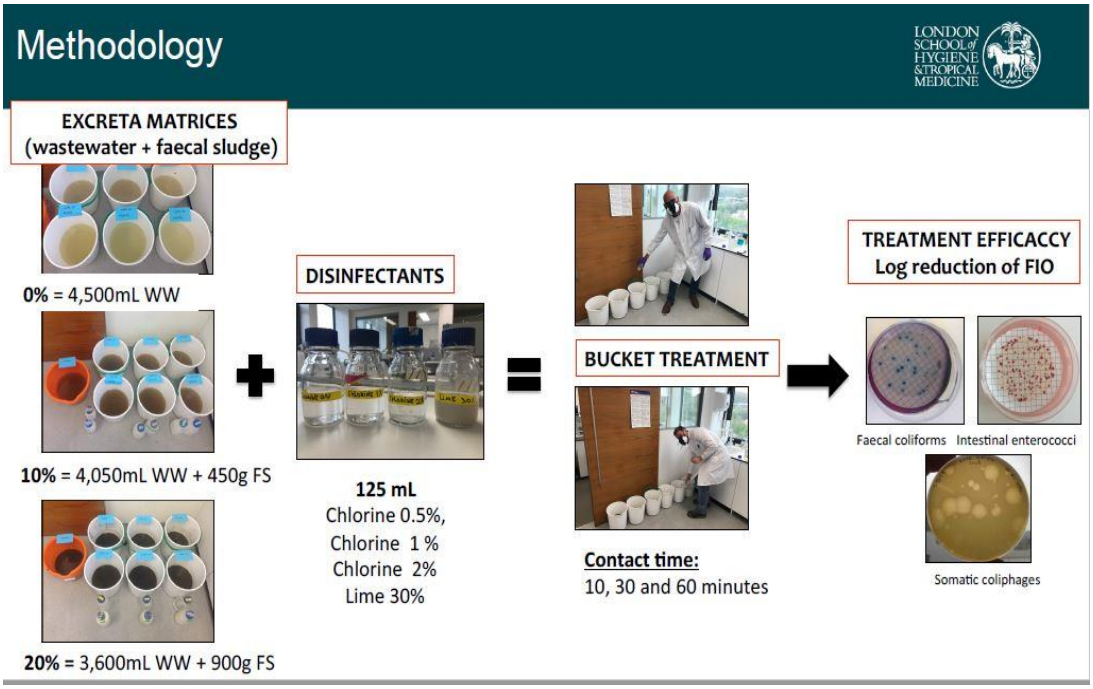

Figure 5: Methodology for measuring treatment efficacy (Diogo Trajano, Brighton University)

2.3. Development of a field lab for monitoring of faecal sludge treatment plants – Johannes Bousek (IFA Tulln/ ÖRK)

Field ready analytical equipment for process and safety monitoring of faecal sludge (FS) is currently missing and remains a constant challenge in emergency and non-emergency contexts. With this challenge in mind, the Microbial Sludge Quality project, funded by the Humanitarian Innovation Fund, aimed to develop a field lab for use among humanitarian organisations that would be mobile, applicable to field conditions, affordable compared to current options and able to produce comparable and reliable results.

Johannes Bousek, of IFA Tulln and the Austrian Red Cross, presented the results of their field lab prototype, for on-site and in-time monitoring of information on effluent characteristics of FS plants, which was tested in Austria and Malawi. The initial testing in Malawi showed that the lab could fit into the back of a standard Land cruiser, took little time to set up and was able to be operational within a short time. The field lab core parameters could measure: bacteriology/helminth egg detection, process control (e.g. chemical oxygen demand, pH, Total Solids) and photometry with ammonia test strips. Challenges identified included difficulties with microbiology and high training requirements for local staff.

The current prototype can also be adapted to the requirements of organisations. Modules and resupply packages are optional and could include: *Module 1: Public Health* providing equipment for the determination of degradation levels of indicator organisms throughout faecal sludge plants; *Module 2: Process Control* providing equipment for process monitoring; and, *Module 3: End Use* with equipment for evaluating effluent streams. It also comes with support kits ("basic lab support", "personal protection" and "power supply) which are customizable to the operators' needs.

Figure 6. Design Criteria for a mobile field lab for monitoring treatment plants (Johannes Bousek, IFA Tulln)

Panel Discussion Plenary 2: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Arne Panesar (GIZ). The panel consisted of the speakers: Tineke Hooijmaans (IHE Delft), Diogo Trajano (Brighton University) and Johannes Bousek (IFA Tulln/ ÖRK).

With the MW technology for FS being relatively high-tech, Dominque Porteaud (GWC) asked about its costs and target quantities. Tineke noted that the device to treat faecal sludge is currently very costly but can target up to 1000m^3 per day. MW technology compared to other technologies measured no bacterial regrowth in results thus far and ultimately aims to reusing the sludge as an ash-based soil enhancer which could offset running costs.

The variability of pH in faecal sludge may be an issue with treatment, Diogo added that further research on what to do with high-alkaline faecal sludge must be undertaken. Likewise, more research in the field, i.e. in pit-latrine emptying trucks, exploring lime mixed with other solutions to enhance effects, is necessary. Hydrated lime, he stated after being asked about using urea for faecal sludge treatment, is quicker for disinfection. Urea takes three to five days longer than lime and is thus not adapted to the emergency context and especially in disease outbreaks. As the research showed, however, lime was less effective in disinfecting somatic coliphages that are seemingly resistant to the disinfectant. SOMPH are a very diverse group of bacteriophages and currently indicators for measuring sanitisation of coliphages in the field are lacking or need to be further elaborated to supply explanations.

Oliver Cumming (LSHTM) asked if the field lab or the disinfection protocols developed by the presenters had looked at or worked on the development of the new WHO Sanitation Guidelines that touch upon the survival of different pathogens and the application of new technologies. Johannes responded that guidelines were not considered beforehand when operationalising the field lab but he and the other presenters agreed to enquire further with the work.

PLENARY 3: Outbreaks and Nutrition

3.1 Community engagement in public health – Oxfam's response to the diphtheria outbreak in the Rohingya refugee crisis – Eva Niederberger (Oxfam)

Since November 2017, diphtheria has spread rapidly through Cox's Bazar, Bangladesh, where public health situation is already alarming, with challenging access to latrine facilities and high water contamination. Oxfam shifted its WASH response towards a more community centred approach to outbreak response and the Rohingya refugee crisis is one of the first emergencies in which the model was systematically trailed. Rising diphtheria cases called for increased vaccination coverage but rumours and fear of vaccination were prevalent in the refugee settlements.

Humanitarian response was channelled through a leadership structure of Community Based Volunteers (CBVs) and community stakeholders (such as imams or teachers) which enhanced mobilisation for vaccination campaigns. Through community involvement, health seeking behaviours were mapped, appropriate information and communication channels were identified, interactions diversified depending on the context and feedback with communities was directly monitored.

Nevertheless, initial uptake of health services was rather slow and developing communication materials was time-consuming. The target population was predominantly illiterate and stakeholder perspectives differed, which made service mapping more difficult. Additionally, building the capacity of technical staff at field level to collect relevant information and ensure real time analysis and scalability of the approach proved to be difficult. In future, rapid stakeholder analysis needs to be improved and health promotion activities harmonized across the course of the outbreak.

Figure 7: Community centred WoW in the Rohinyga refugee crisis (Eva Niederberger, Oxfam)

3.2 First phase WASH response to plague in Madagascar – Tom Heath (ACF)

In 2017, an outbreak of plague began in Madagascar and expanded rapidly, with about two thirds of cases transmitted as pneumonic plague compared to the endemic bubonic plague typically experienced in Madagascar. There were a total of 2417 cases and 209 deaths (case fatality rate 9%) of plague. The WASH cluster's response was focused upon developing a new infection prevention and control (IPC) strategy in the 8 Health Care Facilities (HCFs) across the country for the triage and treatment of plague.

ACF established a community response supporting community sensitization and a plague blocking team and contract tracing. The response showed that community denial of the disease was prevalent and that the panicked "Ebola mind-set" was not useful in the response. Working alongside MSF and WHO, the response was iteratively changed over time including changes to personal protective equipment (PPE), vector control guidelines, dead body management and in operationalising different isolation concepts in the HCFs that categorised by infection and convalescence.

Challenges in the response included the cultural frameworks, especially when it comes to dead body management (e.g. it is typical to squeeze out the nodes in the case of family members who have died of plague- a high infection risk). For future outbreaks, an MOU on response measures is elaborated with the government and WASH/IPC protocols must be agreed on. More epidemiological data is necessary, WASH partners need to be trained and "blocking teams" and NGO networks enhanced. More efforts must be dedicated to strengthen the capacity development coordination, communication and monitoring.

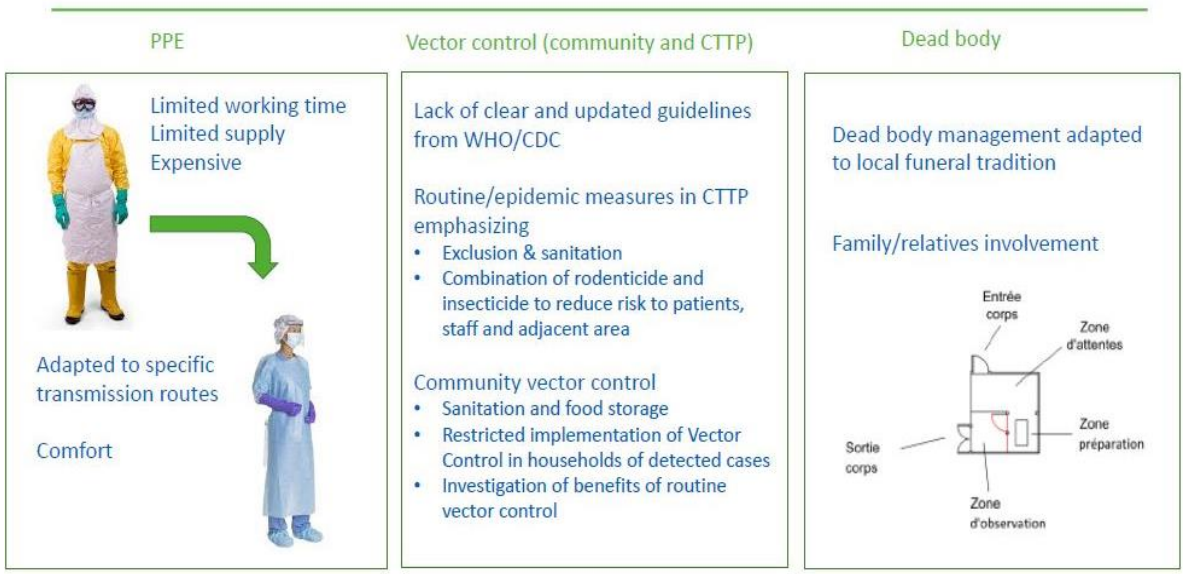

Figure 8: Technical Support to WASH/health response to plague in Madagascar (Tom Heath, ACF)

3.3 Effectiveness of a household WASH package on an outpatient programme for severe acute malnutrition (SAM): a pragmatic cluster randomised controlled trial in Chad – Jean Lapegue (ACF)

To assess the effectiveness of a household WASH package on the performance of an Outpatient Therapeutic feeding Program (OTP) for severe acute malnutrition (SAM) ACF conducted a cluster-randomized controlled trial, from 2015 to 2016, embedded in a routine OTP in 20 health care facilities (HCF) across Chad. In the two-arm trial, both arms received the OTP and the intervention arm received a WASH-package comprising of chlorine water purification tablets, soap, a water storage container, and health promotion to households attending the OTP.

SAM in the form of wasting signifies higher risk of death, especially for children, and it is assumed that that patients receiving the complementary WASH package could benefit thanks to decreased diarrhoea incidence, increased daily weight gain among children and ultimately reduce the risk of relapse.

Outcomes were measured as relapse rates at 2 and at 6 months post-recovery, weight gain, time-to-recovery, recovery rate and diarrhoea prevalence at discharge. The WASH package was generally used and adhered to. The results of this study suggest an association of improved recovery rates (10.5%; p=0.034), shorter time-to-recovery periods (4.4 days, p=0.038), increased weight gain (3 g/d, p=0.014), and less vomiting prevalence (0.5%, p=0.023) in the intervention arm. No significant change between intervention and control arm occurred for relapse rates (0.4%, p=0.911; and 1%, p=0.532 for 2 and 6 months respectively), weight gain velocity (0.4kg/d, p=0.086) or diarrhoeal longitudinal prevalence (1.7%, p=0.223).

Jean noted the several recent studies investigating nutrition and WASH- which found little effect of WASH on diarrhoea or recovery rates- he emphasized, however, that these interventions did not disrupt all exposure pathways. SAM is also associated with lack of toilets, cholera and handwashing habits, which are all scenarios that are important exposure pathways to consider in emergency settings.

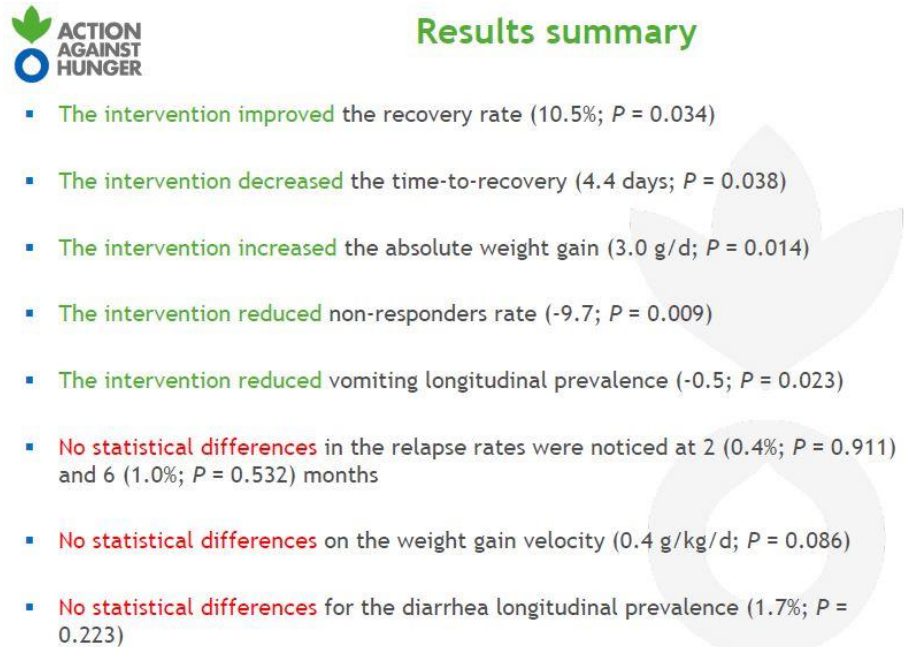

Figure 9: Results of impact of a household-WASH-package on SAM (Jean Lapegue, ACF)

Panel Discussion Plenary 3: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Lauren D'Mello-Guyett (LSHTM). The panel consisted of the speakers: Eva Niederberger (Oxfam), Tom Heath (ACF) and Jean Lapegue (ACF).

The panel discussion chair Lauren D'Mello-Guyett opened the questions and asked what next steps Oxfam and ACF had for their programmes. ACF's priority is to develop together with Red Cross (among others) six eLearning modules on WASH and Nutrition and further engage in uptake measures during a meeting with practitioners and researchers in Paris. Oxfam wants to embed lessons learnt and evaluate effectiveness at a global level and consequently generate models that can replicate experiences in other contexts.

John Fitzgerald (Global WASH Cluster) asked what is being done to improve collaborations and/or operational coordination between health and WASH actors. Tom Heath replied that in the case of plague in Madagascar improved data sharing should be done and the WASH cluster's role could be better defined in the context of disease outbreaks and within affected communities. Generally, a better coordination and communication from WASH actors with the Ministry of Health is required.

Oliver Cumming (LSHTM) asked why programmes were giving out the WASH kit at discharge rather than admission of the patients and how that influences relapse rates. Jean Lapegue replied that handing out kits at admission can be costly and logistically challenging and that further work is required to look at how to distribute earlier interventions.

PLENARY 4: Sanitation Design

4.1. UNHCR's Waste to Value Sanitation Portfolio – Murray Burt (UNHCR)

Murray Burt introduced UNHCR's Waste to Value operational research agenda which is driven by a need to reduce costs, protect the environment and provide refugee livelihood opportunities to refugee populations. Given that the lifespan of an average refugee settlement can be 20+ years, longer time frames allow for the focus to be set on access to WASH services by adopting more cost-efficient technology solutions. Waste to value in the sanitation context means that human or domestic waste is turned into a valuable product using different methods: anaerobic digestion to generate biogas for cooking and lighting, carbonization produces briquettes, combusting waste can generate electricity and composting results in fertilizer.

The portfolio presented three projects: 1) Sanivation, executed in Kenya, where UNHCR converted organic solid waste from 436 households into fuel briquettes; 2) UDDTs in Ethiopia, where urine and faecal sludge were separated and used as soil conditioners and fertilizers in agricultural projects, and 3) biogas digesters, trialled in Bangladesh for household use as fuel. Early results suggest that the criteria of cost-reduction, environmental protection and enhanced livelihood opportunities are generally being met, but more research is needed to quantify the impact and potential economies of scale. Murray also explained that the technologies had their challenges. The briquettes required multiple waste streams, because human faeces makes up only 20% of the briquette, and analysis showed that you would need waste from 2572 households to supply 3 households with monthly provision of fuel. The fertilizer from the UDDTs, for example, were useful only when refugees engage in

farming or agricultural activities. And none of the products showcased were able to meet the demand of a whole refugee camp nor are they always adapted to their immediate needs. Future work will build on this and UNHCR will be exploring new technologies such as solid fuel, biogas and feedstock, new waste to value markets and private sector models.

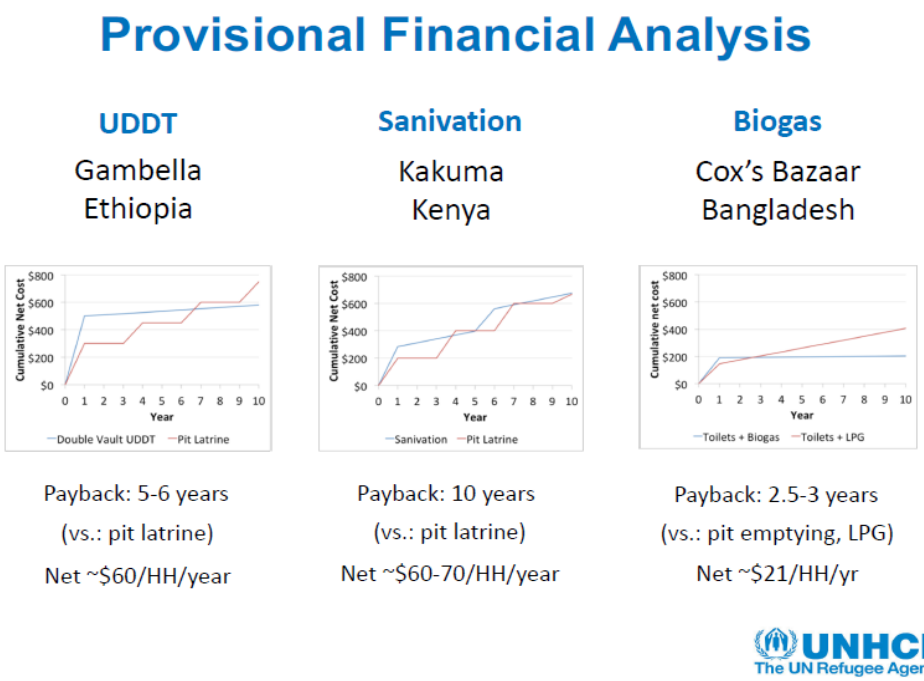

Figure 10: Provisional financial returns of three technologies (Murray Burt, UNHCR)

4.2. User -centered sanitation design through rapid community engagement - how to increase overall satisfaction and use of sanitation facilities in emergencies - Kate Brogan (Oxfam)

4.3. Save the Children & Eclipse Experience: child participation in sanitation design in emergencies - Katrice King (Save the Children)

Kate Brogan presented a landscape review of community engagement approaches to generate actionable and practical solutions for user-centred sanitation in emergencies. The review identified that poor practice comes from the absence of community engagement activities rather than weaknesses in those actively engaging with the community. The challenges of community engagement included the lack of resources and time, timing and context (i.e. whether the camp was constructed prior to refugee arrival), lack of social cohesion and aid workers lacking competence and guidance. As a result of these findings, the Humanitarian Innovation Fund is currently supporting three implementing partners working across different emergency contexts; from rapid on-set emergencies in Bangladesh and Uganda to protracted emergencies in Iraq and Lebanon. The project will test the hypothesis that greater community engagement leads to improved latrine construction that is timely, appropriate, consistently used and community-owned.

Katrice King provided an example of this strategy through Save the Children's work in Bangladesh and Iraq. The project hypothesized that better latrine design would impact latrine use and community engagement with the design of latrines would ensure that the latrines would meet the structured and design characteristics preferred by the disaster-affected community.

In collaboration with Eclipse Experience, a design agency, an iterative-improvement-tool that digitally maps children's needs regarding sanitation and feeds back into reports for sanitation engineers was developed. Over 12 months in a Bangladesh, 200 5 to 12-year-olds and 143 care-takers were asked to indicate critical zones of sanitation design, i.e. where they have problems in and around the latrine cubicle, on a tablet with thermal images.

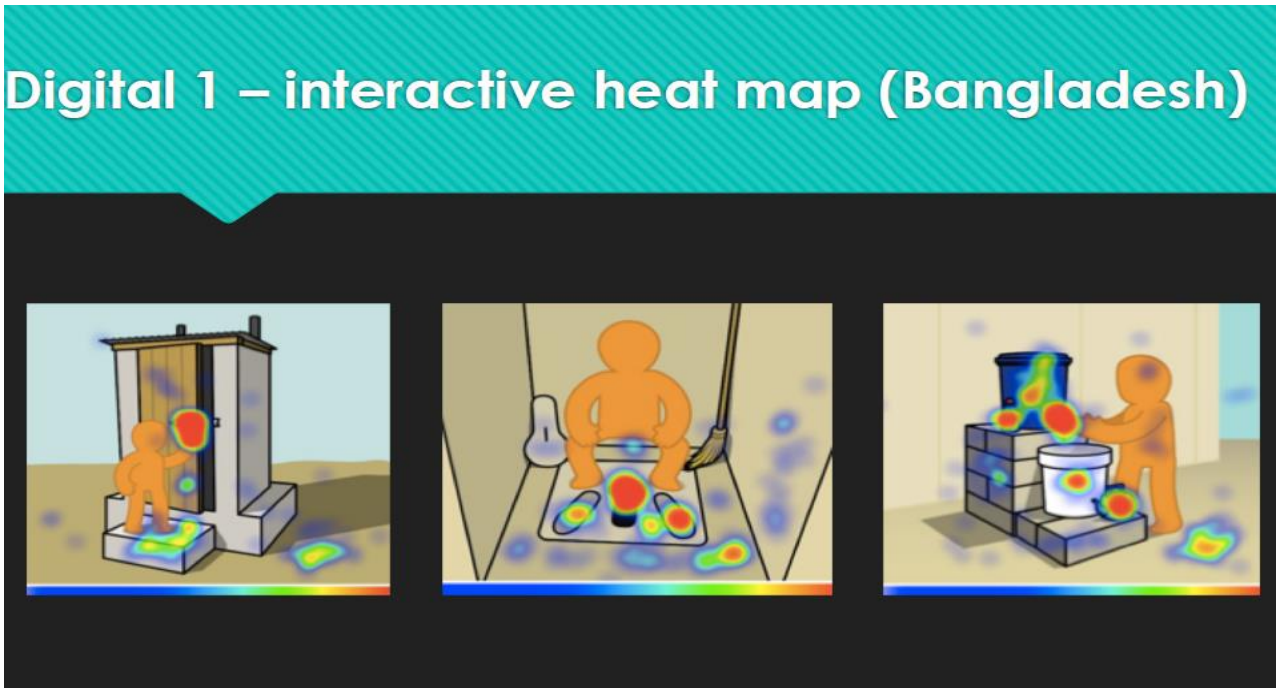

Figure 11: Heat map for sanitation design with child participation (Katrice King, SC & Eclipse Experience)

Children make uo 50-80% of the population among IDP and are also the user group with lowest satisfaction rates concerning toilets and more than 50% of whom practice open defecation. The heat-map images that followed revealed that children had problems with the location and the locks of latrines, with the size of the pit and the large distance between the footpaths and with taps for handwashing. The community was further involved in agreeing on next actions to be undertaken such as installing easier and lower hanging locks, ensuring cleaning schedules are adhered to by cleaners/households and construction of improved hand washing facilities for all ages. The tool is promising in that it is easy to undertake and pictures helped with difficult language exchange. It was, however, challenging to fit the programme into ongoing response work due to time constraints and stakeholders, predominantly the programme engineers, were not easily convinced of the tool's results and the need to fit them into the current response. A full evaluation will be carried out in May/June and results will follow.

Panel Discussion Plenary 4: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Tim Grieve (UNICEF). The panel consisted of the speakers: Murray Burt (UNHCR), Kate Brogan (Oxfam) and Katrice King (Save the Children).

As environmental protection and a better livelihood are key aspirations of waste-to-value programmes, the question was asked if the briquettes might generate pollution and increase or decrease indoor air-quality among users. Murray Burt replied that briquettes burn cleaner in comparison to charcoal and that they generate less smoke. Also, biogas is relatively clean and certainly an improvement to current practices by refugees.

With regard to the presentations on community engagement, the presenters were asked how the behaviour of engineers opposing results generated with community engagement methodology could be changed. Katrice made a suggestion that we may need to think of behaviour change programmes for our own engineers first. A similar concern was outed, namely how it can be avoided that too many people are involved into the programme. Expectations must be managed accordingly, it needs to be explained to all possible stakeholders what will be implemented, and suggestions can be considered during co-creation sessions.

The tool, despite it being good for communicating with children and feeding back into existing community mechanisms of the WASH committee, might generate skewed results for two reasons. As Thilo Panzerbieter remarked, people and children associate dirtiness with toilets because they are shared with other households, not because they are necessarily unsanitary. Secondly, the tools illustrations of latrines, toilets, hand washing facilities might influence the outcomes. Katrice King replied that the 12 different drawings of facilities are made by a designer and were not based on children's perceptions although did add that more research across different settings and populations is needed before the tool is validated.

Extended Panel Discussion: Faecal Sludge Management

The panel discussion on day one was chaired by Nick Brooks (CARE International) and started with a presentation on the variable designs for Faecal Sludge Management in Cox's Bazaar by Andy Bastable (Oxfam) and an opening statement from each of the panellists.

Robert Gensch (German Toilet Organisation) started by publicising the newest FSM technologies as published in the Compendium on Sanitation Technologies. These technologies look at the entire sanitation service chain and not only containment. Arne Panesar (GIZ) tackled the topic by asking what the result of each FS-technology ultimately is and how system design should be oriented at market values. Alberto Acquistapace (Solidarities International) reported that a platform similar to the Compendium is being built to compare different technologies used across his organisation and that challenges of each are being explored to aid others in their designs. Thorsten Reckerzügl (BORDA) mentioned that BORDA is building larger scale FSM plants in development contexts, namely in India and Tanzania, and BORDA are exploring different options for dense and large population sizes in developing cities. Murray Burt (UNHCR) then stated that the Technical Working Group (TWiG) on FSM is very active, especially regarding Cox's Bazaar and that they are looking for long-term solutions for up to one million people.

With regard to sludge transport and conveyance in emergencies, Rick Bauer (NRC) asked how sludge is transported to treatment plants across different settings, how spillage is avoided and how the government or other stakeholders can be involved. Andy Bastable and Alberto Aquistapace answered that in the case of Cox's Bazar, for example, sludge from decentralized

settlements is carried by hand to the nearest road and then picked up by trucks. In the rare case of spillage, chlorine sprayers are available to treat the waste. Oxfam is currently deploying mobile tankers to desludge and transport treatment centres.

Brian Reed (WEDC) then asked if the FSM systems are sustainable. Andy Bastable (Oxfam) replied that the systems in Bangladesh may not be sustainable if the population increases and there is not adequate land for treatment plants. There has been some failure in coordination (especially because the services are carried out by contractors) of collection times and processing and the agencies on the ground including the national cluster could probably not have coordinated better at the start of the influx of refugees.

Hans-Peter Mang (Beijing University) shared his experiences from an example of a market-based system in Dhaka: privatized FSM programmes with trucks equipped with GPS work solely with private investments, no money by the government is needed and 80 million tons of sludge have been collected. In Bangladesh a lot of faecal sludge treatment stations have been working well for the past 10 years, analysis revealed that these stations, which are partly run by private companies, are functioning well. In refugee situations, basic needs are at stake and action must happen quickly, but in a long-term perspective, market-based solutions may be more efficient and financially sustainable.

Johannes Bousek (IFA Tulln & ÖRK) wondered what standards organisations are following at discharge. Standards are difficult to adhere to especially for NGOs, replied Andy Bastable (Oxfam). Alberto Aquistapace (SI) commented that this is work-in-progress and perhaps we need to consider SPHERE-like minimum standards for FSM in emergencies. Similarly, monitoring systems would need to be established to monitor systems over time.

John Fitzgerald (GWC) was concerned about coordination and asked whether international preparation is enough for more severe emergency-scenarios and for rainy seasons. Andy Bastable (Oxfam) replied that coordination will still help and areas prone to flooding need to be mapped more thoroughly when siting faecal sludge plants and toilets closed in areas of concern. This is an on-going activity and international organisations have the capacity to do this.

Kyla Gregory (USAID) inquired whether beneficiaries received training on operation and maintenance of those systems. Thorsten Reckerzügl (BORDA) replied that FSM systems or DEWATS always have trainings coming with them and capacities developed in order to replicate those systems.

Generally, long-term solutions that bridge humanitarian response and development aid, possibly with the involvement of businesses and market-based solutions take time to develop. Many of the organisations here, however, are developing more sustainable solutions. Experiences from Bangladesh and Myanmar should serve as lessons learnt to be better equipped in the future.

DAY 2: Friday April 13th, 2018

PLENARY 5: Sustainable WASH in Emergencies

5.1. Management Systems for ensuring sustainable WASH facilities in humanitarian contexts - St John Day (Oxfam)

The long-term management and sustainability of emergency WASH systems is particularly difficult since national institutions are predominantly weak, availability of resources is limited and quality service delivery varying as camps' demands evolved from Sphere standards to city standards in terms of WASH.

Four broad challenges can occur: emergency water supply and sanitation systems are required to be sophisticated and large-scale, community participation may be limited due to the beneficiary nature of emergencies, displaced communities may have limited ability to operate and maintain extensive WASH systems and limited (if any) user revenue is generated to cover recurrent costs.

St John presented some simple case study examples (outcomes of three months of research in several countries) to demonstrate what considerations need to be factored in and that opposed to conventional management models, i.e. how learning from small town operators, might be adapt to emergency situations.

These models suggest that the WASH systems for camps are treated as businesses (operation, commercial and financial duties). This entails professionalizing the systems by moving away from relying on community management and working with qualified personnel to ensure better standards. Tariff structures could recognize financial constraints of the community. Five things consequently need to change: 1. Plan for permanent services from the outset; 2. Rationalise the number of agencies post emergency; 3. Assess the enabling environment (conditions) for different WASH models; 4. Clear policy direction from Government; 5. Service performance levels –business models and financial plans.

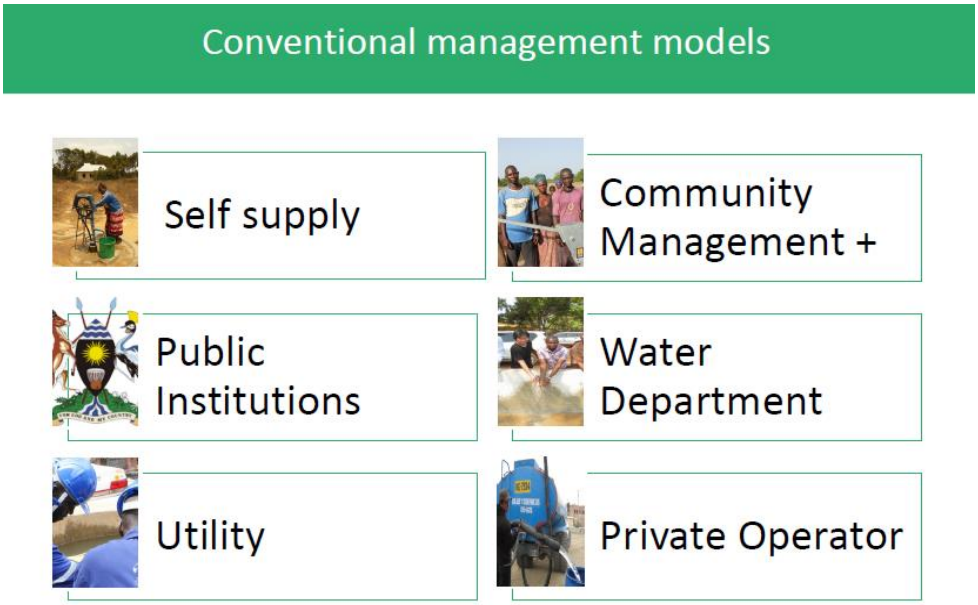

Figure 12: Conventional management models for WASH facilities in humanitarian contexts (St John Day, Oxfam)

5.2. Challenges and constraints of implementing community approaches for total sanitation in conflict areas: case study from Boko Haram-conflict area in Cameroon - Tim Grieve (UNICEF)

Tim Grieve on behalf of Faustin Ekeh Ekwele presented the main difficulties encountered during project implementation in the crisis-torn northern region of Cameroon. Northern Cameroon has experience internal displacement of a quarter million of people and is currently hosting more than 90 000 of refugees. There have been 37 578 cases of cholera reported from the area in the last 7 years and there are 22% of the population practicing open defecation compared to 6% nationally and 41% with access to improved drinking water compared to 71% nationally.

In 2017 year, UNICEF partnered with a local NGO (ACDC) targeting 126 communities and seven IDP camps (a total 65 000 beneficiaries) in the region with CLTS for six months. Latrine-access increased to from 24% to 98% of households with access to improved latrines after CLTS at a cost of 1.5$/person. Cholera cases were reported from intervention areas and CLTS provided an entry point for other WASH activities (MHM, cholera education, hand washing promotion).

However, challenges soon arose because of regular attacks by Boko Haram. Security measures made movement difficult, activities were rescheduled and there were visibly less people attending meetings. Soldiers and security personnel were required to accompany staff and practitioners were unable to conduct door-to-door visits. Furthermore, restrictions by the government and traditional authorities made monitoring more difficult. Further research is necessary to understand how to maintain and scale up emergency sanitation programmes in insecure environments and if or CLTS or other WASH interventions can be entry points for other services or integrated with other programmes.

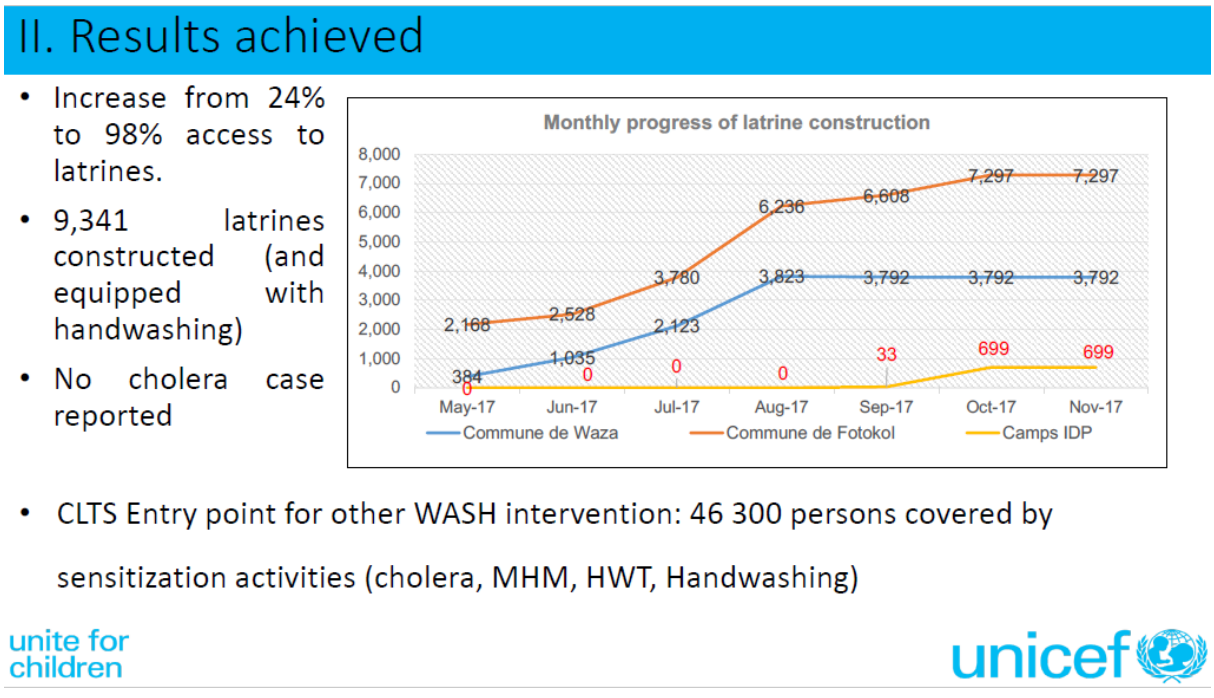

Figure 13: Results from CLTS intervention in Boko Haram area Cameroon (Tim Grieve & Faustin Ekeh, UNICEF)

5.3. Vector Control in Humanitarian Emergencies – John Thomas (UNICEF, MSF, Mentor Initiative)

Vector borne disease constitute the one of the most common causes of excess mortality and morbidity in humanitarian crises, especially among children and moving populations. Vector control is emergencies has typically been split among WASH and Health actors, John Thomas noting that WASH partners are well placed to contribute to vector control to mitigate disease transmission in precarious situations. Interventions for mobile or displaced populations will vary compared to more stable settings. John gave an example of the treated shelters, tarpaulins, blankets, curtains that many of us will have seen but also noted that IDPs may have different needs and tents, blankets, sheets, clothing may be more feasible when in transit.

John proceeded to provide a case study of a camp setting in South Sudan (Bentiu, 112,140 IDPs; Maban camps, >130,000 PDs) where an integrated vector management package was delivered with mass distributions of long lasting insecticide treated nets (LLIN), indoor residual spraying (IRS), larviciding of breeding sites and fly control at latrine and defecation sites. There was a 68% reduction in the incidence of malaria over a one-year period.

A second example included leishmaniosis control in Yemen, Syria, Iraq and Turkey. Household spraying reduced sand-fly populations and saw a decline in the number of reported cutaneous leishmaniosis in Northern Syria. Another example from Myanmar, where dengue control activities saw an 80+% reduction in *Aedes* pupae per person and a 50+% reduction in the Breteau index. Dengue control, in Myanmar, was highlighted as an example of coordination between local governments and international agencies.

Concluding, John emphasised that effective management and prevention of vector related diseases requires implementation of WASH measures which can be combined with vector control measures where appropriate. Achieving effective control of vector borne diseases requires advocacy, technical support, information exchange and facilitated through cross-sectoral collaboration between Health, WASH, Education and Shelter partners.

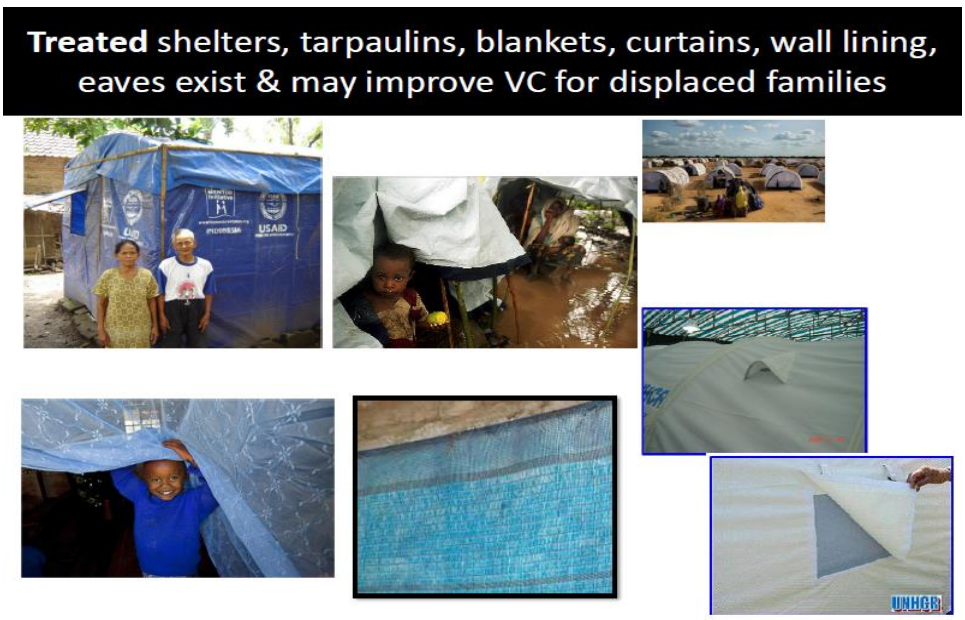

Figure 14: Technologies for vector control in emergencies (John Thomas, MSF, UNICEF, Mentor Initiative)

Panel Discussion Plenary 5: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Jean Lapegue (ACF). The panel consisted of the speakers: St John Day (Oxfam), Tim Grieve (UNICEF), John Thomas (UNICEF), Corey Leclair (MSF) and Andy Bastable (Oxfam).

With regard to management models of IDP camps, the concern was voiced that alternative models might be possible for areas experiencing natural disasters but less so for refugee camps where there are less private sector institutions. St John Day agreed and added that permanent services in long-term camps are needed and models that allow for the transition to household-level solutions and responsibilities need to be identified. The situation in camps are not merely influenced by factors like funding and subsidized supply of services but by many more features such as the camp's inhabitants and surrounding environment.

Drainage and surface water management in camps was highlighted as a key vector control activity, John Thomas gave an example where poor drainage from standpipes was contributing to breeding sites in camp settings and highlighted the need for the WASH sector to recognize its role in disease prevention. He also mentioned new and innovative approaches being used by partners to monitor and distribute larvicides across surface water by drones.

PLENARY 6: Cholera

6.1. A systematic review and meta-analysis of the association between WASH exposures and cholera in case-control studies – Marlene Wolfe (Tufts University)

There are an estimated 1.4-4.3 million cases of cholera each year with 28,000-142,000 deaths. Treatment of cholera has reduced case fatality rates substantially, but prevention is key to reducing morbidity associated with the disease. The evidence supporting water, sanitation and hygiene interventions to prevent and control cholera is limited. Marlene Wolfe noted how there has been no summary of the evidence from the multiple case-control cholera investigations published.

Marlene presented the results of her systematic review and after an initial search of 111 papers, 51 case-control papers from 30 countries were reviewed quantifying the association between WASH factors (exposures) and cholera cases (outcomes). WASH interventions were grouped into: water sources, water treatment, water management, sanitation and hygiene and the studies were assessed for "predicted protective factors" such an improved water source or "predicted risk factors" such as open defecation.

All eight "predicted risk factors" were associated with higher odds of cholera among cases, while only five of the seven "predicted protective factors" were associated with lower odds of cholera. Results suggest that "predicted risk factors" are less variable in nature are associated with cholera and that differences across the factors were attributable to variations in WASH intervention quality and appropriateness. To better understand which WASH factors are most effectively protective, it is recommended that: 1) interventions be well implemented to ensure field effectiveness matches theoretical efficacy, and 2) case-control reports detail intervention characteristics so factors leading to success or failure can be more directly assessed to determine factors contributing to disease prevention.

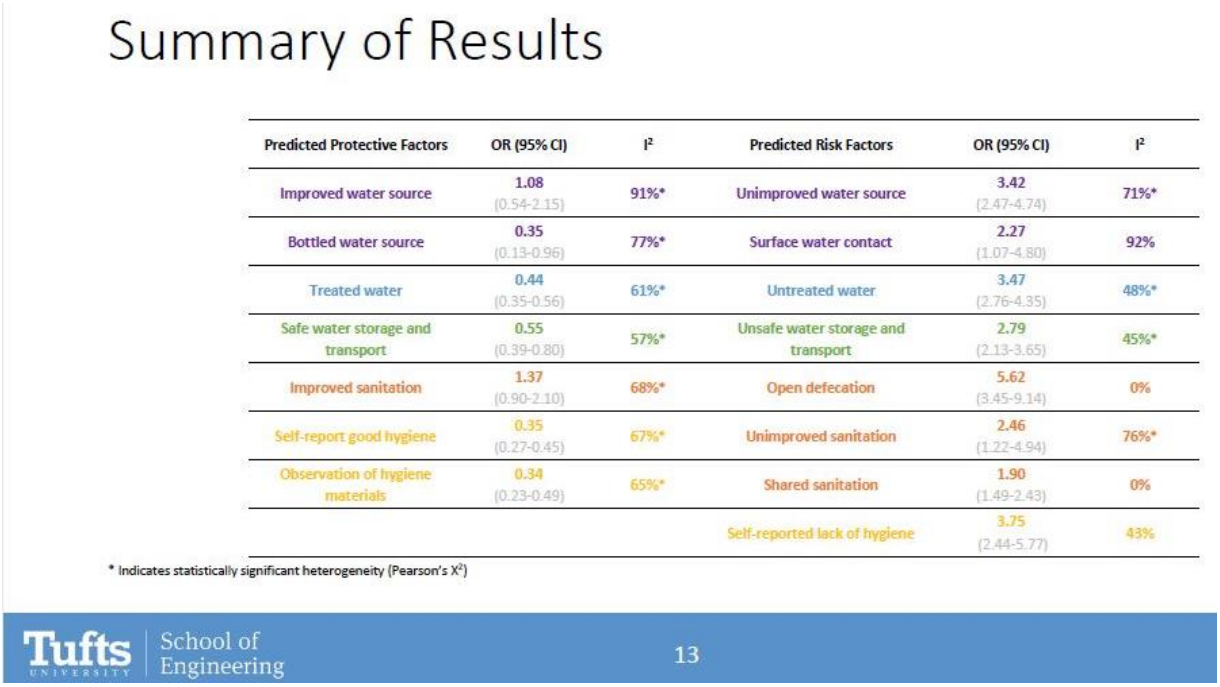

Figure 15: Odd ratios of WASH factors and cholera (Marlene Wolfe, Tufts University)

6.2. Evaluating the effect of an MSF hygiene kit intervention on domestic transmission of cholera among household contacts of cholera infected patients: a study protocol – Lauren D'Mello-Guyett (LSHTM/ MSF)

Models suggest that interventions targeting domestic human-to-human transmission such as hygiene kits could be a more effective way to control cholera in outbreaks than interventions in the public domain. To close a knowledge and research gap on hygiene kits for cholera mitigation in emergencies prospective cohort study was designed by Lauren D'Mello-Guyett to assess the reduction of secondary transmission from use of the hygiene kit during an MSF cholera response in a complex emergency.

This study will enrol the household contacts of cholera-infected patients admitted to the MSF Cholera Treatment Centre with hygiene kits distributed to these households. Environmental samples (water, at source and point of use, and food) will be tested for faecal indicator bacteria and *Vibrio cholerae*, and stool samples from primary household cases and household members will be tested for cholera case confirmation by Rapid Diagnostic Test. The cohort study will take place in DRC and comprise 250 Cholera cases and all of their respective household contacts (approximately 1325 persons). The hygiene kit which is given out at CTCs will contain 250 g of soap per person, water treatment for two months, a bucket with a tap and a 20L jerry can. The use of the kit will be assessed after one week and samples of stored water, source water and food taken, in addition to clinical diagnosis of secondary cases. After three weeks, qualitative interviews will further assess its use and reception of CTC-based delivery. The outcomes, measured as a function of extent kits during follow up from generalized estimating equations (GEE) and hierarchical models with multivariate regression models, will include the incidence of cholera in household contacts and *Vibrio cholerae* presence in water and food. The outbreak for this year is unpredictable yet rather probable and needs to have a certain outbreak size to allow for an adequate and statistically meaningful sample.

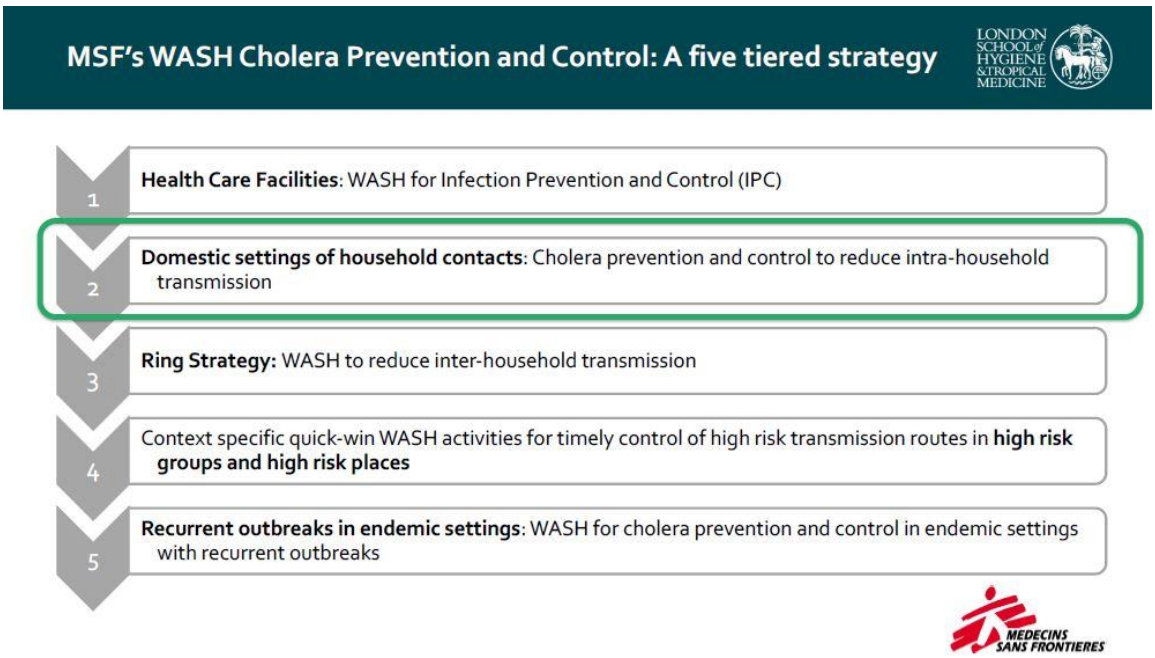

Figure 16: Evaluation of hygiene kit distribution to support MSF's five tier cholera strategy (Lauren D'Mello-Guyett, LSHTM, MSF)

6.3. Pre-crisis market analysis (PCMA) of WASH Non-Food Items (NFIs) for cholera mitigation and emergency preparedness in Haiti – Jenny Lamb (Oxfam)

Market-based emergency responses are largely underutilized in WASH. Four Pre-crisis market analysis (PCMAs) were conducted in Haiti, by Oxfam and ACF with support from OFDA, and explored the capacity of the market to supply common WASH items (soap, chlorine, water containers).

The assessment revealed that the market for soap is well established, products are available and affordable. Systematic distributions of soap during outbreaks seemed questionable as the assessment revealed that 90% of households had at least one bar of soap in their homes, more than half had 2 types or more, at any one time. Only 6% are however equipped with a handwashing device. An area that has thus far been neglected, despite its importance to support handwashing behaviours. Additionally, more than 90% of households had purchased their water collection or storage buckets on local markets rather than receiving them through NFI distribution. Whereas, fewer than a quarter of households had chlorine treatment tablets or solutions in their households.

Following the study, a marketing scheme offering the retrofitting of taps to household-owned buckets and the purchase of chlorine-solution was successfully piloted. Recommendations from this analysis for emergency preparedness in similar contexts included: consideration of vouchers over in-kind donations; saving costs for bucket distribution by only providing taps; and, to develop a market for handwashing devices.

Panel Discussion Plenary 6: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by David Clatworthy (IRC). The panel consisted of the speakers: Marlene Wolfe (Tufts University), Lauren D'Mello-Guyett (LSHTM/MSF) and Jenny Lamb (Oxfam).

Marlene Wolfe was asked whether how the whole sanitation chain was not regarded in the review, but merely the sanitation ladder, and what can be done to address it. Marlene noted that limitations of the studies reviewed did not allow for considerations of the whole sanitation chain since many of the studies did not contain enough information on the interventions. Likewise, the revision could only assess observed WASH factors of the studies in the sample, which for example could not include flies in toilets as transmission factors.

Directed at Lauren D'Mello-Guyett and the researchers waiting for a cholera outbreak in DRC, the question came up whether it was not better to target another area, whether the kit distribution will be going on after the crisis and how handwashing uptake is measured. Lauren replied that the targeted area was a setting with a consistent history of cholera outbreaks, a ready operational response and the in-country support needed for the research. On the second question, Lauren clarified that the hygiene kit will remain an operational activity of MSF and delivered at the CTC. Health promotion messages in the community will be ongoing. With regard to the methodology, the study will be unable to conduct structured observations of handwashing practices and during this study handwashing will be measured through proxy indicators and through self-reporting with noted inherent biases.

Extended Panel Discussion Day 2: Cholera

David Clatworthy (IRC) chaired the panel discussion on day two on Cholera with panellists Lauren D'Mello-Guyett (MSF), Tim Grieve (UNICEF), Jean Lapegue (ACF) and Alexandra Machado (IFRC). David opened the discussion by reflecting on Yemen over the past year and summarising the End Cholera Road Map and how there is momentum, in development and humanitarian settings, for cholera prevention and control.

Alexandra Machado (IFRC) opened the discussion with a presentation of IFRC's One WASH programme which will be established across the federation for the prevention of cholera. It was noted that health and WASH actors were linked in their approach and is facilitated by their national societies globally.

Tim Grieve (UNICEF) stated that in 2017 there were roughly one million cholera cases in Yemen alone and 175, 000 in Sub-Sahara Africa. Most investments are undertaken during the outbreak itself, but more must be done to prevent cholera in predictable hotspots and seasons. Cholera control in the long run relies fundamentally on WASH interventions and long-term prevention requires preparedness and more research in order to identify multiple preventive factors and appropriate interventions. UNICEF's rapid response teams have been demonstrating some success intervening within 48 hours of case identification and have improved surveillance of case at the household level, but this has been difficult in more complex settings or conflict areas.

Jean Lapegue (ACF) reported that ACF is involved in cholera control, case management and coordination on a sub-regional level in Yemen. Conducting research in cholera treatment centres there is very difficult, as security issues (bombing caused fear among the population) leads to low attendance and attrition of patients. Yemen was also characterised by the associated undernutrition in cholera cases. Undernutrition was an increased risk for cholera among the populations.

Ongoing mapping and surveillance has allowed the sector to start identifying hotspots and modelling how interventions can be targeted for improved control. Lauren D'Mello-Guyett (MSF/LSHTM) elaborated on the MSF WASH strategy is integrating with Oral Cholera Vaccine (OCV) campaigns, and MSF is moving to responses that are always integrated with medical interventions. MSF is also using hotspot mapping and surveillance systems from their own medical activities to aid their response time. Research is also being generated to evaluate WASH and WASH + OCV interventions within the operational response of the organisation.

The first question asked if there is any action within the End Cholera Road Map for health system strengthening. Tim Grieve (UNICEF) replied that the GTFCC is focusing on multi-sectoral interventions in cholera hotspots and that health care system strengthening is included in the pillars of the Road Map and is based on working with national governments and systems. Alexandra Machado (IFRC) added that the global task force is in need of more diverse funding to tackle the array of problems and interventions across health and WASH sectors.

A question on OCV was posed and scepticism was outed whether the WASH community had an appropriate response to cholera interventions coupled with OCV. Oliver Cumming (LSHTM) commented that OCV groups are looking towards WASH actors to deploy appropriate responses in collaboration with vaccine campaigns. At the same time, there is very little research on this integration and MSF and LSHTM will be hoping to start a trial in the near future on this. Tim Grieve (UNICEF) added that the many limitations of vaccines get overlooked and WASH needs to have a louder evidence-based voice to move the case for improved WASH up the agenda.

Other areas that should be looked at when it comes to cholera control, put forward by participants, included:

- research on transmission of cholera through flies and appropriate interventions for fly control
- increased focus on certain population groups (fishermen) and community places and events (funerals, markets) to identify transmission routes;
- And overall, all agencies were asked to improve the frequency and quality of evaluations among their current WASH programmes and interventions

PLENARY 7: Handwashing and Hygiene Promotion

7.1. Motivators and barriers to handwashing behaviour during humanitarian emergencies – Lauren Blum (University of Buffalo)

Little is known about motivators and challenges to handwashing during emergencies despite handwashing promotion accounting for a 23% decrease in acute respiratory and diarrheal disease. It was pointed out, however, that there is little evidence of strategies to understand the drivers of handwashing or hygiene among crises-affected populations.

Between 2013 and 2015, Lauren Blum and colleagues at Buffalo University led a study to investigate drivers, motivators and barriers for WASH behaviour in camp settings in the Democratic Republic of Congo (DRC). Initial findings revealed that there are certain challenges to behaviour change communication, especially in the emergency context.

Refugee settlements go through different phases of the emergency and different social needs are emerge at different times.

Hygiene promotion and particularly hand washing promotion strategies needs to adapt to these unique and continuously changing camp settings. Challenges faces by behaviour change communication included: undefined timelines and audiences, a lack of expertise at all levels, overemphasis of technical aspects rather than behaviour change, limited exploration of psychosocial motivators or barriers to handwashing and communications based on anecdote and convenience rather than evidence.

Interviews and group discussion with staff in Rubaya camp, DRC, where WASH conditions were not ameliorated through the supply of hardware, showed that primary motivators for handwashing with soap included feelings of cleanliness, beauty and pride/confidence, especially in the interaction with other camp members. Health, as a motivator, was limited to feelings of removing dirty substance and prevent illnesses. Main barriers were the lack of soap and unavailability of handwashing facilities.

Overall, the study confirmed hypothesized limitations of hygiene promotion in emergencies raised by global experts. There is a significant lack of planning and use of the evidence when planning the response and basic survival needs take precedence over hygiene practices. There is a defined need for the WASH Community to engage more frequently and effectively with behaviour change experts at all stages of the emergency response.

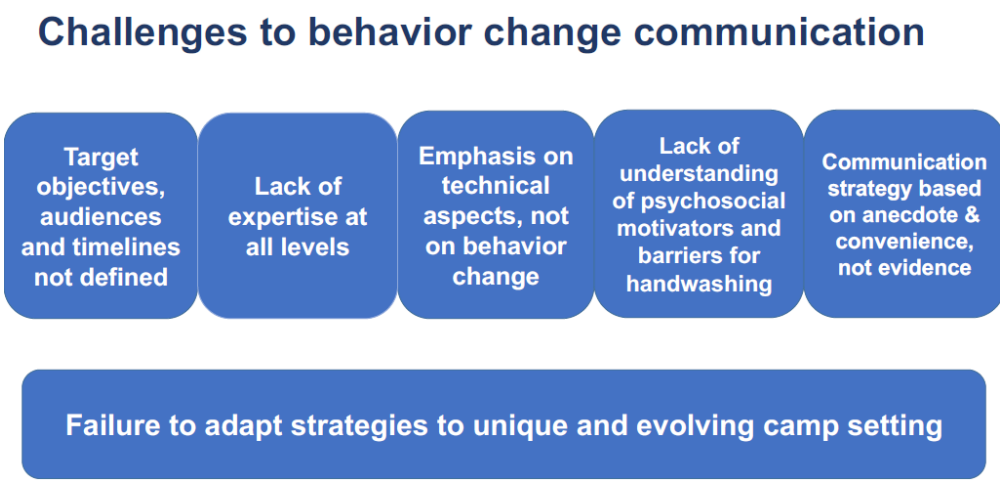

Figure 17: Barriers to handwashing BCC during humanitarian emergencies (Lauren Blum, Buffalo University)

7.2. Pre-test findings of a new interactive handwashing promotion program: Mums Magic Hands in emergencies using emotional and health motivators – Foyeke Tolani (Oxfam)

Foyeke Tolani presented findings of formative research with emergency affected mothers in The Philippines, Pakistan and Nepal to better understand what motivates mothers to wash their hands in emergencies.

As previously identified in formative research, presented at the 2016 EEHF, nurture and affiliation were found to be strong motivators for improved hygiene behaviours among mothers in these three settings. This information was used by the team to develop "Mum's Magic Hands (MMH)", a handwashing with soap promotion programme that uses story-telling, demonstrations and nudges to initiate behaviour change. The programme was

piloted among mothers and female caregivers for cultural proximity, appropriateness, comprehension and persuasion in the Zaatari Camp, Jordan, and the Bidibidi settlements, Uganda.

"Mum's Magic Hands (MMH)" aims to increase HWWS before contact with food and after contact with faeces. Focus group discussions and key informant interviews in the two protracted emergency settings revealed that that mothers understood key messages and were able to recall the slogan "2 fingers 2 occasions" for two key handwashing situations. Furthermore, the mothers/caregivers found the materials attractive, persuasive and could identify with the narrative. Nevertheless, they felt the visuals did not accurately reflect their cultural/religious milieu. New MMH manuals were created including: 1) MMH Africa for low literacy and inclusion of more visuals; 2) MMH Global with multicultural images of different groups including features such as a woman in a head scarf and including a man; and, 3) MMH for rapid response with fewer activities for fast implementation.

This study was able to reinforce the need to better understand motivators and barriers around good hygiene practices in emergency contexts, especially since health may not be the most effective motivator for improved practices.

Figure 18: MMH activities to motivate handwashing practice in emergencies (Foyeke Tolani, Oxfam)

7.3. Do we need to do hygiene promotion differently in humanitarian emergencies? Findings from exploratory research in Iraq and DRC – Sian White (LSHTM)

In an emergency many of the determinants of handwashing behaviours (e.g. social networks, physical infrastructure, risk perception, etc.) are disrupted and we know little about how behavioural adaptions are made. The response usually relies on the distribution of soap, hygiene kits and educational materials. A review of the literature finds that there is a greater need for sociological and anthropological studies in emergency contexts, and that behaviour change communication strategies currently used in emergencies would benefit from an improved understanding of the influencers of behaviours.

Sian White presented her qualitative research conducted in two field sites: a conflict affected population in a refugee camp near Mosul, Iraq and an IDP settlement and host community affected by cholera in the Democratic Republic of Congo (DRC). Using participatory methods to explore handwashing determinants in both Iraq and DRC, Sian's initial findings found little similarities in the motivations for hand washing between the two populations.

In Iraq, hygiene behaviours were suspended while people were besieged and fleeing but upon arrival in the camps people prioritised hygiene at the top of their daily routines. The exposure to trauma, lack of agency, reduction in standards of living, a heightened sense of disgust and hot weather were all cited as caused for this change in behaviours. Comparatively in DRC, chronic poverty and hunger were the main barriers to prioritizing hand washing. The population simply prioritized food and other activities over their personal hygiene. There was the additional perception that cholera is easy to treat, cholera occurs by chance and limited access to hygiene materials inhibiting behaviours.

Insights common to both settings included: 98-99% of people knew the benefits of hand washing; creating the right setting for handwashing behaviour to take place is the most important factor for enabling behaviour; and, hygiene promotion programmes need to consider psychosocial wellbeing into their programmes to facilitate agency and dignity among the population. These findings should facilitate a shift from educational approaches to more innovative, evidence-based and context-specific interventions.

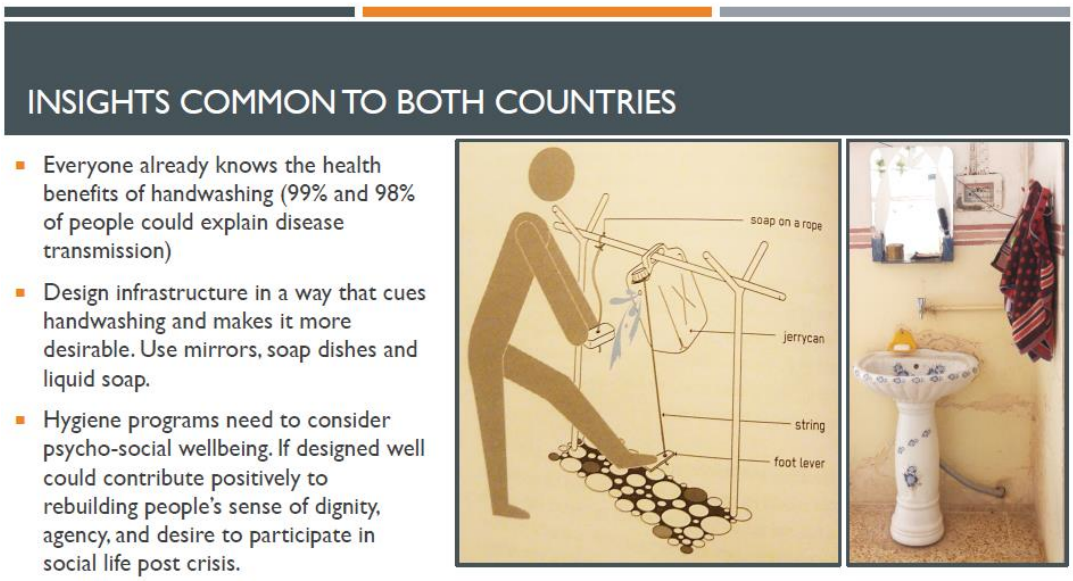

Figure 19: Insights from hygiene promotion in emergencies in Iraq and DRC (Sian White, LSHTM)

Panel Discussion Plenary 7: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Marion O'Reilly (Oxfam). The panel consisted of the speakers: Lauren Blum (Buffalo University), Foyeke Tolani (Oxfam) and Sian White (LSHTM).

First of all, it was generally agreed that educating people is no longer considered an appropriate response in development or emergency settings. Health-related motivators are accepted and can work in disease outbreaks, but not in the long term and in other emergency settings it depends on the nature of the respective population. Understanding the unique motivations of a community was paramount to behaviour change.

Regarding nudges in the emergency context (which were also used in MMH), a recent RCT in Bangladesh showed great uptake of the nudges to improve hand washing with soap among school children. It was thus asked what is preventing us from adopting uses nudges in emergencies. Sian White answered that indeed more nudges should be used and that mirrors at handwashing stations might be an approach some agencies are starting to consider in their hand washing station designs.

With regard to settlements in Iraq, the question came up on how to scale up interventions nation-wide despite cultural differences within Arabic communities. Clearly – a repetition of approaches is not efficient to shape behaviours. Rather, there is a tendency to decline good practices if done so. As emergency settings are often subject to programmes with a short lifespan, it is hard to document with evidence how behaviour change is sustained across time and cultural differences.

PLENARY 8: Waste Water Treatment and Sewers

8.1. The needs for low cost and sustainable wastewater management practice in protracted emergency: a case study from Rakhine State, Myanmar – Basilius Kris Cahyanto (UNICEF)

Kris Cahyanto opened this session describing current displacement of more than 124,026 people over 30 camps in Rakhine State in Myanmar. There are large number of WASH agencies in the IDP camps in Rakhine State and latest data reports 99% of the population have access to improved drinking water and 77% have access to improved sanitation. Desludging in each camp is carried out by separate WASH agencies and wastewater treatment has been centralized in 5 locations.

Currently, there are three wastewater treatment facilities in three camps: STMG in Sittwe, KNP in Pauktaw and STM in Pauktaw. The total of these facilities is approximately 100m3/d. Kris presented images of these facilities during his presentation and two basic stabilization ponds near Ngat Cheung camp.

The operations and maintenance of the facilities, however, remains challenging and expensive. The costs for the wastewater treatment comes from six agencies and there is an ongoing discussion to look for cheaper and more sustainable alternatives.

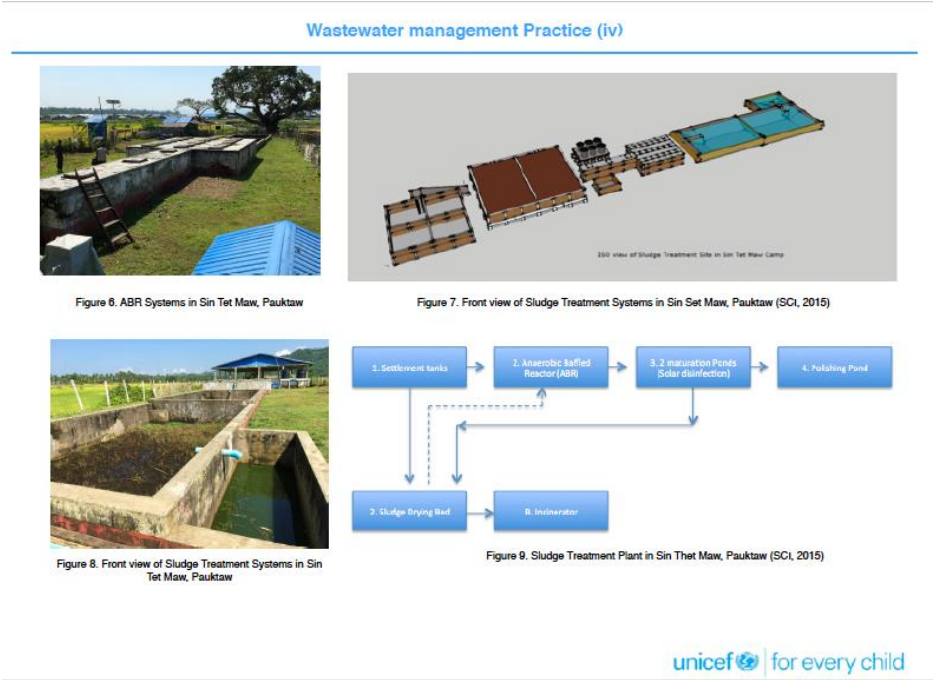

Figure 20: Wastewater treatment facility in Rakhine State, Myamar (Kris Cahyanto, UNICEF)

8.2. Solid-free sewer networks – Gert de Bruijne (Daily Business)

In late 2016, Daily Business and other agencies from the Dutch Surge Support were invited by UNICEF to develop alternative options to pit latrines that inhibit polluting the groundwater but remain durable yet non-permanent for the approximately 250,000 Syrians living in refugee camps in Lebanon.

In many of the camps, there are no connections to sewer networks and there is limited capacity of the environment to absorb the wastewater produced without a high risk of contaminating the groundwater. There is a definite need to reduce ground water pollution and reduce the high operational costs of desludging current tanks.

The team trialled a solid free sewer network syphoning the sewage liquid from sludge holding tanks, followed by a wastewater treatment in an Anaerobic Baffled Reactor (ABR) on site in the refugee camps, vertical wetland and sludge drying beds for further treatment. The quality of the effluent met local waste water standards and reduced overall costs compared to existing strategies.

Currently, UNICEF are piloting the strategy and two other INGOs (WASTE and Daily Business) are trialling the technology in Lebanon and Uganda. The team have suggested that the designs could be prefabricated and stocked ready for other locations and could also be adapted by local communities or environments.

Figure 21: Technical brief for wastewater facilities in Lebanon (Gert de Bruijne, Daily Business)

8.3. Evaluation of the waste water treatment systems in MSF hospitals – Rym Arbaoui (MSF)

In the countries where Médecins Sans Frontières works, waste water management is very basic. Sewage is usually treated by septic tanks and infiltrated or released into surface water. New technologies are appearing to improve the treatment, but to date, there is no monitoring of the quality of the effluents. Mindful of the impact of its activities on the environment and public health risk, Rym Arbaoui presented the evaluation of three wastewater treatment technologies used in three hospitals in Haiti. These included a septic tank system, anaerobic up-flow filter and rotating biological contacter (RBC) with bio discs.

Analysis results showed that RBC gives the best performances on the main parameters (BOD, turbidity, DCO, PO_4-3, NT, NH_4, *E. coli* and faecal coliforms). The septic tanks were only able to reduce solid materials and required secondary treatment. Anaerobic filters decreased turbidity, but their maintenance is difficult and can drastically affect their performance.

Rym also presented the wastewater testing kit developed by the team. The kit showed difficulties in analyzing BOD and biological parameters. Most Probably Number (MPN) methods were used but the results require dilutions to achieve readable results and would therefore require extra samples to be taken or pre-testing before running full analysis. Additionally, European laws and standards require reductions in nitrogen and phosphorus which the current technologies do not treat for.

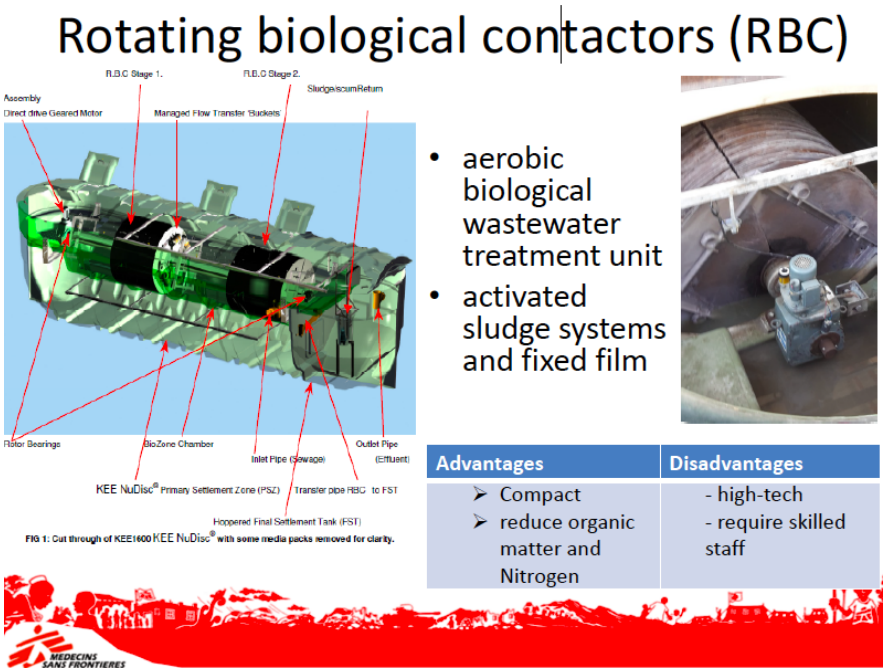

Figure 22: Rotating Biological Contactor, Haiti (Rym Arbaoui, MSF)

Panel Discussion Plenary 8: Questions and Answers

The session concluded by inviting any questions from the floor for a panel discussion chaired by Nick Brooks (CARE). The panel consisted of the speakers: Basilius Kris Cahyanto (UNICEF), Gert de Bruijne (Daily Business) and Rym Arbaoui (MSF).

Marco Visser asked how the RBC worked and if it could also be used in camp facilities. Rym replied that the RBC required electricity to work but is modular and can fit many systems. Unfortunately, one unit would be too small for a camp and as the RBC bio discs require sufficient fluid to work this would need to be taken into consideration in the camps.

There was also some surprise that the up-flow filter did not work as expected. Rym added that initially it did work well but when they needed to change the sand filter, the sand layer was not correctly installed, and efficiency fell soon after. The technical knowledge to main the up-flow filter was an issue. Rym was also asked if the effluent levels from any of the wastewater treatment options were low enough for chlorination or oxidation to remove pharmaceuticals. At the stage, the effluent levels were not low enough for reuse, but you could treat.

Andy Bastable (Oxfam) asked Gert why they had not considered tiger worm toilets or UDDT in Lebanon when others are finding this to be quite successful. Gert added that the brief required a standardized, pre-fabricated product and that because the team were unable to use cement in their designs the other options were not explored in much detail.

Closing Remarks and Plans for the next EEHF

The forum was concluded with an evaluation on the 2018 EEHF. This year, 83 voting participants strongly agreed that the EEHF had met their expectations, 89% of which felt there was a good balance between presentations and discussions and 42% felt the balance between research and field practice was "perfect" (31% felt it was practitioner heavy and 27% felt it was too research heavy). In addition to the evaluation, 95% of voting participants agreed that we should continue to hold the EEHF alongside the Global WASH Cluster meetings and 81% were happy to pay a small fee to attend in future.

The participants were asked for their opinion on potential additions or improvements for future forums, including:

- Improving the diversity of attendees and increasing the number of field staff attending the EEHF including local partners
- Engage with non-conventional actors and those from other sectors (Health, Nutrition, Shelter) to attend the EEHF
- Start video recording presentations to share to wider networks and to field staff

Participants were also asked what the theme of future forums could be, including:

- WASH in conflict zones
- Maintaining technical quality
- WASH in urban environments
- Gender and WASH
- Forgotten crises
- Behaviour change and community engagement

We would like to thank all the participants for their active engagement and participation in the EEHF. We value your feedback and time.