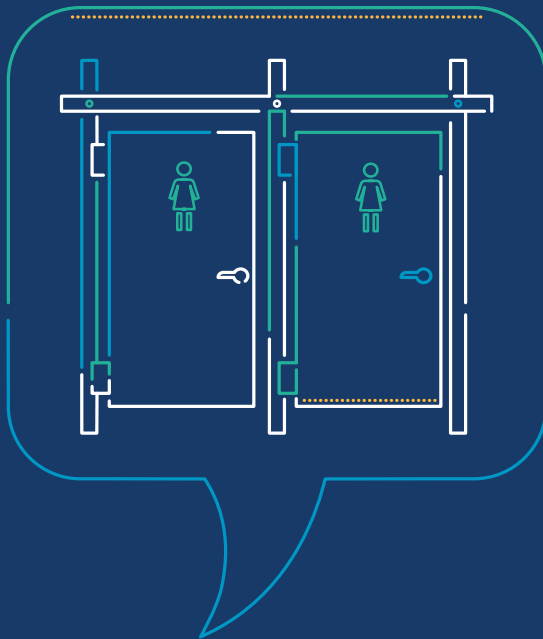
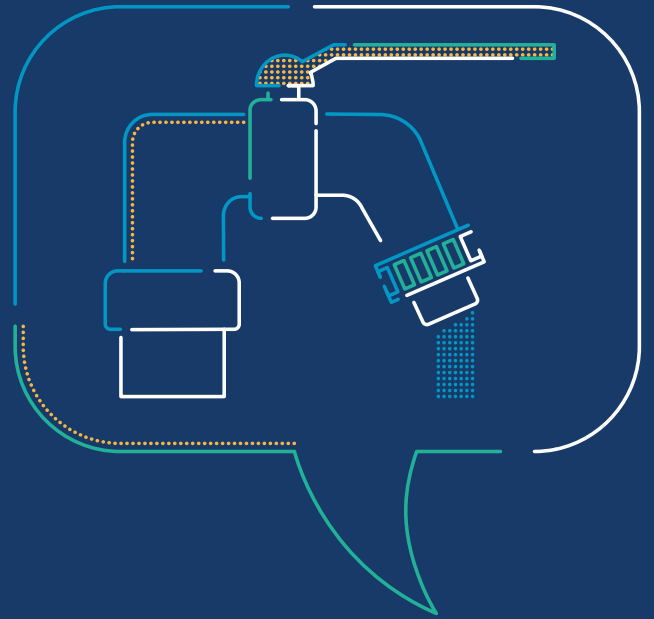


elrha



# WATER, SANITATION & HYGIENE INNOVATION CATALOGUE

A collection of innovations for the humanitarian sector

We are Elrha. A global charity that finds solutions to complex humanitarian problems through research and innovation.

#### SUGGESTED CITATION

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Edited and designed by the Good Problems team at Science Practice, a research and design consultancy that works with funders to help them identify and prioritise important problems and design effective innovation programmes.



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#### ACKNOWLEDGEMENTS

We want to thank everyone who has provided invaluable help in shaping this catalogue; our Elrha grantees, who engaged so enthusiastically with us; our WASH Technical Working Group, who spent many hours reviewing project entries and supporting us with the technical advice we needed; Science Practice, who worked tirelessly to collate, edit and design the catalogue; and the wider Elrha team who made it all possible. Our thanks, as always, also go to our Funding Committee and Advisory Group members who strategically help to steer all we do through our Humanitarian Innovation Fund programme.

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# FOREWORD

DOMINIQUE PORTEAUD

GLOBAL WASH CLUSTER COORDINATOR, UNICEF

> The need for humanitarian aid continues to grow year on year, yet the way WASH aid is delivered has changed very little in the last few decades. Elrha's problem exploration research has demonstrated what many practitioners will tell you: we are still struggling with fundamental challenges like managing the large amounts of human waste produced in camps like Cox's Bazar in Bangladesh; we still don't engage enough with communities to understand how to build safe and accessible latrines for them; we don't have consistently effective ways to incentivise and facilitate handwashing or support women and girls with menstrual health – the list goes on. However, the WASH sector is bursting with talented, passionate people who want to find better solutions, and, thanks to them, the emerging WASH innovation ecosystem has the potential to drastically improve the sector's impact.

This Humanitarian WASH Innovation Catalogue is the first of its kind. It offers a unique overview of some of the most promising new solutions in WASH, and is designed to help practitioners decide which innovations could help them solve their most pressing problems. Taking an innovation from idea to scale can take years, and the innovations featured in this catalogue are all at different stages on that journey. What this offers the WASH sector now is a look at the exciting work happening around the world to address our common challenges. As the Global WASH Cluster (GWC), we are proud to be a strategic partner of Elrha and its Humanitarian Innovation Fund. Elrha is uniquely positioned to package up and share new solutions and evidence of what works in the WASH sector, through tools and guidance just like this, drawing on their experiences of working with and investing in research and innovation.

Innovation without uptake is futile; as a community of practitioners, researchers, donors and coordinators, we all play an important role in ensuring that the investment made in WASH innovation is translated

to impact, with more people getting the right help they need, when they need it. The innovations in this catalogue are all looking for partnerships – some need to be tested at a larger scale to collect robust evidence; others are ready to be adopted and applied in different contexts. The onus is on all of us to make this happen.

I hope that you, the reader, will commit to engaging with these new potential ways to strengthen the WASH response globally. The GWC's strategy is centred around strengthening the quality of WASH response provided to people affected by emergencies – it is my hope this collection will help our sector progress collectively, increasingly building on and using others' work, so we improve together. After all, our ability to engage with and adopt new evidence, processes and products into our ways of working and the supply chains we rely on is crucial to providing a better humanitarian response, which is what we are all here to do.

# PREFACE

JESS CAMBURN

DIRECTOR, ELRHA

> We believe people caught up in crises have the right to appropriate and effective solutions, informed by robust evidence. That's why, through our work in innovation and research, we support and develop new solutions, we share what works and push for adoption at scale, and we transform this knowledge into practical tools and guidance – just like this catalogue – for the humanitarian community to put into action.

We are proud to present this catalogue as an overview of some of the most promising new solutions in WASH, offering the WASH practitioner community a unique opportunity to access over 30 innovations that could help to solve their most pressing problems.

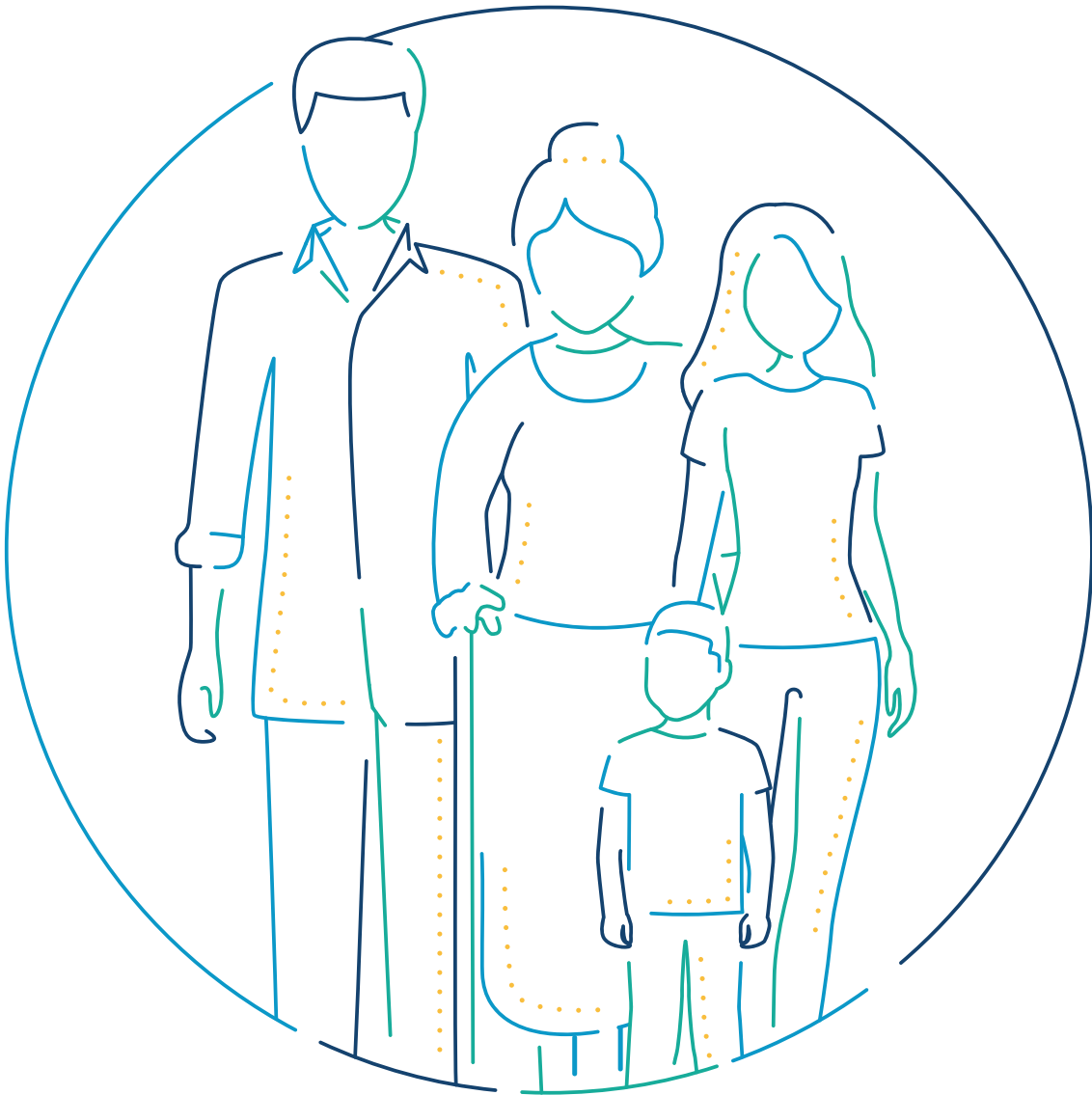
Over the last few years, we have heavily invested in funding and supporting innovation and research in the WASH sector, highlighting gaps in evidence, exploring the problems, identifying opportunities where innovation can play a vital role, and funding the right people to find potential solutions. Our work in WASH is a strong example of how we work across the humanitarian community to embed innovation and research into the way we all work, leading to an improved humanitarian response.

From the start, we have worked in partnership with the Global WASH Cluster to position our investments effectively and to champion the outcomes. The WASH community has been at the forefront of innovation practice in the humanitarian sector and shown serious commitment and enthusiasm to the role of innovation and research in improving the performance of WASH responses. We are particularly grateful to our donors for helping to make this work happen, and to our WASH Technical Working Group who support us with expert advice and guidance, invaluable knowledge and an enduring belief that things can be done better.

## *Now we need you.*

Driving uptake and adoption of what works to improve humanitarian response is what we strive to do, but we can't do it alone. We know that despite increased investment, scaling humanitarian innovations remains a considerable ongoing challenge. From our experience in funding hundreds of organisations to find, test and scale many highly impactful innovations, we know there are significant barriers to adoption. These barriers are a product of the political, structural and cultural make-up of the humanitarian system and therefore overcoming them requires a sustained collaborative commitment. We are working with donors, partners and our fellow innovation bodies to proactively provide the platform and opportunities to tackle some of these barriers together.

Imagine if more innovations were given the chance to scale? What would this mean for those around the world who are affected by crises? Through adopting innovations more routinely into humanitarian response, with more partnerships and further investment, and with the piloting of these potential solutions, together, we can make change happen. This catalogue, while just one small part of our collective effort to improve how humanitarian response in WASH is delivered, could have a huge impact in the hands of the right people.



# ABBREVIATIONS

<b>ACF</b> Action Contre la Faim (Action Against Hunger)	<b>FHNW</b> Fachhochschule Nordwestschweiz (University of Applied Sciences and Arts Northwestern Switzerland)	<b>LSHTM</b> London School of Hygiene and Tropical Medicine	<b>R2HC</b> Research for Health in Humanitarian Crises
<b>BORDA</b> Bremen Overseas Research and Development Association	<b>FSM</b> Faecal sludge management	<b>MHM</b> Menstrual hygiene management	<b>UNESCO-IHE</b> UNESCO-IHE Institute for Water Education, formerly International Institute for Infrastructural Hydraulic and Environmental Engineering, and now the IHE Delft Institute for Water Education
<b>CAWST</b> Centre for Affordable Water and Sanitation Technology	<b>GWC</b> Global WASH Cluster	<b>MSF</b> Médecins Sans Frontières (Doctors Without Borders)	
<b>CDC</b> National Foundation for the Centers for Disease Control and Prevention	<b>HEV</b> Hepatitis E virus	<b>MSR</b> Mountain Safety Research	<b>UNHCR</b> United Nations High Commissioner for Refugees
<b>Cesvi</b> Cooperazione e Sviluppo	<b>HIF</b> Humanitarian Innovation Fund	<b>NGO</b> Non-governmental organisation	<b>UNICEF</b> United Nations International Children's Emergency Fund
<b>Eawag</b> Eidgenössische Anstalt für Wasserversorgung, Abwasserreinigung und Gewässerschutz (Swiss Federal Institute of Aquatic Science and Technology)	<b>IFRC</b> International Federation of Red Cross and Red Crescent Societies	<b>NTU</b> Nephelometric turbidity unit	<b>WASH</b> Water, sanitation and hygiene
	<b>IRC</b> International Reference Centre for Community Water Supply and Sanitation	<b>PATH</b> Program for Appropriate Technology in Health	<b>WEDC</b> Water, Engineering and Development Centre
		<b>PHAST</b> Participatory Hygiene and Sanitation Transformation	<b>WHO</b> World Health Organization

# INTRODUCTION

CECILIE HESTBÆK

SENIOR INNOVATION MANAGER, ELRHA

> We are Elrha. A global charity that finds solutions to complex humanitarian problems through research and innovation. We are an established actor in the humanitarian community, working in partnership with humanitarian organisations, researchers, innovators, and the private sector to tackle some of the most difficult challenges facing people all over the world. We equip humanitarian responders with knowledge of what works, so that people affected by crises get the right help when they need it most. We have supported more than 200 world-class research and innovation projects, championing new ideas and different approaches to find what works in humanitarian response.

## OUR WORK IN WASH

In 2013, we began our work in WASH with a bold ambition: to identify and prioritise key problems in the field and to find and nurture innovative solutions to address these at scale. *Why WASH?* Limited access to clean water and poor sanitation are drivers for the spread of diarrhoeal diseases – a critical challenge during humanitarian crises. These diseases account for more than 40% of deaths in the acute emergency phase, and for 80% of deaths in children under the age of two. Girls and women are particularly affected by a lack of well-designed latrines and access to safe water. We knew more needed to be done and that innovation could play a vital role.

Through an extensive global consultation with over 900 WASH practitioners and in-depth evidence reviews, we identified a list of challenges the sector urgently needed to solve. The topics ranged from handwashing to faecal sludge management; from safe drinking water to surface water treatment.

To address these problems, we have run 12 innovation Funding Challenges to date, working with WASH experts, academics and private companies, engineers and designers. From these, we funded over 40

innovations, the majority of which you will see featured in this catalogue. We hope the WASH sector will use the catalogue for new ideas, solutions and partnerships – and that through this, we will begin to see some of the bigger problems in the sector being addressed.

Our portfolio of research and innovation is exciting and promising for the future of humanitarian WASH. However, while some of our funded insights or solutions are being widely disseminated, many are struggling to ‘break through’ and gain traction in the wider humanitarian sector. Research and innovation are only impactful if adopted and used, and as an organisation that funds and supports research and innovation, this is a key factor against which we measure our success.

This is why we have developed this catalogue. We hope you will engage with it and share it with colleagues, reach out to the innovators and consider trialling their solutions in your programmes. Together, we can ensure the WASH sector’s investment in innovation is turned into real impact on the ground, and that the innovations truly fulfil their potential to save lives and improve outcomes for people affected by crises.



## HOW TO READ THIS CATALOGUE

The WASH Innovation Catalogue is written with and for humanitarian WASH practitioners and researchers. Our aim is for all innovations in the catalogue to appeal to and be understood by both WASH generalists and specialists. We want both senior and less experienced WASH practitioners to be able to engage with any of the featured innovations and assess if they are relevant for solving their local or global challenges. The catalogue therefore assumes a certain level of understanding of WASH but includes highly technical terms only where this is essential for understanding the innovation concerned.

## HOW WE CREATED THE CATALOGUE

All innovation teams were sent a template to complete. This included assessing the stage of their innovation, as well as which phase of emergencies it is relevant for. This information was then edited by the HIF team and Science Practice before being reviewed by a member of our WASH Technical Working Group (TWG)\*. Following this technical review, we went back to the innovators to clarify questions and gaps and built their responses into the descriptions of the innovations.

## HONESTY ABOUT THE NATURE OF THE INNOVATION PROCESS

While packed full of ideas and evidence, this is not a 'quick-fix' sales catalogue of new innovations that will solve all your problems. Innovation is about continuous learning and constant iteration, and we have challenged our innovators to reflect in a transparent manner on both the strengths and limitations of their solutions. All innovation descriptions include a section on 'impact' – this is meant in the loosest sense of the word. These sections contain any evidence the innovations have of solving the problem, no matter how small

the scale or level. Innovation takes a long time, and many of the projects are currently on the journey to showing impact at scale.

## THIS IS JUST THE BEGINNING

The innovation pages are not 'technical manuals' enabling practitioners to adopt and implement solutions right away; all descriptions signpost the reader to more information and key contacts. We hope you will make use of these contacts and reach out to the innovators to find out how you could benefit from the new research or solution.

## WHAT IS IN THE CATALOGUE?

The WASH Innovation Catalogue is divided into thematic sections, each introduced through a short summary of the problem drawing on our 2013 Gap Analysis on Emergency Water, Sanitation and Hygiene Promotion and subsequent Problem Exploration Reports. Many of the innovations featured have been supported through our targeted Funding Challenges which directly responded to the priority problems outlined in the Gap Analysis. Others have entered our portfolio through our former Core Grants funding process that had no specific problem or sector focus but awarded grants solely based on the quality of the idea.

This catalogue contains 31 HIF-funded innovations, as well as four research studies funded by our sister programme, Research for Health in Humanitarian Crises (R2HC). However, not all of our funded WASH innovations are included – some are at an early stage and have no outputs to report to date. Towards the end of this catalogue you will find a section with short summaries of three innovations that have finished without concrete outputs, but with valuable learning to share.

\* Except for a few – this is noted directly in the individual entries.

# STAGE OF INNOVATION

> The journey of an innovation from idea to scale is often long and winding. To understand how best to engage with the innovations in this catalogue, it is important to know which stage of the innovation process they have reached and therefore which types of partnership they may need. Our Humanitarian Innovation Guide divides the innovation process into six stages. It is important to keep in mind that although this process is mapped out as linear, few if any innovation journeys are linear and chronological: most innovators will find themselves having to miss steps, go back to earlier stages and iterate over and over again.



## RECOGNITION

**Recognition of a specific problem or opportunity.** This stage involves identifying a problem or opportunity to respond to, collecting and assessing readily available knowledge on the issue and context, diagnosing root causes and properly framing the challenge. At this early stage, rich input and feedback rather than a wide range of partnerships are usually needed. *There are 2 innovations currently at this stage.*



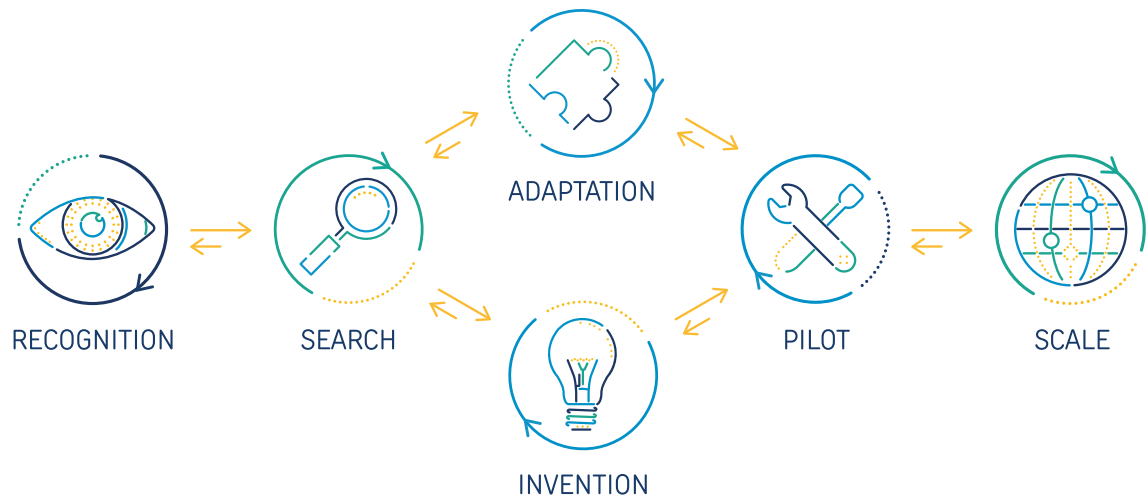
## SEARCH

**Search for existing solutions to the problem, or for ideas and collaborators to inform your onward journey.** A key aim of this stage is to find solutions that might already exist in the context, in the wider humanitarian sector and in other sectors or industries. *There is 1 innovation currently at this stage.*



## ADAPTATION

**Adaptation of a solution from elsewhere that requires significant rethinking of certain elements.** This stage involves identifying the changes that are required to adapt an existing solution to a new context. At this stage, innovators are often looking for a broad range of experts to feed in, including WASH practitioners, designers and private sector actors. *There is 1 innovation currently at this stage.*



INVENTION

Invention of a solution through the generation of new ideas. This stage involves working with users (whether crisis-affected populations or humanitarian workers) to design a solution and develop a prototype. At this stage, innovators are often looking for a broad range of experts to feed in, including WASH practitioners, designers and private sector actors. *There are 3 innovations currently at this stage.*



PILOT

Testing a potential solution to learn whether and how it works in a complex real-world environment. A successful pilot will provide evidence that the innovation had demonstrable impact and that it offers a comparative improvement over existing approaches. It will generate learning on what works, what doesn't and why. Innovations at this stage are often looking for field-testing partners and evidence experts. *There are 21 innovations currently at this stage.*

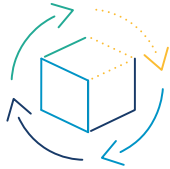


SCALE

Scaling the impact of an innovation to better match the size of the social problem it seeks to address. This stage involves building in the complexity required for a sustainable innovation and distilling this complexity to make it replicable. Innovations at this stage will often be looking for funding and field-testing partners. *There are 7 innovations currently at this stage.*

# CATEGORY OF INNOVATION

> Humanitarian innovation is often categorised as either product, process, position or paradigm ('the four Ps'). However, for the purpose of this catalogue and after discussion with our partners we simplified this to two types of innovation outputs.



PRODUCT & PROCESS

## 22 OF OUR WASH PROJECTS ARE PRODUCT & PROCESS INNOVATIONS

Product and Process innovations can be products or new ways of delivering WASH but will often be a mix of the two—very few new products can be introduced into the humanitarian context without being embedded within a new process.



RESEARCH & GUIDANCE

## 13 OF OUR WASH PROJECTS ARE RESEARCH & GUIDANCE INNOVATIONS

Research and Guidance innovations usually explore a particular problem in depth and offer new insights for how to address them, whether by introducing new evidence-based insights to the field, or by informing humanitarian practice directly.

# PHASE OF EMERGENCY

> We asked each innovator to assess the phase of emergency for which their solution or evidence is applicable or most relevant. Our Humanitarian Innovation Guide sets out seven phases of the disaster management cycle: prevention, mitigation, preparedness, disaster, response, recovery, and reconstruction. For the purpose of this catalogue, we have reduced these to three top-level categories.



RESPONSE

## 28 OF OUR WASH PROJECTS ADDRESS RESPONSE

Acute response, referred to throughout this catalogue simply as **Response**, includes the disaster and response phases of Elrha's seven-phase scale.



STABILISATION

## 25 OF OUR WASH PROJECTS ADDRESS STABILISATION

**Stabilisation** includes the latter half of the response phase as well as early recovery. In a WASH context, stabilisation can be understood as the point at which communities go from communal to household latrines.



RECOVERY

## 18 OF OUR WASH PROJECTS ADDRESS RECOVERY

**Recovery** includes medium-term recovery and longer-term reconstruction.



# HYGIENE

> Good hygiene practices have proven central to saving lives and reducing suffering during humanitarian crises. Handwashing with soap is recognised as an easy, effective and affordable method to protect and prevent disease transmission. However, handwashing practices in humanitarian crises are often found to be deficient and less effective than expected, with many socio-cultural, technical and financial factors likely contributing to the problem.

The Gap Analysis and Problem Exploration Report on Handwashing identified priority challenges in this area including the limited adaptability of existing hygiene promotion programmes, the poor condition and design of existing handwashing stations and the limited availability or lack of soap. The Gap Analysis further highlighted the challenge of poor menstrual hygiene provision in emergencies.

To address these challenges, we have prioritised innovations looking to:

1. Develop effective handwashing promotion strategies that lead to positive changes in behaviour,
2. Develop alternatives to soap,
3. Design better handwashing facilities and develop innovative approaches for deployment and maintenance and
4. Improve menstrual hygiene provision.

## HANDWASHING PROMOTION

**HIDDEN INCENTIVES: SURPRISE SOAP** p. 14  
Save the Children UK, LSHTM and Field Ready designed a toy-in-soap product to promote handwashing through play rather than health-based messaging.

**USING PUPPETRY TO INCREASE PARTICIPATION IN HANDWASHING COMMUNICATION INITIATIVES** p. 16  
No Strings International and partners promoted handwashing with children, youth and carers through a puppetry film and activities.

## ALTERNATIVES TO SOAP

**SUPERTOWEL** p. 18  
Real Relief, LSHTM and partners created SuperTowel, a handwashing alternative that enables users to remove bacteria and viruses from hands or surfaces anywhere, any time and with minimal water.

**MORINGA PRODUCTS AS ALTERNATIVE TO SOAP** p. 20  
ACF Spain and LSHTM ran lab tests and found that dry *Moringa oleifera* (*M. oleifera*) leaf powder is unsuitable as a soap alternative.

## HANDWASHING FACILITIES

**AN IMPROVED HANDWASHING STATION FOR PROMOTION AND PRACTICE** p. 22  
Oxfam GB, Dunster House Ltd. & partners designed a self-contained kit for communal handwashing that enables first-phase emergency installation because it is easy to use, assemble, transport and maintain.

## MENSTRUAL HYGIENE PROVISION

**IMPROVING ACTION FOR MENSTRUAL HYGIENE MANAGEMENT IN EMERGENCIES** p. 24  
The IFRC and partners developed, piloted and internally disseminated guidance, videos and tools to help volunteers implement menstrual hygiene management (MHM).

## SEE ALSO

**BUILDING A CROSS-SECTORAL TOOLKIT AND RESEARCH FOUNDATION FOR THE INTEGRATION OF MENSTRUAL HYGIENE MANAGEMENT INTO EMERGENCY RESPONSE** p. 88



# HIDDEN INCENTIVES: SURPRISE SOAP

SAVE THE CHILDREN UK, LSHTM & FIELD READY

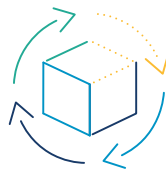
> Save the Children UK, LSHTM and Field Ready designed a toy-in-soap product to promote handwashing through play and curiosity rather than health-based messaging. Children receiving the intervention were four times more likely to wash their hands with soap at key occasions than expected.

STAGE OF  
INNOVATION



Pilot

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Response, Stabilisation

## BACKGROUND

Handwashing with soap greatly reduces diarrhoea but interventions targeting children in humanitarian settings have been school-focused, resource-intensive and reliant on health messaging. Research from non-humanitarian settings suggests that interventions targeting behavioural motives may be more effective than health promotion messaging.

## METHODOLOGY

The team conducted a proof-of-concept trial in a humanitarian camp in Iraqi Kurdistan. Children in 40 households received the toy-in-soap intervention after playing a five-minute game, and children in 40 control households received plain soap in a standard,

health-based, hygiene promotion session of a similar length. To assess the effect of the intervention, the team observed households and measured the number of times children washed their hands with soap at key times. This was done at baseline and four weeks after the intervention.

## SPECIFICATIONS

Surprise Soap provides a new approach to child handwashing in an emergency context, as it is motive-based and avoids health-based messaging which research suggests is not effective at changing handwashing behaviour. The intervention can reach children both in and out of school. It requires minimal training to carry out, and can be delivered in under ten minutes per household, making it rapidly





Credit: Julie Watson, LSHTM

deployable. Surprise Soap was conceived for children ages 5–12 but has the potential to reach whole families through children-led participation. However, it is important to ensure that the toy inside the soap is culturally appropriate and acceptable, and that there is either local capacity to produce the Surprise Soap or a feasible supply chain.

## IMPACT

A total of 97% of households in the intervention study finished at least one bar of Surprise Soap, indicating that nearly every household had engaged with the intervention in some way. In qualitative interviews, adults indicated a preference for Surprise Soap based on its better-than-standard quality and scent. After four weeks, children who received the intervention were four times more likely to wash their hands with soap at key occasions in comparison to children in the control group.

## GAPS

Surprise Soap is more expensive to produce than standard, plain soap, but the potential public health impact may justify this extra cost. The intervention is also reliant on a sufficient supply of water to wash with soap. Further studies are needed to determine the longer-term behavioural and health impact

of Surprise Soap when delivered at scale and to understand how Surprise Soap can be used in other humanitarian contexts.

## NEXT STEPS

Save the Children UK, LSHTM and Field Ready plan to conduct similar trials in other cultural contexts and in other kinds of emergency settings (eg, rapid-onset responses), as well as at a larger scale.

**KEYWORDS** hygiene; handwashing; behaviour change; humanitarian; emergency; children; soap; toys

## FIND OUT MORE

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Claudio Deola [c.deola@savethechildren.org.uk](mailto:c.deola@savethechildren.org.uk)

Watson, J. et al. 2018. 'Child's play: harnessing play and curiosity motives to improve child handwashing in a humanitarian setting' in *Int J Hyg Environ Health* in press.

# USING PUPPETRY TO INCREASE PARTICIPATION IN HANDWASHING COMMUNICATION INITIATIVES

NO STRINGS INTERNATIONAL & PARTNERS

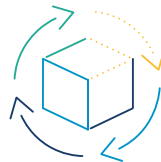
> No Strings International and partners promoted handwashing with children, youth and carers through a puppetry film and activities. Based on a pilot study conducted with Northumbria University and Catholic Relief Services in five schools, 73% of child respondents observed an increase in handwashing practices among peers.

STAGE OF INNOVATION



Pilot

CATEGORY OF INNOVATION



Product & Process

PHASE OF EMERGENCY



Stabilisation, Recovery

## BACKGROUND

Handwashing with soap saves lives. However, communicating this message is challenging, as there is a need to attract widespread attention to promote participation, reaching children, youth and carers in ways they respond to positively.

## METHODOLOGY

No Strings International and partners developed a puppetry film to teach children and their carers about the importance of handwashing. They also developed a set of participatory crafts, games and other activities

to accompany this film. They piloted the film and activities during a 'WASH Week' in five primary schools (approximately 8,000 students in total) located in Kawangware, Nairobi informal urban settlements where disease risk is chronic. No Strings International trained teachers to deliver the activities to students, who ranged in age from 4 through 14 years. Across the five schools, 94 children ages 8–14 completed survey questionnaires. A total of 75 caregivers also completed questionnaires, and 15 teachers shared their insights through semi-structured interviews.

## SPECIFICATIONS

The 15-minute long puppetry film is currently available in 10 languages. It can be shown alone or followed by activities designed to reinforce the messages communicated in the film. Showing the film with the activities is more time-consuming but more effective at promoting behaviour change.

When implementing this intervention, it is important to identify and remove systemic blockers to behaviour change that could place conflicting demands on children; for the intervention to be effective, children must have access to adequate facilities where they can practice handwashing and be free from other, potentially competing pressures such as eating.

## IMPACT

In the pilot, the puppet approach was universally appealing to the participating students. Based on the study, 73% of child respondents observed an increase in handwashing practices among peers at school, 67% of caregivers reported an increase in handwashing at home and teachers reported a 'significant' increase in handwashing after the intervention.

## GAPS

The pilot identified several barriers to handwashing in the participating schools. These include a lack of time, a lack of staff, growing school populations, lack of handwashing facilities and soap and competing pressures and incentives in the environment. Further work is required to understand how this handwashing promotion approach could help teachers and pupils overcome these barriers.

## NEXT STEPS

No Strings International is currently partnering with Catholic Relief Services and Caritas Bangladesh to deliver the WASH programme to facilitators serving Rohingya refugees in child-friendly spaces.



*Credit: No Strings International*

This programme includes appropriate monitoring, evaluation and follow-up channels to allow for scaling.

**KEYWORDS** handwashing; handywash tap; public health promotion; sanitation; emergency WASH; hygiene; soap; WASH innovation

## FIND OUT MORE

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No Strings International. 2018. 'Measuring impact' at [nostrings.org.uk](http://nostrings.org.uk).

# SUPERTOWEL

## REAL RELIEF, LSHTM & PARTNERS

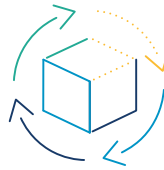
> Real Relief, LSHTM and partners created SuperTowel, a handwashing alternative that enables users to remove bacteria and viruses from hands or surfaces anywhere, any time and with minimal water. Preliminary field trial results indicate that SuperTowel increases handwashing frequency.

### STAGE OF INNOVATION



Scale

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Access to handwashing facilities in humanitarian emergencies is limited, resulting in people rarely washing their hands. In these situations, the prevalence of diseases related to hand hygiene increases dramatically. The problem can be addressed through handwashing with soap and water, but even if these resources are distributed, the problem may remain if water is a scarce resource.

## METHODOLOGY

Real Relief, LSHTM and partners conducted a lab study with 16 volunteers. Their hands were cleaned in an antibacterial solution, then artificially contaminated with *Escherichia coli* (*E. coli*), and then randomly washed for 1 minute with either water and soap or with the SuperTowel. The study measured the

reduction of bacteria between freshly contaminated hands and freshly washed hands. In a following field study, LSHTM, Real Relief and the Danish Refugee Council distributed 120 SuperTowels among refugees in Hitsats Camp, Ethiopia. They conducted two follow-up visits to the test households, 5 and 10 days after distribution, to qualitatively assess user acceptance and behaviour change.

## SPECIFICATIONS

SuperTowel's antimicrobial treatment is permanent. It relies on a purpose-made treatment of quaternary ammonium compounds attached to the fabric with silicon. For its antimicrobial properties to work, it requires minimal water from any source, including greywater. The towel is expected to last at least two years. The estimated price of each SuperTowel is £0.40. It is intended to mainly be a personal tool, with

people needing one to two per person. To be used correctly, SuperTowel needs a moderate amount of explanation and training when distributed.

## IMPACT

Lab results indicate SuperTowel is at least as efficient for handwashing as water and soap. During the field study, people found it an acceptable and appropriate solution for hand- and body-washing. People liked its multi-functionality and its portability, which allowed them to clean their hands at times when they might not otherwise have been able to do so. Although analysis is still in progress, feedback from the field study indicates that SuperTowel increased the number of times and occasions when people washed their hands.

## GAPS

Further lab studies might test SuperTowel's effectiveness when moist rather than soaking wet, or its performance when used for a shorter duration. The antimicrobial treatment could also be tested for efficacy against sporozoites, encapsulated and non-encapsulated viruses and specific bacteria and viruses. The team would like to eventually conduct a randomised control study to assess the intervention's impact on behaviour change and disease incidence.

## NEXT STEPS

A scientific paper describing the lab studies and the results is currently under review for publication; another paper describing the field study will follow.



*Credit: Real Relief*

**KEYWORDS** handwashing; water-scarce environments; hand hygiene; SuperTowel; clean hands; bacteria removal

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Real Relief. 2018. 'SuperTowel™' at [realreliefway.com](http://realreliefway.com).

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# MORINGA PRODUCTS AS ALTERNATIVE TO SOAP

## ACF SPAIN & LSHTM

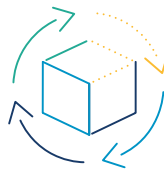
> ACF Spain and LSHTM ran lab tests and found that dry *Moringa oleifera* (*M. oleifera*) leaf powder is unsuitable as a soap alternative.

### STAGE OF INNOVATION



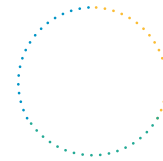
Adaptation

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Unsuitable for any stage

## BACKGROUND

Handwashing helps prevent waterborne disease. However, access to soap is a challenge in some emergency contexts, so finding cost-effective and locally available alternatives is a priority. Before this study, one possible alternative was *Moringa oleifera* (*M. oleifera*), a widely cultivated plant. Previous lab tests at LSHTM showed that dry *M. oleifera* leaf powder was as efficacious as non-medicated (ie, non-antibacterial) soap in its ability to remove bacteria from artificially contaminated hands. ACF Spain and LSHTM developed a prototype using locally sourced, minimally processed *M. oleifera* in Ghana to explore its potential as a soap alternative in an emergency setting. However, testing this prototype revealed that *M. oleifera* is unsuitable for this use.

## METHODOLOGY

ACF Spain and LSHTM conducted a handwashing trial to assess the efficacy of different forms of *M. oleifera* (boiled leaves, dry leaf powder) in removing *Escherichia coli* (*E. coli*) from artificially contaminated hands compared to regular, non-medicated soap. During the trial, the team collected the water used to rinse hands after handwashing with each different product. They then measured the colony-forming units (cfu/mL) of each rinsewater sample each day for three days to calculate differences in cfu/mL.

## FINDINGS

In lab settings, minimally processed *M. oleifera* did not show the same efficacy as regular, non-medicated soap when tested as a handwashing product. Instead, *M. oleifera* was found to promote

the growth of bacteria in both sterile and rinsewater solutions. These results indicate that *M. oleifera* is an ineffective antimicrobial agent and is unsuitable as a handwashing product. Using it as a soap alternative is not recommended.

## IMPACT

Although previous studies indicated that *M. oleifera* might have potential as a soap alternative useful in humanitarian emergencies, this study found that the plant is unfit for this purpose and should no longer be considered as a potential solution.

## GAPS

As the *M. oleifera* products were procured from just one supplier, a replication of the study in a different lab and with different suppliers is recommended to confirm the findings and rule out any biases that might have affected the results.

## NEXT STEPS

Diffusion of this research and its results will be mainstreamed in order to avoid agencies using *M. oleifera* as a handwashing product.

**KEYWORDS** *Moringa oleifera* (*M. oleifera*); *Escherichia coli* (*E. coli*); Handwashing; Soap; Ghana; Acción Contra el Hambre (ACF Spain); London School of Health and Tropical Medicine (LSHTM); National Public Health Reference Laboratory (NPHRL)



Credit: LSHTM

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Clark, J.N. et al. 2018. 'Evaluation of key antimicrobial properties of *Moringa oleifera* in relation to its use as a hand-washing product' in *Water* 10: 1154.

# AN IMPROVED HANDWASHING STATION FOR PROMOTION & PRACTICE

OXFAM GB, DUNSTER HOUSE LTD. & PARTNERS

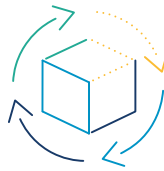
> Oxfam GB and Dunster House Ltd. designed a self-contained kit for communal handwashing that enables first-phase emergency installation because it is easy to use, assemble, transport and maintain. Trials showed increased handwashing where kits were installed.

## STAGE OF INNOVATION



Scale

## CATEGORY OF INNOVATION



Product & Process

## PHASE OF EMERGENCY



Response, Stabilisation

## BACKGROUND

Handwashing with soap is recognised as an easy, effective and affordable method to prevent disease transmission and should be achievable, even in emergency settings. Too often the lack of quick-to-assemble, readily-available, robust and self-contained kits for communal handwashing facilities means they are not installed alongside first-phase latrines.

## METHODOLOGY

Oxfam GB co-designed the handwashing kit with Dunster House, a UK supplier of wooden buildings, and the Royal College of Art. Oxfam GB conducted a pre-

test of the prototypes and improved it through a year-long iterative process with beneficiaries. The kit has been piloted with refugee populations in Tanzania and Uganda in communal and institutional settings with adult men, women, children and people with disabilities.

## SPECIFICATIONS

The 30 L capacity allows for 300 episodes of handwashing with soap before it needs to be refilled. Affordable and easy to transport and assemble, the kits can rapidly be deployed alongside communal latrines in an emergency setting. A collection tray prevents water splashing on the users and the mirrors are an attractive feature. The height-



adjustable tripod legs facilitate easy usage including by people with physical disabilities and children. The large reservoir reduces frequency of filling and means it can be used with large populations (eg, in schools). The handwashing kit is appropriate for rapid deployment and for use in communal settings before household-level sanitation and hygiene facilities have been installed. The kit requires only one refill per day for communal latrines serving 10 households, and two refills for institutions (with about 600 users). While this means water availability should be guaranteed before installation, it also means that in addition to improved public health outcomes, the kit allows for time saving in terms of staff and logistics.

## IMPACT

Evaluation results from first trial phase show an increase in handwashing practice where the kits were installed. Trials in Tanzania Nduta refugee camp showed lower disease incidences, and data from Uganda are currently being analysed. The kits were marked as easier to use for vulnerable groups (young children, elderly persons and persons with disabilities), easier to maintain, attractive, motivating and more durable than other handwashing stations within the camp.

## GAPS

The project team is currently evaluating the second phase of the trial in an acute emergency in Africa and plans to take the final design to scale. This design incorporates all learnings to date. Work with a manufacturer is ongoing to support scale up.

## NEXT STEPS

The designer is currently working on a final prototype based on the feedback from the trials. Oxfam GB is seeking further funding to scale up use in different emergencies, promote to other NGOs and governments and sell through Oxfam Supply Centre.



Credit: Oxfam GB

**KEYWORDS** handwashing; handywash tap; public health promotion; sanitation; emergency WASH; hygiene; soap; WASH innovation

## FIND OUT MORE

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Gulland, A. 2018. 'New handwashing station offers a clean slate for refugee sanitation' in *The Telegraph* online 1 August.

Stock, M. 2018. 'Oxfam's solution to hand hygiene in refugee camps' via Reuters online 21 June.

# IMPROVING ACTION FOR MENSTRUAL HYGIENE MANAGEMENT IN EMERGENCIES

## IFRC & PARTNERS

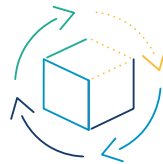
> The IFRC and partners developed, piloted and internally disseminated guidance, videos and tools to help volunteers implement menstrual hygiene management (MHM). These resources facilitate a more responsive, integrated approach to MHM across IFRC operational units.

STAGE OF  
INNOVATION



Scale

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Response

## BACKGROUND

The IFRC recognised a lack of awareness of the issues and risks associated with MHM in emergencies at a strategic, decision-making level both within the IFRC and the wider humanitarian community. Menstrual hygiene needs continue to be overlooked or poorly addressed, often in a belated, 'piecemeal' and uncoordinated way by humanitarian actors.

## METHODOLOGY

The IFRC designed three different types of MHM kit (disposable, reusable/washable, and combination disposable and reusable) in a participatory way with women and girls through focus group discussions.

They then distributed the kits to over 2,000 women and girls in Burundi, Uganda, Somaliland and Madagascar. To measure use, effectiveness, and impact, the IFRC conducted quantitative surveys and qualitative follow-ups one and three months following distribution. More recently, through participatory workshops, the IFRC developed resources to train IFRC volunteers in implementing the new kits. These resources include evidence-based guidance, two educational videos and 13 implementation tools. The IFRC are currently distributing these resources to units in Asia, the Middle East, Africa, Europe and the Americas. Through a participatory approach, they will test and refine the tools, using insights to inform dissemination across the IFRC's 191 national societies.



*Credit: IFRC*

## FINDINGS

Testing the MHM kits reinforced the need for a multifaceted approach to MHM that encompasses not only sanitary pads but a range of additional products, amendments to infrastructure and information. Awareness of MHM exists, but in current practice, it often takes two to six months from disaster onset for practitioners to consult with women and girls and procure appropriate supplies. The IFRC's kits and resources address this problem by providing evidence-based tools that support a quicker response.

## IMPACT

The IFRC's research in Burundi, Uganda, Somaliland and Madagascar showed that women and girls' dignity, health and knowledge improved following MHM kit distribution and promotion of menstrual hygiene. The IFRC found that these efforts helped reduce girls' and women's irritation and itching (by 32% in Burundi), embarrassment (by 22% in Uganda) and restriction in daily life (by 72% in Somaliland) during their periods. The IFRC has yet to establish the impact of disseminating the implementation resources across IFRC units as this project is ongoing.

## GAPS

Piloting the kits and resources in different contexts will inform their continued development. It will also

promote their acceptance and adoption by various humanitarian actors within and beyond the IFRC.

## NEXT STEPS

The IFRC will continue to iteratively improve the kits and resources based on practitioner feedback, and adapt them to ensure they complement other internal and external initiatives without duplicating efforts. As part of these efforts, they plan to develop and trial an e-learning platform.

**KEYWORDS** menstrual hygiene management; East Africa; dignity of women; dignity kits; operational coordination; volunteer training

## FIND OUT MORE

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# SAFE WATER

> Providing safe water to drink is essential for public health in emergencies. Without safe water, infectious diseases including hepatitis E, cholera and other diarrhoeal diseases can quickly spread causing suffering and loss of life. In emergency situations, the need for simple-to-use, easy-to-transport and effective mechanisms for ensuring access to clean water is paramount.

Based on the Gap Analysis, the Problem Exploration Report on Water Treatment, and on consultations with WASH practitioners, the following priorities stood out: the lack of an evidence base for the effectiveness of commonly used treatment technologies such as household water filters in humanitarian settings; the lack of low tech, simple solutions which are acceptable, maintainable and sustainable by the local population; and the limited evidence and guidance on safe water provision, especially when it comes to water chlorination and other disinfection protocols.

To address these challenges, we have prioritised innovations looking to:

1. Build evidence of the effectiveness of existing household water filters in a humanitarian setting,
2. Develop innovative emergency household and community water treatment technologies or adapt existing technologies,
3. Develop rapid and effective tools and methods to monitor and test water quality in emergencies and
4. Develop research and guidance for safe water provision.

## EVIDENCE ON EXISTING WATER FILTERS

### HOUSEHOLD WATER TREATMENT AND SAFE STORAGE KNOWLEDGE BASE p. 28

CAWST's interactive online Knowledge Base gives practitioners access to information on contextually appropriate point-of-use water treatment technologies and their implementation.

### EVALUATING HOUSEHOLD WATER FILTERS IN EMERGENCY CONTEXTS p. 30

University of Applied Sciences and Arts Northwestern Switzerland, Cesvi, Caritas and Eawag conducted an independent evaluation of five types of household filters implemented in three emergency contexts.

## INNOVATIVE TREATMENT TECHNOLOGY

### FAIRCAP OPEN WATER FILTER p. 32

Faircap and Oxfam developed a small, portable, low cost, easy-to-use water filter that can be screwed on to standard plastic beverage bottles. It removes sediment and 99.9% of bacteria.

### TULIP FLOW SIPHON WATER FILTER FOR EMERGENCIES p. 34

Basic Water Needs and partners developed a portable, gravity-operated water purifier that is easy to use and store.

### HOUSEHOLD WATER TREATMENT SYSTEM CHLORINE DOSER p. 36

MSR Global Health's household drinking water treatment system is intuitive, simple, low-cost and combats all microorganisms causing diarrhoeal disease.

### 'PLATE SETTLER' WATER TREATMENT (CLARKE SYSTEM) p. 38

University of Laval and Oxfam GB's CLARifier Kit for Emergencies (CLARKE) system is a cost-efficient bulk water treatment kit capable of treating high-turbidity water without clogging.

## TESTING WATER QUALITY

### AN IMPROVED TEST FOR BACTERIAL WATER CONTAMINATION p. 40

WaterScope and Oxfam developed an inexpensive rapid water testing system capable of identifying bacterial presence in less than six hours. A cartridge allows tests to be performed in the field without access to a lab.

### VIRWA: AN AFFORDABLE POINT-OF-USE TEST FOR DETECTION OF ENTERIC VIRUSES AND VIRAL FAECAL INDICATORS IN WATER p. 42

University of Barcelona, Oxfam Intermon and partners developed a three-step process for testing water samples for the presence of viruses at point of use.

### REALTIME MONITORING AND REPORTING OF WATER IN REFUGEE CAMPS p. 44

BRCK, UNHCR and partners developed a custom 'internet of things' reporting tool to enable remote monitoring of water usage and chlorine levels in humanitarian camps.

## SAFE WATER PROVISION

### SAFE WATER FOR REFUGEES p. 46

MSF Netherlands and University of California, Berkeley created field evidence-based guidance for water chlorination in emergency settings.

### WADHE: WATER DISINFECTION PROTOCOLS FOR HEPATITIS E VIRUS p. 48

Oxfam Intermon developed standard protocols for Hepatitis E virus (HEV) water disinfection to support humanitarian actors intervening in HEV epidemics.

## SEE ALSO

EVALUATING THE EFFECTIVENESS OF SAFE DRINKING WATER IN TREATMENT OF SEVERE ACUTE MALNUTRITION p. 86

# HOUSEHOLD WATER TREATMENT & SAFE STORAGE KNOWLEDGE BASE

## CAWST

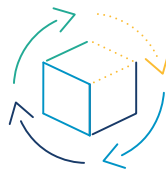
CAWST's interactive online Knowledge Base gives practitioners access to information on contextually appropriate point-of-use water treatment technologies and their implementation. The platform has a global reach across 107 countries, with over 500 users accessing it monthly.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

In an emergency, humanitarian WASH practitioners have to choose from a number of point-of-use water treatment options. But they often lack the technical, contextual or experience-based information to help them select and implement these products or technologies. Current or historical knowledge of the implementation of solutions in specific regions prior to an emergency is also limited.

## METHODOLOGY

CAWST will use the Knowledge Base's first release – the current working version – to engage with users for feedback. They will use the feedback in combination with user analytics to make content and user

interface improvements. This iterative approach to system development will ensure cost-effectiveness, relevancy and usability of CAWST's Household Water Treatment and Safe Storage Knowledge Base.

## SPECIFICATIONS

CAWST's Knowledge Base provides a neutral space for practitioners to get a full picture of point-of-use water treatment technology beyond what each manufacturer provides. It also shares real experiences of implementing the technologies. Registered engineers specialised in point-of-use water treatment moderate contributions to verify product information and ensure quality and accuracy of Knowledge Base entries. The platform is web-based and available as an offline-first mobile



*Credit: CAWST*

application, allowing access to information without internet connection. The ‘product progression’ feature in the app shows the extent to which a product has been independently tested and implemented. The ‘project map’ allows users to see if a product has already been implemented in the area in which they work, and by whom. ‘Country focus’ pages provide information on the enabling environment in a specific country.

## IMPACT

The platform has achieved a promising global reach over the course of the funding period, with users from 107 countries and over 9,000 unique user sessions. The platform is accessed by over 500–600 users each month and has garnered interest from lead WASH Advisors. It is currently accessible in three languages: English, French and Spanish.

## GAPS

The information is practitioner-focused with the intention of supporting the implementation of solutions. However, detailed implementation approaches for the various solutions are not yet available and require additional expertise. This is currently CAWST’s priority.

## NEXT STEPS

Further development of the platform in the coming year will include additional content (projects, experiences, research and key documents) relevant to emergency practitioners as well as minor user interface improvements. More extensive engagement with the WASH Cluster is also planned, including engaging key experts and showcasing events. Once the platform reaches a more mainstream user base in the WASH sector, CAWST will undertake a usability and effectiveness study to get more information on what functionality, features and content will better support WASH practitioners.

**KEYWORDS** point-of-use; household water treatment; knowledge base; knowledge management; technical support

## FIND OUT MORE

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CAWST. 2018. ‘Household water treatment and safe storage (HWTS): Knowledge Base’ at [hwts.info](http://hwts.info).

# EVALUATING HOUSEHOLD WATER FILTERS IN EMERGENCY CONTEXTS

FHNW, CESVI, CARITAS & EAWAG

> University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Cesvi, Caritas and Eawag conducted an independent evaluation of five types of household filters implemented in three different emergency contexts to understand user and implementer preferences and monitor performance.

STAGE OF  
INNOVATION



Pilot

CATEGORY OF  
INNOVATION



Research & Guidance

PHASE OF  
EMERGENCY



Response

## BACKGROUND

Household water treatment devices are an essential element within humanitarian emergencies to improve the quality of drinking water and achieve a positive health impact. Many household water treatment products have shown technical efficacy in lab settings. However, there is limited evidence that these products are used correctly and consistently in emergency settings and perform satisfactorily in these contexts.

## METHODOLOGY

Elrha's HIF pre-selected five types of filters through an open evaluation process. Working with these filters, project partners evaluated a total of

420 filter units during a 10-month period in rural communities in the Occupied Palestinian Territories, rural communities affected by drought in Northern Kenya and in informal camps in Somalia. The methodology included a quantitative assessment of the filters' performance, including integrity control and monthly microbial water quality testing; user-centred evaluation using structured observations, focus group discussions, semi-structured in-depth interviews and a co-design workshop; and a multi-criteria decision analysis workshop.

## FINDINGS

All filters showed at least 99.9% bacterial removal under laboratory conditions. The integrity tests in Palestine showed that 93% of all filters removed



Enterococci bacteria by more than 99%, while 62% of filters removed more than 99.9% of bacteria. Ultrafiltration membrane-based filters performed generally better than ceramic filters in regard to bacteria removal and flowrate. Re-contamination was observed in all settings. Generally, aspirational products with high flow rates were valued most. This was true in Kenya where the large capacity (15 L) as well as availability of the safe water storage container were important factors for users. In Kenya, soft plastic parts were at risk or perceived to be at risk from damage by rodents.

## IMPACT

As a result of this intervention, affected communities have access to cleaner and safer water. No formal impact assessment has been conducted, but the project team collected questionnaire responses in addition to reported data. Palestinian communities expressed a general interest in buying filters, and Palestinian water authorities expressed interest in distribution. Based on this study, UNICEF have also expressed interest in investigating household water filters further.

## GAPS

The market for household water treatment products is growing fast. The design and user interface features vary widely between the five different filters tested in this project, but they did not cover all the different technology options. Furthermore, predicting the long-term performance of filters based on this field study is difficult due to its relatively short duration (10 months).

## NEXT STEPS

The project partners will publish findings as a peer-reviewed article, and will share them widely with WASH practitioners and filter manufacturers in a range of workshops and conference presentations.



*Credit: FHNW*

Cesvi and FHNW are currently using elements of the methodology developed in this study in ongoing projects. The project partners will also share a filter integrity control method developed during this study.

**KEYWORDS** household water filters; household water treatment and safe storage (HWTS); household drinking water treatment; filter design

## FIND OUT MORE

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# FAIRCAP OPEN WATER FILTER

## FAIRCAP & OXFAM

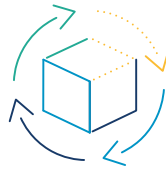
> Faircap and Oxfam developed a small, portable, low cost, easy-to-use water filter that can be screwed on to standard plastic beverage bottles. It removes sediment and 99.9% of bacteria in lab tests adhering to WHO standards. A virus-removing version is in development.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation

## BACKGROUND

Access to clean drinking water is often limited during emergency relief situations, especially during the first days of an emergency. During refugee migrations, the added problem of being 'on the move' exacerbates this situation.

## METHODOLOGY

The Faircap Open Water Filter (Faircap) has been lab tested for removal of *Escherichia coli* (*E. coli*) by Bachema AG (Switzerland), an independent lab, as well as the Virus Research Lab of the University of Barcelona. These tests followed WHO guidelines for testing household water filters, using the recommended water specifications (reducing water measuring 40 NTU to less than 1 NTU). This water filter can be considered as highly effective as

it performs over log 4 removal or 99.99% removal of bacteria; when challenged with a test sample containing 10% water combined with faecal and organic matter, it had a log 3 removal rate.

## SPECIFICATIONS

The filter is easy to use, portable and highly effective against bacteria and larger pathogens. It has a very high flow rate compared to ceramic filters and a low weight and small size to reduce transportation costs. Faircap can filter directly between water source and consumer at point of use. It has a flow rate of 0.5 L/minute and an estimated life of up to 1,000 L depending on the water source. If the water source is less turbid, the life of the product will be extended. When the filter is no longer working, the flow ceases and the device becomes unusable, making it impossible to use a filter that is no longer active.



*Credit: Faircap*

The approximate cost per filter is £3–4 at the point of origin. A gravity-fed family version (intended for a 5-person household) connects to a bucket and would have a cost of £5–8. A major advantage of the filter over comparable products is that its filtration effects can be made visible between filtering and consumption; turbid water can be filtered into a glass to demonstrate its effects.

## IMPACT

The bottle has been tested in Kenya with 30 young women and the family version has been tested with 25 families in urban as well as rainforest settings in Peru. In each location, it was well received.

## GAPS

Although it is possible to demonstrate the product's filtering effects, potential lack of confidence from end-users is still a possible barrier to uptake. The current version of the filter effectively filters out bacteria, but a viral version is still in development. User experience, user feedback and health impact are all yet to be assessed.

## NEXT STEPS

More field testing is needed, specifically a large-scale pilot in the field. Faircap is actively seeking partner organisations to help facilitate this testing in any humanitarian context.

**KEYWORDS** water filter; E. coli; clean drinking water; purifier; portable low cost water filter

## FIND OUT MORE

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# TULIP FLOW SIPHON WATER FILTER FOR EMERGENCIES

## BASIC WATER NEEDS & PARTNERS

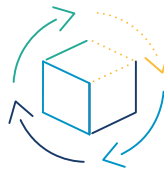
> Basic Water Needs and partners developed a portable, gravity-operated water purifier that is easy to use and store. It has a modular design (filter, activated carbon and pre-filter), which makes it versatile, affordable and low-waste.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Humanitarian responses lack technologies for making water safe that are easy to use and operate, affordable, require no energy or infrastructure, are packable and efficient in transport, provide at least enough safe water for one family for one year and are robust and lightweight.

## METHODOLOGY

The Basic Water Needs team developed and piloted the Tulip FLOW filter in the laboratory, and tested 24 filters in two small-scale user tests on three continents. Evidence from the lab and feedback from users helped improve the filter. However, the Basic Water Needs team has not yet had the opportunity to test the filter as part of a humanitarian response.

## SPECIFICATIONS

The Tulip FLOW filter is gravity operated with a high flow rate of over 30 L/hour of water in non- or low-turbid situations. Over time, through non-reversible bio-fouling, the flow decreases. Depending on the circumstances, the lifespan is about 20,000 L. Bacterial and protozoa removal is 99.99% (log4). It does not protect against viruses. The complete packaged product costs less than £16. Because of its modular design, replacements for the activated carbon and the washable pre-filter are very affordable. The activated carbon improves the taste, colour and smell of the treated water, which evidence shows is a huge benefit for the user. The membrane filter is designed to be able to fit into almost any jerrycan, as well as in a table top with safe

storage. The modular design provides a choice to add activated carbon and/or a pre-filter, improving performance with turbid raw water. Performance in these circumstances however needs to be tested. Backwashing is done using the syringe provided. The filter is lightweight, packable, easy to store and to operate. It has no fail-safe. It is designed to be affordable, using sturdy materials.

## IMPACT

Several prototypes have previously been tested with users in non-emergency situations. Based on these results, the configuration and design have been adapted; however, field testing in a humanitarian response setting is needed to assess the innovation's impact.

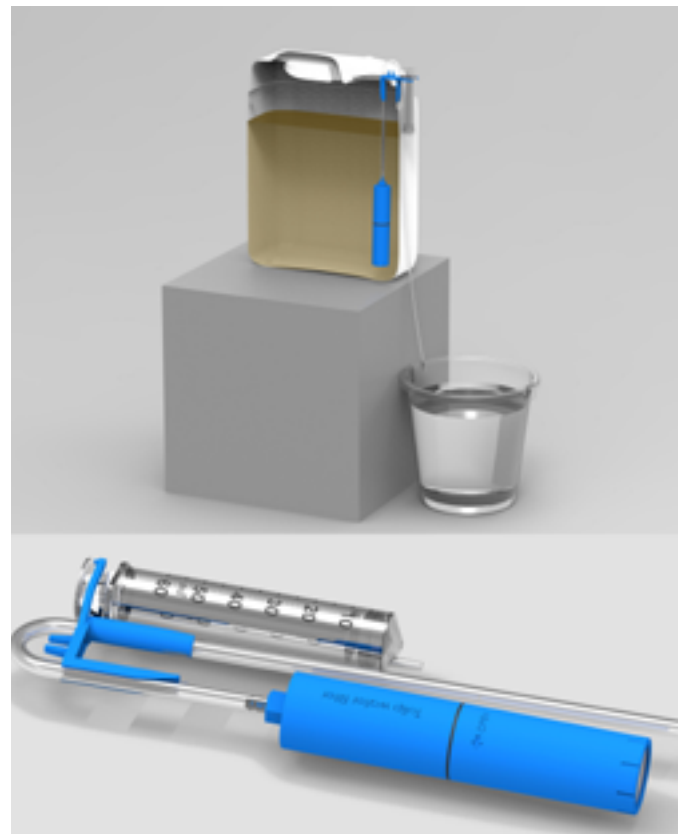
## GAPS

There are at least two areas needing further research and testing: a more elegant integration of the backwash function (building on an earlier design rejected after user tests), and a prolonged test in typical situations requiring a humanitarian response (including turbid raw water).

## NEXT STEPS

As a non-humanitarian actor, Basic Water Needs is currently seeking collaboration with humanitarian agencies to generate further evidence and potentially use this in support of (open) collective further innovation.

**KEYWORDS** drinking water; filtration; purifier; micromembrane filter; activated carbon; point-of-use (POU)



*Credit: Basic Water Needs*

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## FIND OUT MORE

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# HOUSEHOLD WATER TREATMENT SYSTEM CHLORINE DOSER

MSR GLOBAL HEALTH

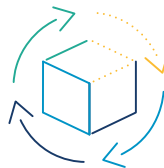
MSR Global Health's household drinking water treatment system is intuitive, simple, low-cost and combats all microorganisms causing diarrhoeal disease. The design is modular, open source and can provide up to 6,000–10,000 L of safe drinking water.

STAGE OF INNOVATION



Invention

CATEGORY OF INNOVATION



Product & Process

PHASE OF EMERGENCY



Stabilisation, Recovery

## BACKGROUND

As the second leading cause of death in children under five, diarrhoeal disease takes the lives of more than half a million children worldwide each year. Existing preventative solutions targeting water treatment are often too expensive, not suitable for all environments, treat inadequate amounts of water or are ineffective against all pathogens.

## METHODOLOGY

MSR Global Health developed their household water treatment system according to the needs of families who will ultimately use the system. By studying daily habits and routines, community and family structures and awareness levels of end-users, the MSR team designed the treatment system to ensure a higher

level of acceptance. The household water treatment system is engineered to be intuitive and simple. Its technology combats all microbiological agents that lead to diarrhoeal disease and provides safe water from a wide spectrum of water source types. The design uses PATH's C1 Common Interface; this makes it a universal, modular, open source platform for other parties with appropriate purification technologies.

## SPECIFICATIONS

The household water treatment system is capable of providing 6,000–10,000 L of safe drinking water, depending on the condition of the water source. The system's clear end-of-life indicator alerts the user when the system has surpassed its capacity to provide safe drinking water by shutting off flow.

## IMPACT

At the time of writing, this project was at too early a stage to report on impacts.

## GAPS

After the current prototype has been updated based on feedback from practitioners, the system will return to the laboratory for validation. Once validation is complete, field trials will be conducted on the household water treatment system. As it uses chlorine, there may be some taste; user testing will look at how to keep this at an acceptable level. The system is still in need of additional development and it is not currently available for purchase.

## NEXT STEPS

Additional development is needed on the chlorine dosing system to ensure consistent levels are produced over months of use. Several recommendations were also received for adaptation, including the provision of a physically easier means for removing the chlorine tablet and improving the system's ease of assembly. MSR Global Health is also actively looking for humanitarian partners to enable long-term field testing with users.

**KEYWORDS** water treatment; water innovation; drinking water; low cost; household; chlorine; emergency response; displaced peoples; diarrhoeal disease



*Credit: MSR Global Health*

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# PLATE SETTLER WATER TREATMENT (CLARKE SYSTEM)

UNIVERSITY OF LAVAL & OXFAM GB

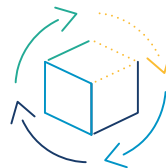
> University of Laval and Oxfam GB's CLARifier Kit for Emergencies (CLARKE) system is a cost-efficient bulk water treatment kit capable of treating high-turbidity water without clogging. It was successfully developed, optimised and field tested and is now being commercialised.

## STAGE OF INNOVATION



Scale

## CATEGORY OF INNOVATION



Product & Process

## PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

A main limitation of current emergency water treatment kits is their inability to treat water with high turbidity; they are often vulnerable to 'clogging'. This limits the quantity of water they can produce. The Plate Settler project aimed to develop a cost-efficient water treatment kit able to overcome such limitations.

## METHODOLOGY

Proof of concept was first conducted to establish the capacity to treat large volumes of water with significant turbidity reductions. Following this, the development and initial testing (ie, against water quality targets determined by Sphere guidelines) of the CLARKE prototype

was conducted. This was followed by a carefully controlled design optimisation and field testing in Juba, South Sudan to validate the final design in a humanitarian setting.

## SPECIFICATIONS

The CLARKE system provides a throughput of 6 m<sup>3</sup>/hour of clarified water (< 5 NTU). It can function continuously (tested for up to 8 hours) without compromising production due to blockages or deterioration of water quality. It is relatively easy to set up and operate with adequate training. The capital cost of the CLARKE system is approximately £8,000. This includes only the water treatment kit; tanks and extra pumps may be needed depending on the set-up.



## IMPACT

Field testing revealed that with adequate training (ie, similar to any conventional chemically-assisted water treatment operation), the system was able to perform to design expectations. The team has discussed the application of the kit to the Rohingya crisis response in camps in Bangladesh given the need for increased water production rates with changing water quality during monsoon season. At the time of writing, however, there have been no further deployments.

## GAPS

The CLARKE system still relies on chemically-assisted (ie, coagulation) sedimentation. Some operators do not like having to do jar-tests to determine optimal coagulant doses. It may not be ideal for water supply in situations where the affected population is dispersed.

## NEXT STEPS

The CLARKE system has been successfully developed, optimised and field tested. AquaPlus Water Purifiers (Pune, India) was one of the industrial partners involved in the development of the system and will be responsible for the commercialisation of the CLARKE system.

**KEYWORDS** bulk water treatment; centralised; coagulation; flocculation; clarifier; inclined plate settling



*Credit: University of Laval*

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Bédard G. et al. 2015 'Inclined plate settling for emergency water treatment: final design' at 38th WEDC International Conference, Loughborough, UK.

Dorea, C.C. et al. 2014. 'Inclined plate settling for emergency water treatment: towards optimisation' at 37th WEDC International Conference, Hanoi, Vietnam.

# AN IMPROVED TEST FOR BACTERIAL WATER CONTAMINATION

WATERSCOPE & OXFAM GB

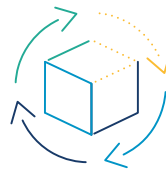
> WaterScope and Oxfam GB developed an inexpensive rapid water testing system capable of identifying bacterial presence in less than six hours. A cartridge allows tests to be performed in the field without access to a lab. WaterScope is faster than current systems, enabling a faster emergency response.

STAGE OF INNOVATION



Pilot

CATEGORY OF INNOVATION



Product & Process

PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

In humanitarian settings, current water testing equipment is complex, bulky, expensive and slow, taking at least a day to give results. This leads to infrequent testing and poor dissemination of results to key stakeholders in the community. The effect is that people do not know if their water is safe to drink.

## METHODOLOGY

Following initial product design, WaterScope is testing the solution weekly in Cambridge, UK against the established 'gold standard' method using conventional bacterial colony counting. A field trial with Oxfam in Nyarugusu refugee camp, Tanzania was also conducted. Working with Oxfam WASH

engineers, the trial sampled 20 different sources including boreholes, communal and household taps and the local river for quality control. The results were compared to lab test results.

## SPECIFICATIONS

Running a test with the WaterScope cartridge requires 100 mL of water. Each cartridge lasts for one test, and currently the process takes 18–24 hours. WaterScope costs an estimated £4,000 for the testing system, with each cartridge costing less than £0.40. Data from the device can be downloaded and automatically quantified and displayed as a number that is more easily interpreted than raw data.



Credit: WaterScope

## FINDINGS

WaterScope is faster than current systems, allowing for a faster emergency response – but it is still not instantaneous. It is appropriate for routine testing as it is portable and much simpler than current methods, allowing for tests to be done on site without complex sterilisation and sample handling steps. However, initial upfront cost may present a barrier to local community workers purchasing independently rather than through an NGO. Testing is still in progress to establish WaterScope's robustness and shelf life.

## IMPACT

WaterScope is still in early stages of testing, but the field testing elicited feedback from WASH engineers, who favoured its simplicity and trustworthiness of results. WASH engineers can be trained in 20 minutes to correctly run a test.

## GAPS

WaterScope is still in prototype stage and needs to be validated further in different extreme environments to ensure that the system is robust. Establishing its consistency across these environments and a variety of users is the main concern.

## NEXT STEPS

The WaterScope team ultimately aims to help get water safety information from experts to community members faster and more transparently in a way people can understand. The team will continue to reduce the time needed to run the test and refine the display modes so test results are easily interpreted. They will soon be filing for intellectual property on the cartridge. In January 2019 they will test the system in further humanitarian contexts with Oxfam in Bangladesh and India. WaterScope are looking for further funding and partners to scale up and support commercialisation by 2020.

**KEYWORDS** water contamination; WASH; coliforms; Escherichia coli (E. coli); microscope, water testing

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# VIRWA: AN AFFORDABLE POINT-OF-USE TEST FOR DETECTION OF ENTERIC VIRUSES & VIRAL FAECAL INDICATORS IN WATER

## UNIVERSITY OF BARCELONA, OXFAM INTERMON & PARTNERS

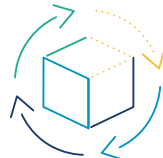
> University of Barcelona, Oxfam Intermon and partners developed a three-step process for testing water samples for the presence of viruses at the point of use. The process does not require specialist equipment and enables field practitioners to carry out testing with very little training.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

In humanitarian crises, monitoring drinking water for harmful microorganisms is crucial for ensuring its safety. Rapid and accurate diagnosis of water quality at the point of use provides data that can be used to design adequate plans to prevent outbreaks of diarrhoea and related diseases. However, all available commercial solutions for water testing in the field test only for the presence of harmful bacteria such as *Escherichia coli* (*E. coli*), and these do not always correlate with the presence of harmful viruses, which can also cause disease. If water is tested only for bacteria, it may still contain harmful viruses.

## METHODOLOGY

The VirWa test is a three-part process involving concentration, extraction and detection. To detect viruses in water, samples must first be concentrated. This is usually done with large, expensive, electrical centrifuge equipment or with filters vulnerable to clogging. The VirWa test instead uses milk and citric acid to cause 'flocs' (clumps) of viruses to form in 10 L of water over a period of 15 hours, which concentrates them to testable levels. After this step, the viral concentrates may be sent to reference laboratories for extraction and detection, or this can be done in the field if a thermocycler is available.

## SPECIFICATIONS

All material and small equipment needed to perform the VirWa test can be packed in a wheeled suitcase. Training is provided via a video and booklet. The VirWa test does not require any power or freezing conditions and can be conducted with minimal equipment at room temperatures (around 30°C). The test, especially the concentration step, is easy to conduct with limited training. Cross-contamination is prevented through gloves, lids on buckets and the use of a control during the detection phase. The test is not recommended for a single analysis and should instead be set up as routine practice.

## IMPACT

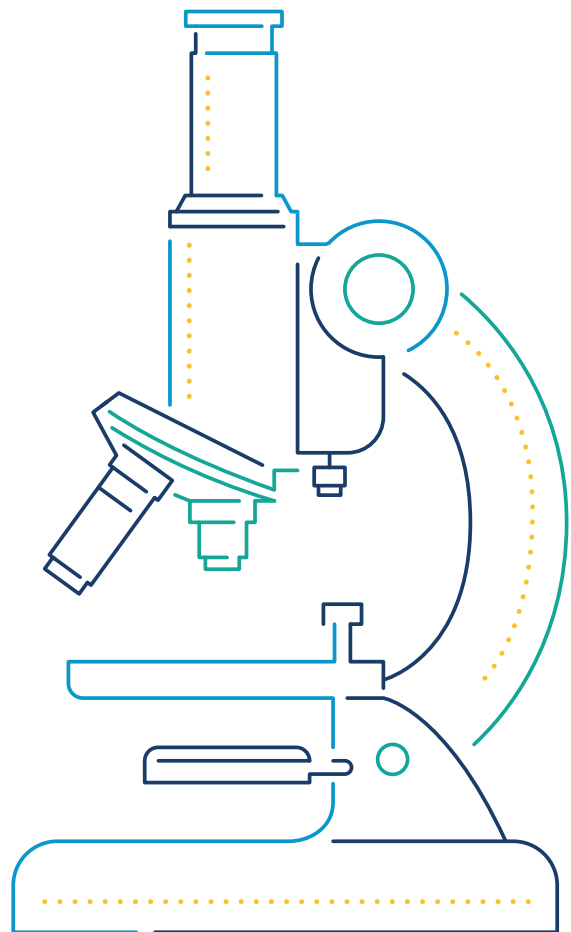
Oxfam teams have implemented the VirWa test in Ecuador and the Central African Republic. Oxfam recognised the test's usefulness in early detection of waterborne disease and has expressed interest in participating in further field trials. Further pilots are needed in order to assess the test's ease of use and effectiveness in the field.

## GAPS

In both field test settings, testers successfully carried out the concentration step and sent samples to a reference lab for extraction and detection. The extraction and detection parts of the methodology have not yet been performed in the field, so more testing is needed to validate the complete VirWa test in different contexts.

## NEXT STEPS

The VirWa test is currently at a pilot and iteration stage, and the team is actively looking for humanitarian agencies to collaborate with on further field testing. The University of Barcelona is hoping to further adapt the innovation to user requirements in the field and is prepared to provide training and support to testers.



**KEYWORDS** water contamination; WASH; coliforms; Escherichia coli (E. coli); microscope; water testing

## FIND OUT MORE

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# REALTIME REMOTE MONITORING OF WATER IN REFUGEE CAMPS

BRCK, UNHCR & PARTNERS

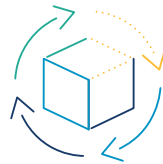
BRCK, UNHCR and partners developed a custom 'internet of things' reporting tool to enable remote monitoring of water usage and chlorine levels in humanitarian camps. The tool collects and transmits data without requiring in-person visits. This is an advantage in situations where security is a concern.

STAGE OF INNOVATION



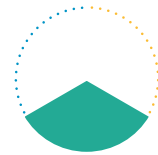
Pilot

CATEGORY OF INNOVATION



Product & Process

PHASE OF EMERGENCY



Stabilisation

## BACKGROUND

UNHCR (WASH) was having difficulty determining how much water was being used in Dadaab camps in Kenya due to security concerns when staff were traveling between metered boreholes. To overcome this challenge, Dadaab WASH programme staff sought a remote monitoring solution. However, when investigating off-the-shelf options, they found that numerous solutions fell short of their requirements.

## METHODOLOGY

Firstly, BRCK developed ten prototypes of the PicoBRCK(Water), including hardware peripherals,

bespoke electronics and code. Then, they identified and sourced a chlorine sensor to develop one prototype of the PicoBRCK(Chlorine). BRCK updated the software system to allow the PicoBRCKs to send water flow and chlorine information to the cloud so it could be accessed and analysed. The team also configured PicoBRCKs to automatically update software in order to eliminate the need for them to be transported to the plant for periodic updating.

## SPECIFICATIONS

The PicoBRCK Dadaab solution is customised for the Dadaab context, but has potential to be applied in a

range of other contexts where safety issues prevent frequent monitoring, or to save staff time and cost on travelling to water points. Minimal training is required to install the PicoBRCK solution, and no tampering of the water line is required. PicoBRCK is rugged, solar-powered and lasts indefinitely.

## IMPACT

Previously, water meter reading and chlorination testing in Dadaab was a challenge based on the security and the distances involved. With PicoBRCK, the data enable remote data acquisition which mitigates the risks associated with requiring staff to read the water meters and to test chlorine levels. Monitoring and evaluation is in progress, so a full impact assessment will soon be available.

## GAPS

A dashboard to display PicoBRCK's readings will need to be approved by WASH staff to confirm it displays the information they require.

## NEXT STEPS

As development continues, BRCK will replace the deployed units with updated PicoBRCK hardware and will continue to monitor data. BRCK will continue developing the PicoBRCK hardware with a focus on water monitoring. This project has also enabled other potential applications in the humanitarian sector that could benefit from remote monitoring.

**KEYWORDS** BRCK; chlorine; water; monitoring; IoT; analytics; meter; Dadaab



*Credit: BRCK*

## FIND OUT MORE

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Alucho, C. 2018. 'PicoBRCK for WASH – UNHCR, Dadaab refugee complex' on BRCK blog.

# SAFE WATER FOR REFUGEES

## MSF NETHERLANDS & UNIVERSITY OF CALIFORNIA, BERKELEY

MSF Netherlands and University of California, Berkeley created field evidence-based guidance for water chlorination in emergency settings. It sets multiple chlorination targets for different site temperatures and WASH conditions and has significantly improved household water safety in emergencies.

### STAGE OF INNOVATION



Scale

### CATEGORY OF INNOVATION



Research & Guidance

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Current guidance for water chlorination in humanitarian emergencies is adapted from WHO conventions for water supply in cities. This fails to ensure water is safe because it does not account for chlorine decay after water leaves the tap – a concern in hot and unhygienic camp settings.

## METHODOLOGY

In four refugee camps (in Jordan, South Sudan and Rwanda), MSF monitored water quality changes between tapstand distribution and household consumption. Modelling the chlorine decay data and empirically validating its output against field data established how much free residual chlorine is required at the tapstand in order to ensure

sufficient chlorine residual (0.2 mg/L by convention) at households up to 24 hours later. As a result of this process, MSF specified four chlorination targets for various site temperatures and WASH conditions.

## FINDINGS

Current chlorination guidance in the Sphere guidelines and other humanitarian sector field manuals do not provide adequate water safety in camps in hot settings (ie, where midday temperatures exceed 30°C). Instead, MSF's new guidance should be used in these settings to inform chlorination for bulk water treatment and supply systems, as well as household water treatment programmes. Comprehensive water quality monitoring at both point





Credit: MSF Netherlands

of distribution (tapstand) and point of consumption (in refugees' shelters after typical durations of household storage and use) must accompany implementation of the guidance to assure water safety effectiveness.

## IMPACT

MSF has adopted the new evidence-based guidance in its emergency water supply projects. The guidance improves the proportion of camp households in hot settings that have safe water at the point of consumption to 85% or higher – far over the 15% to 50% that were provided with access when following the Sphere guidelines and similar manuals.

## GAPS

MSF generated the guidance using field evidence from four refugee camps, and carried out a validation study in Tanzania which found the guidance to be effective. However, further study is required to determine field effectiveness in different conditions.

## NEXT STEPS

MSF is building a web-based Safe Water Optimization Tool that builds on the analytics developed in this

research. Using artificial intelligence, the tool will use the routine water quality monitoring data collected at every camp to generate a water chlorination target specific to each. Following development of the tool, MSF will field test it.

**KEYWORDS** water safety; public health; chlorination; water treatment; refugees; IDPs; camps; emergencies

## FIND OUT MORE

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Ali, S.I. et al. 2015. 'Effectiveness of emergency water treatment practices in refugee camps in South Sudan' a bulletin of the World Health Organization.

Ali, S.I. et al. 2017. 'Study report: Evidence based FRC targets for centralized chlorination in emergencies' at MSF Field Research Portal.

# WADHE: WATER DISINFECTION PROTOCOLS FOR HEPATITIS E VIRUS

## OXFAM INTERMON & UNIVERSITY OF BARCELONA

Oxfam Intermon and the University of Barcelona developed standard protocols for Hepatitis E virus (HEV) water disinfection to support humanitarian actors intervening in HEV epidemics. The project also improves understanding of risk factors and routes to infection, as it makes experimental data on HEV disinfection available for the first time.

### STAGE OF INNOVATION



Invention

### CATEGORY OF INNOVATION



Research & Guidance

### PHASE OF EMERGENCY



Response

## BACKGROUND

The WHO estimates that every year, there are approximately 20 million HEV infections worldwide, with 3.3m of these becoming symptomatic cases of hepatitis E; in 2015, an estimated 44,000 of these cases resulted in death. Previous to this project, no experimental data had been published on HEV disinfection.

## METHODOLOGY

Oxfam Intermon and the University of Barcelona's approach was to first develop a baseline of experimental data with different water treatments and respective HEV removal and inactivation levels. They used the resulting coded reports to

then develop a standard operational protocol to disinfect water in emergency settings considering the conditions of specific scenarios.

## FINDINGS

The partners tested the various water disinfection treatments for HEV stability. Following chlorine treatment, the data showed that HEV inactivation parameters achieve 90% inactivation between 0.15–0.12 mg × min/L for HEV from cell culture. Following UV radiation, kinetics showed a 99% disinfection with low fluences (100 J/m<sup>2</sup>). Following rapid flocculation–chlorination treatment, data on inactivation kinetics showed different efficiencies



depending on the commercial preparation of chlorine used: treatment with PUR achieved an inactivation of 91.39% in low-turbidity water and 79.58% in high-turbidity water, while treatment with WaterMaker achieved an inactivation 93.48% in low-turbidity water and 91.51% in high-turbidity water.

## IMPACT

By developing experimental data on HEV stability in water, this project provides humanitarian actors with specific protocols for interventions on water- or foodborne HEV epidemics and improves understanding of risk factors and routes to HEV infection.

## GAPS

Pilot studies in the field are needed to confirm water treatment efficiencies with lab-tested doses.

## NEXT STEPS

The partners plan to conduct a field study in an HEV outbreak scenario (South Sudan) to identify transmission routes by tracking HEV in water matrices. Future implementation

of developed protocols in HEV epidemics will improve understanding of the dynamics of HEV transmission and the efficacy of water treatments in real scenarios.

**KEYWORDS** Hepatitis E virus (HEV); water disinfection protocols; waterborne epidemics

## FIND OUT MORE

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Guerrero-Latorre, L. et al. 2016. 'UV disinfection and flocculation-chlorination sachets to reduce hepatitis E virus in drinking water' in *Int J Hyg Environ Health* 219(4-5): 405-11.



# SANITATION

> The Gap Analysis identified sanitation in humanitarian settings as the area with the most challenges and potential for innovation. The provision of adequate sanitation facilities is one of the key measures to minimise health risks as well as preserve the privacy and dignity of the people affected.

Several priority areas were outlined by the Gap Analysis and Problem Exploration Report on Faecal Sludge Management. These include limited options for storing, treating and disposing of faecal sludge, particularly in areas where building pit latrines is not possible, and the lack of practical guidance on how to set up safe and sustainable faecal sludge disposal. Another core challenge is the limited use of purpose-built latrines as these often fail to address the sanitation needs and practices of affected communities, leading people to prefer open defecation.

To address these challenges, we have prioritised innovations looking to:

1. Develop and effectively disseminate guidance on building faecal sludge disposal sites in emergencies,
2. Develop alternative solutions for faecal sludge storage, treatment, final disposal and drainage,
3. Develop ways of rapidly engaging with affected communities to design better sanitation facilities and
4. Understand links between lighting in latrine areas and gender-based violence.

## FAECAL SLUDGE DISPOSAL

**GUIDANCE ON FAECAL SLUDGE DISPOSAL IN EMERGENCIES – RESEARCH COMPONENT** p. 52  
BORDA investigated how faecal sludge management can be incorporated into preparedness and contingency planning for the OCTOPUS project.

**OCTOPUS: GUIDANCE ON FAECAL SLUDGE DISPOSAL IN EMERGENCIES** p. 54  
With research by BORDA, Solidarités International developed an online collaborative platform to support learning and decision-making regarding faecal sludge disposal in emergencies.

## FAECAL SLUDGE MANAGEMENT

**MICROBIAL SLUDGE QUALITY (MSQ) – FIELD TEST KIT FOR FAECAL SLUDGE MONITORING** p. 56  
University of Natural Resources and Life Sciences and partners developed a field laboratory for the process and public health monitoring of faecal sludge treatment plants in emergencies.

**TIGER WORM TOILETS: SUSTAINABLE, WORM-BASED, COMMUNAL SANITATION FOR REFUGEE CAMPS** p. 58  
Oxfam GB, UNESCO-IHE Delft Institute for Water Education and

partners developed communal toilets using composting worms that reduce maintenance and treatment requirements and improve user experience.

**SPEEDY SANITISATION AND STABILISATION OF FAECAL SLUDGE** p. 60  
WASTE and LSHTM identified, selected, developed and tested effective biological and chemical additives for treating faecal sludge to provide a wider range of treatment options.

## RAPID COMMUNITY ENGAGEMENT

**QATAR RED CRESCENT COMMUNITY ENGAGEMENT PROJECT** p. 62  
Qatar Red Crescent Society ran a user-centred community engagement pilot to help provide sanitation infrastructure that is flexible and adaptable to changing circumstances and needs of users.

**USER-CENTRED ENGAGEMENT FOR CHILD-FRIENDLY SANITATION DESIGN IN EMERGENCIES** p. 64  
Save the Children UK and Eclipse Experience piloted a user-centred community engagement approach using a digital survey tool and co-creation sessions to involve communities in designing child-friendly sanitation facilities.

**USER-CENTRED DESIGN – A BETTER OPTION TO SANITATION FACILITY SUSTAINABILITY** p. 66  
Deutsche Welthungerhilfe and Snook combined user-centred design with other participatory approaches to identify user needs and problems with current sanitation facilities.

**USER-CENTRED SANITATION DESIGN THROUGH RAPID COMMUNITY ENGAGEMENT: LANDSCAPE REVIEW AND EVALUATION OF PILOTS** p. 68  
Oxfam GB and LSHTM assessed the extent to which user-centred design is operationally feasible in the early weeks of an emergency response and evaluated whether such approaches increase community satisfaction with sanitation facilities.

## LIGHTING

**LIGHTING FOR SAFER LATRINES: RESEARCH ON GBV AND LIGHTING AROUND WASH FACILITIES** p. 70  
Oxfam GB and WEDC researched whether lighting in or around WASH facilities reduces the risk of gender-based violence (GBV) in camp settings and made recommendations for comprehensive lighting strategies.

## SEE ALSO

**ALTERNATIVE SANITATION IN PROTRACTED EMERGENCIES** p. 90

# GUIDANCE ON FAECAL SLUDGE DISPOSAL IN EMERGENCIES

## RESEARCH COMPONENT

### BORDA & PARTNERS

BORDA investigated how faecal sludge management (FSM) can be incorporated into preparedness and contingency planning. Findings informed collaboration with Solidarités International to develop OCTOPUS, an online platform for guidance, decision support and peer-to-peer exchange.

#### STAGE OF INNOVATION



Pilot

#### CATEGORY OF INNOVATION



Research & Guidance

#### PHASE OF EMERGENCY



Response, Stabilisation

### BACKGROUND

Existing guidelines on emergency sanitation management insufficiently address the management of human waste and faecal sludge, including the treatment and safe disposal of waste. This is particularly true during the first phase of rapid-onset emergencies. Guidance focusses on latrine construction and is limited in its consideration of safe emptying practices, transport, treatment and disposal of waste; it also fails to provide links between different technologies to indicate how they function together.

### METHODOLOGY

BORDA investigated why few existing guidelines comply with the decision-making process of practitioners. They reviewed 57 guidelines on 8 different technologies for managing faecal sludge in emergencies and conducted an online survey with 93 responses on current practices and sources of FSM decision-making with field practitioners. BORDA also held 14 semi-structured interviews with practitioners to understand their decision-making processes, needs and limitations in the field.

## FINDINGS

Survey results indicated that practitioners generally approve of the use of guidelines, but have the perception that existing ones lack context specificity and may delay implementation or inhibit innovation when consulted. Respondents reported consulting the Sphere guidelines (64%), internal organisational (55%) and Cluster guidelines (53%) or going to peers for advice. Online webinars and courses are not widely utilised. Respondents rely heavily on their own experience or consult technical advisors for decision making, both of which could reinforce existing limitations. About half of the time, decisions on WASH are not made by WASH specific staff but by generalists at management level.

## IMPACT

The findings have been published in a report available online, and will be widely shared with the WASH community. In collaboration with Solidarités International, BORDA are developing an online platform called OCTOPUS (p. 54–55) to provide quick and easy access to guidance and support in decision-making processes around FSM. The platform includes a peer-to-peer exchange and review function.

## GAPS

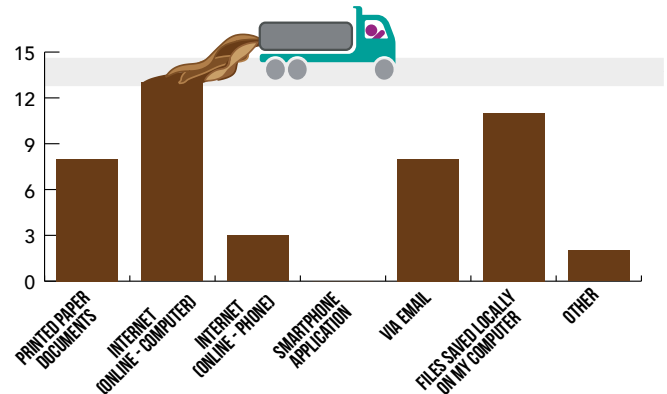
The platform is currently in a Beta version, so the structure, content and user friendliness of the platform need to be tested in the field. Uptake by practitioners using and contributing to the platform will also need to be analysed and facilitated in future iterations.

## NEXT STEPS

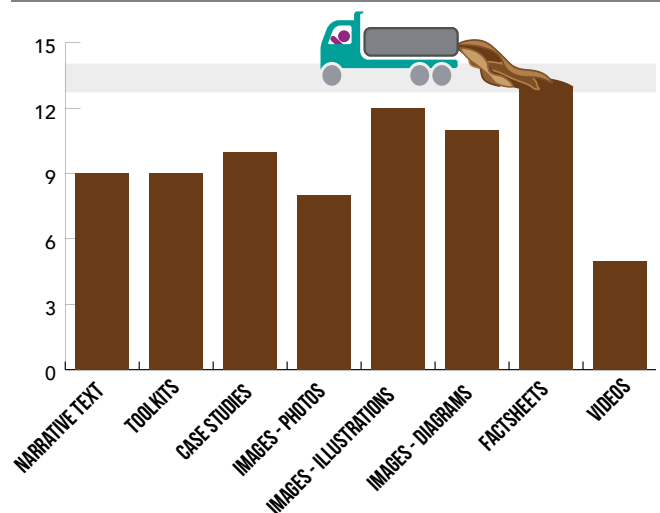
See the following project (p. 54–55) for descriptions of OCTOPUS and next steps.

**KEYWORDS** faecal sludge management; sanitation; human waste management; treatment; safe disposal; decision-making process

### WHERE DO YOU PRIMARILY ACCESS/UTILIZE THE GUIDELINES YOU USE WHEN YOU ARE FACED WITH REAL-TIME DECISIONS?



### WHAT DO THE GUIDELINES YOU CONSULT USUALLY CONTAIN?



Credit: BORDA

## FIND OUT MORE

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Huber, M.S. and Jennings, A. 2018. 'Preparing to be unprepared: decision making and the use of guidance on sanitation systems and faecal sludge management in the first phase of rapid-onset emergencies' via [solidarites.org](http://solidarites.org).

# OCTOPUS: GUIDANCE ON FAECAL SLUDGE DISPOSAL IN EMERGENCIES

SOLIDARITÉS INTERNATIONALE WITH  
BORDA AS RESEARCH PARTNER

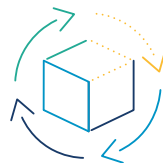
> With research by BORDA, Solidarités Internationale developed an online collaborative platform to support learning and decision-making regarding faecal sludge disposal in emergencies. The platform acts as a 'one-stop shop' tool for disseminating case studies from specific crises.

STAGE OF  
INNOVATION



Invention

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Response

## BACKGROUND

Disposal of faecal sludge is a significant problem during rapid-onset emergencies – in particular the low consideration given to these aspects when deploying responses. Despite the existence of guidance and resources, practitioners often make inappropriate decisions or apply solutions ineffectively. The project was divided into two components: research and dissemination.

## METHODOLOGY

BORDA (p. 52–53) researched field practitioners' decision-making processes and use of guidance for faecal sludge management (FSM) through a literature review, survey and interviews. Following this research, Solidarités Internationale involved practitioners in the development of a web-based tool to disseminate guidance and to help identify key common criteria and indicators for crisis-specific





*Credit: Solidarités International*

case studies. The tool connects with other existing sanitation initiatives.

## IMPACT

OCTOPUS is still in development and has yet to be officially launched. However, the Cox's Bazar FSM working group have been testing the platform and have confirmed the need for and the utility of such a tool.

## GAPS

Input from the global sanitation community will help improve the quality and number of experiences shared on the platform. Testing openly will help link theory to practice regarding the decision-making process at the field level. The process for documenting final guidance based on learning from each crisis will need to be systematised.

## NEXT STEPS

A second phase of the project will allow for the expansion of the platform to address other crises beyond the Cox's Bazar case. According to feedback from a wide group of practitioners, the platform could also be improved by developing search filters to aid decision-making. Ultimately, the aim for the platform is to become the go-to destination for guidance on FSM in humanitarian crises.

**KEYWORDS** faecal sludge management; practice; on-going crisis; theory; discussion; collaboration; coordination; decision-making; comparison

## FIND OUT MORE

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# MICROBIAL SLUDGE QUALITY (MSQ) FIELD TEST KIT FOR FAECAL SLUDGE MONITORING

UNIVERSITY OF NATURAL RESOURCES  
AND LIFE SCIENCES & PARTNERS

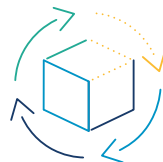
> University of Natural Resources and Life Sciences and partners developed a field laboratory for the process and public health monitoring of faecal sludge treatment plants in emergencies to ensure they operate optimally and dispose of or reuse treatment outputs hygienically.

STAGE OF  
INNOVATION



Pilot

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Response, Stabilisation

## BACKGROUND

Process and public health monitoring of faecal sludge treatment plants, especially during emergencies, is important for environmental safety and public health. The Microbial Sludge Quality project developed and field-tested a field laboratory for this purpose.

## METHODOLOGY

The University of Natural Resources and Life Sciences assembled a minimum set of analytical parameters from several literature sources. To ensure fast set-up and semi-independent operation of the field lab, they

included additional support equipment (buckets, tubes, solar panels, a wind turbine) to the off-the-shelf analytical material. Methods initially followed standard operating procedures, but the project team adapted them to minimise power use, weight and cost. The team tested and redeveloped all the methods and equipment in a laboratory environment before field testing the whole lab in Malawi.

## SPECIFICATIONS

The major advantage of this innovation is that it enables process and public health monitoring

directly in the field. It is cheaper than comparable standardised lab solutions, fits on two standard European pallets and weighs approximately 250 kg. The estimated price of the full field lab (all parameters and all modules) with supplies for 100 samples is €19,100. The field lab can be set up in one day and, depending on local procurement, can be operational within a week. Experienced lab technicians only need a short familiarisation to the field adapted methodology. However, methods are more labour intensive than standard fixed lab methods. Furthermore, for labs in general, logistics can prove problematic due to the need to transport hazardous materials.

## IMPACT

A functioning prototype of a field laboratory for the process and public health monitoring of faecal sludge treatment plants was developed and field tested in Malawi. Throughout the MSQ and the follow-up dissemination project, several humanitarian aid organisations, social enterprises and utilities expressed high interest in the lab. This led the team to increase the degree of modularity to fit this new group of stakeholders. To support the ongoing development of the lab, the project team have partnered with the Austrian Red Cross and Eawag.

## GAPS

While a field ready laboratory solution has now been developed, a field-deployable faecal sludge treatment plant for humanitarian aid operations is still missing. The current proliferation of different treatment options in Bangladesh is a sign that a standardised treatment solution is needed.



*Credit: University of Natural Resources and Life Sciences*

## NEXT STEPS

IFRC has procured, shipped and set up one MSQ field lab for monitoring their faecal sludge treatments in Bangladesh. The project team is cooperating with Eawag for ongoing development and deployment, and the Red Cross and Eawag are developing training materials together. Other WASH-focused organisations have also expressed interest in the MSQ field lab.

**KEYWORDS** faecal sludge treatment; process monitoring; public health monitoring; field laboratory

## FIND OUT MORE

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Bousek, J. et al. 2018. 'Development of a field laboratory for monitoring of fecal-sludge treatment plants' in *Water* 10(9): 1153.

## TIGER WORM TOILETS: SUSTAINABLE, WORM-BASED, COMMUNAL SANITATION FOR REFUGEE CAMPS

OXFAM GB, UNESCO-IHE DELFT INSTITUTE  
FOR WATER EDUCATION & PARTNERS

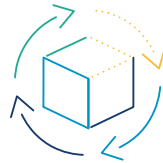
Oxfam GB, UNESCO-IHE Delft Institute for Water Education and partners developed communal toilets using composting worms that reduce maintenance and treatment requirements and improve user experience. In a trial, 99% of households opted to keep the toilets instead of reverting to a previous model.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Stabilisation, Recovery

### BACKGROUND

Providing sustainable long-term sanitation for people living in humanitarian camps is a huge challenge due to the need for frequent and costly emptying and treatment of waste. To help address this, Oxfam GB and IHE Delft adapted the household Tiger Worm Toilet to a communal version suitable for humanitarian application.

### METHODOLOGY

The team tested an initial prototype in Myanmar and adapted the toilet design based on local feedback. A new species of worm (Indian blue worm, *Perionyx excavates*) was trialled, and worms were sourced

from local suppliers and through a project-affiliated wormery. The team then constructed toilets and demonstrated them to the community. They monitored usage and performance over 18 months, gathering regular feedback throughout. Samples were sent for analysis and technical performance, and the team evaluated life-cycle cost and user acceptance. They developed a technical manual to collect their learnings and provide guidance on the use of worm-based toilets in emergencies.

### SPECIFICATIONS

Communal Tiger Worm Toilets allow up to 24 users per toilet. Each toilet block contains two toilets, which are either connected to one single large vault or two



Credit: Bagus Setyawan/Oxfam

smaller individual vaults. Communal vaults require 4 kg of worms. The estimated emptying frequency is three years in favourable conditions. Communal Tiger Worm Toilets also have a superior user experience, offering less odour and better cleanliness. The toilets work in high water table environments, but are dependent on soil infiltration rates. Higher quality control of build is required to prevent predators from entering the vault. Rigorous community engagement is also required to communicate what can and cannot be put into the toilet.

## IMPACT

A total of 99% of households testing the Communal Tiger Worm Toilets preferred them over previous, standard models and opted to keep using them. Management of the camp's sanitation has been taken over by Solidarités International, but Communal Tiger Worm Toilets will continue to be used in the camp due to their high user acceptance, functionality and low initial and operating costs.

## GAPS

Long-term monitoring or follow-up monitoring is needed to establish long-term sustainability. A guaranteed worm supply is also needed for scale-up. Communal Tiger Worm Toilets require a predictable

number of users and so are better suited to family or shared latrines where the context is more stable.

## NEXT STEPS

Oxfam GB have installed over 1,000 adapted Communal Tiger Worm Toilets in Bangladesh camps and hope to install Communal Tiger Worm Toilets in the next appropriate emergency response, conditions permitting. Oxfam GB plans to review current worm-based sanitation options to enable other agencies to make informed choices in sustainable sanitation.

**KEYWORDS** sustainable sanitation; tiger worm toilet; desludging; vermicompost; vermifilter; communal latrines

## FIND OUT MORE

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Oxfam GB. 2018. 'Tiger Worm Toilets for sanitation in humanitarian camps in Myanmar' at [susana.org](http://susana.org).

Furlong, C. et al. 2017. 'Learning from Oxfam's Tiger Worm Toilets projects' at 40th WEDC International Conference, Loughborough, UK.

# SPEEDY SANITISATION AND STABILISATION OF FAECAL SLUDGE

## WASTE & LSHTM

WASTE and LSHTM identified, selected, developed and tested effective biological and chemical additives for treating faecal sludge to provide a wider range of treatment options. They also developed a protocol that can be used to assess the effectiveness of bio-additives.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Research & Guidance

### PHASE OF EMERGENCY



Response

## BACKGROUND

Untreated faecal matter is particularly dangerous in acute humanitarian emergencies and must be treated through sanitisation (killing pathogens) and stabilisation (reducing vector attraction). However, further research is required to determine appropriate treatment methods that can be employed to sanitise and stabilise faecal sludge in emergency settings.

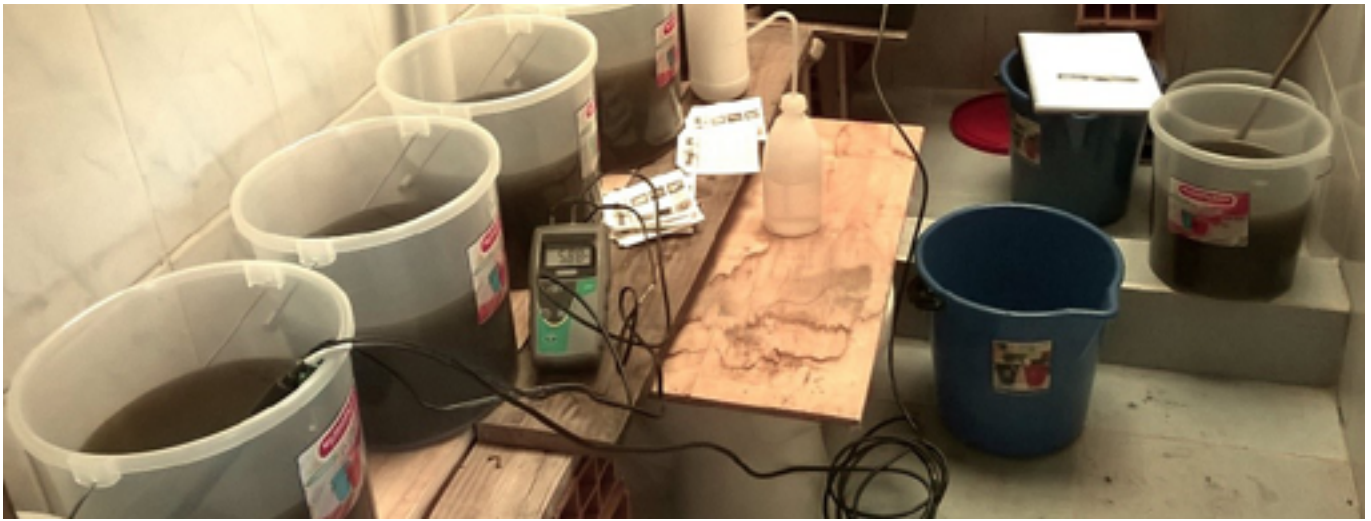
## METHODOLOGY

The project followed a two-part methodology: the first phase was a lab test, which identified and tested potential additives at a small scale and under controlled circumstances. Two lab trials were undertaken using 300 mL blackwater samples. Tested additives included Biomax, Ikati, AquaClean and soda,

with control and water as references. Based on the main findings from the lab phase, a second phase with three field trials was then conducted in countries with different climate conditions: Malawi, Bolivia and Nepal. In this second phase, testing was conducted in drums of 50 and 200 L. Dosages identified in the first phase were added, and each prototype was monitored for two weeks. The stability was evaluated against attaining volatile solids reduction whereas the sanitisation was evaluated against WHO guideline values for restricted irrigation.

## FINDINGS

The study found that rapid stabilisation and sanitisation of faecal sludge is most likely to be achieved using chemical additives such as Ikati,



Credit: WASTE

soda, urea and lime. However, mixing is critical for their effectiveness. Bio-additives require more time – a locally produced effective microorganism in Nepal was capable of stabilising the faecal sludge in two weeks – but are advantageous because their performance does not depend on mixing. Therefore, in emergency contexts, chemical additives may be preferred because they are fast-acting. However, in longer-term development contexts, bio-additives can also be considered.

## IMPACT

The study has contributed to an evidence base for bio-additives and documented the effectiveness of alternatives to the commonly used lime, thereby providing more treatment options in emergencies. These findings have been taken up by the German Toilet Organisation compendium for emergency sanitation, and the BORDA and Solidarités project, OCTOPUS (p. 54–55).

## GAPS

In order to continue with the second field study phase of this research, the WASTE team would like to design a device to mix and add the recommended dosages of effective additives, testing in detail the mixing conditions for large volumes of faecal sludge.

Further work should also look at how to ensure safe conditions for workers involved in the mixing and using of additives. Finally, the study has, so far, not recommended one additive over another; this could be explored in the future.

## NEXT STEPS

The team has obtained funding for a third phase, during which the study will be scaled up further.

**KEYWORDS** faecal sludge; bio additives; chemical treatment; field testing; sodium carbonate; caustic soda

## FIND OUT MORE

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Jan Spit jspit@waste.nl

Mamani, G. 2015. 'Speedy sanitization and stabilization' report on waste.nl.

# QATAR RED CRESCENT COMMUNITY ENGAGEMENT PROJECT\*

## QATAR RED CRESCENT SOCIETY

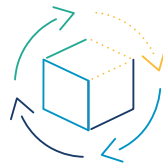
Qatar Red Crescent Society ran a user-centred community engagement pilot to help provide immediate sanitation infrastructure that is flexible and adaptable to changing circumstances and needs of users. The intervention improved women's feelings of safety and comfort using the latrines by 76%.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response

## BACKGROUND

In the post-emergency phase, affected communities face many sanitation challenges as a result of usage, adaptations and an unfriendly environment. Although consultation with disaster-affected communities is strongly encouraged in almost all guidelines in the humanitarian sector, the designed sanitation facilities are not flexible enough to address changing circumstances and usability.

## METHODOLOGY

Qatar Red Crescent Society followed a three-part methodology. During the field assessment stage, the

team conducted rapid ethnographic questioning to surface hidden needs of individual users. They then translated these insights into co-creation sessions to capture collective needs and to design the immediate sanitation provision for engineers to implement. Finally, the team conducted surveys to iteratively improve the prototypes.

## SPECIFICATIONS

When implementing user-centred design for flexible and adaptable sanitation facilities, there are several things to consider. Firstly, there are many competing needs when it comes to sanitation, including drainage,

\* Note that this project description has not been reviewed by the HIF's WASH Technical Working Group.



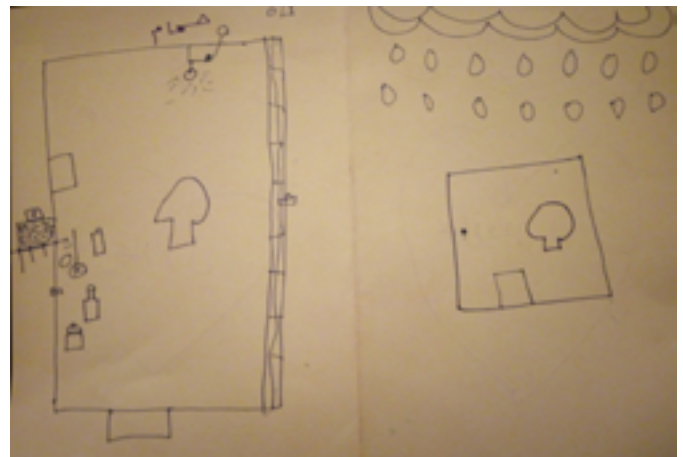
health and solid waste. Also, a high tension with the host community will decrease the flexibility of the sanitation solution provided by users and experts. A further consideration is the translation and advocacy of user standards which differ from normative, established standards used by humanitarian organisations. The piloted approach is highly adaptable because it draws on feedback from the users themselves. However, during rapid-onset emergencies, users may not be emotionally stable enough to share feedback. The user-centred design methodology may also be costly in terms of human resources.

## IMPACT

The project resulted in an increased percentage of women feeling safe and comfortable using latrines during the day and at night, from 23% before the intervention to 99% following. Instances of excreta on slabs also decreased from 94% to 47% following the intervention. Qatar Red Crescent Society's co-created immediate sanitation prototype also saw a decrease in poor maintenance in the piloted area from 84% to 42% – an additional benefit realised by this process.

## GAPS

User-centred solutions cannot be adopted equally by all responders because of complex factors that affect engagement and adaptation of the solution. Using pen and paper for ethnographic questioning may not be practical in emergency contexts where a high number of users need to be consulted, as using this method can make data collection and analysis slow and cumbersome.



*Credit: Qatar Red Crescent Society*

## NEXT STEPS

An interesting outcome of the user-centred design process was an increased level of mobilisation and negotiation power. An area that could benefit from further investigation is the psychological motivations and cultural taboos of incoming disaster-affected communities to anticipate which solutions they need, amidst political and social barriers associated with the host community.

Elrha is working on a user-centred design publication highlighting best practice approaches based on this study and others.

**KEYWORDS** co-creation; sanitation; latrine; prototype; pain point; user centred data; customer service

## FIND OUT MORE

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# USER-CENTRED ENGAGEMENT FOR CHILD-FRIENDLY SANITATION DESIGN IN EMERGENCIES

## SAVE THE CHILDREN UK & ECLIPSE EXPERIENCE

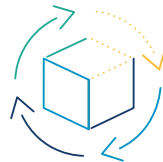
Save the Children UK and Eclipse Experience piloted a user-centred community engagement approach using a digital survey tool and co-creation sessions to involve communities in designing child-friendly sanitation facilities. The two pilots showed an increase in child and caregiver satisfaction with latrines.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Product & Process

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Rapid-onset emergency responses often focus on scale and speed of delivery with scarce resources. Currently, affected adults, let alone children, are rarely consulted about their preferences regarding services. If they are consulted, interaction is often focussed on quantitative measures. This can result in sanitation facilities that are inappropriate for the needs and preferences of disaster-affected children and adults.

## METHODOLOGY

Working in partnership, Save the Children UK and Eclipse Experience, a user-centred research and

design company, developed the user-centred community methodology. It was piloted with Rohingya refugees in Bangladesh and with displaced Yazidi in Iraq. In each location, there was an initial interactive survey (343 people in Bangladesh, 574 in Iraq) and co-creation sessions (with 60 people in each country). These were followed by latrine adaptations. The combination of the interactive surveys and co-creation sessions was essential to combine scale of engagement with depth of understanding. The period from training to engagement and design changes was achieved in 10 days. In combination with requiring few field resources, this makes the methodology well-suited for rapid-onset emergencies.



Credit: Eclipse Experience

## SPECIFICATIONS

Deployed on tablets, the digital tool used for the interactive surveys allows children and caregivers to tap on illustrations to respond, thus overcoming literacy and language barriers. In the pilots, data collection was quick – approximately 10 minutes per survey and a total of three days of data collection per pilot. Collected data were automatically analysed and presented in a dashboard format, making it readily accessible. In both pilots, the field teams found it easy to deploy the digital tool on tablet devices because it was simple and lightweight. However, participatory approaches like co-creation sessions can be novel in some working cultures; effort is needed to familiarise field teams with participatory processes. Moreover, if budget restrictions preventing implementation of a co-created design are not communicated effectively, this can lead to increased dissatisfaction.

## IMPACT

Pilots showed an increase in children and caregivers' satisfaction with latrines following the user-centred design process (Bangladesh 9.5% to 98.9%; Iraq 10.8% to 50%). The project team also found evidence that engagement in this project increased caregivers' confidence that Save the Children UK would act on their feedback, suggesting that participation increased trust between displaced people and Save the Children UK (Bangladesh 97.2% to 100%; Iraq 0% to 36.7%).

## GAPS

There is a lack of evidence around open defecation reduction as a result of the intervention. However, latrine satisfaction is assumed to be a relatively good indicator.

## NEXT STEPS

Save the Children UK and Eclipse plan to develop a toolkit, including an open-source digital tool, to run the interactive surveys. This would lower costs and allow for purpose-built functionalities. With this tool, the process will then be piloted further.

Elrha is working on a user-centred design publication highlighting best practice approaches based on this study and others.

**KEYWORDS** community engagement; latrines; child participation; digital; user-centred design; child-friendly

## FIND OUT MORE

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Eclipse Experience. 2018. 'User-centred community engagement' at [eclipse-experience.com](http://eclipse-experience.com).

# USER-CENTRED DESIGN A BETTER OPTION TO SANITATION FACILITY SUSTAINABILITY

DEUTSCHE WELTHUNGERHILFE & SNOOK

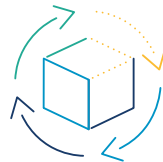
> Deutsche Welthungerhilfe and Snook combined user-centred design with other participatory approaches to identify user needs and problems with current sanitation facilities. Following the intervention, about 80% of users reported that sanitation facilities are now comfortable and appropriate to use.

STAGE OF  
INNOVATION



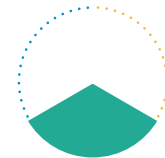
Pilot

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Stabilisation

## BACKGROUND

In Ugandan camps housing South Sudan refugees, some users – especially women, the elderly, pregnant mothers, people with disabilities and children – do not consider sanitation facilities appropriate, which leads to vandalism and conflicts. There is a need for safe, appropriate and user-friendly sanitation facilities. Emphasising the user experience, the project team focussed on how to adapt the superstructure built over the pit to meet user preferences.

## METHODOLOGY

Snook conducted initial community engagement meetings, including key informant interviews, focus

group discussions and household visits to collect information about conventional sanitation projects and local sanitation, construction and maintenance practices. They then developed a hybrid participatory hygiene and sanitation transformation (PHAST)/ user-centred design methodology and toolkit adapted from cognitive behavioural theory and nudge theory to promote behavioural change; this was developed, prototyped and tested with WASH field staff. The toolkit specified a process for identifying culturally recognisable WASH icons. It also provided data collection tools for rapid-onset emergency settings to support the construction of communal latrines, and a data collection tool focusing on household latrines.



Credit: Deutsche Welthungerhilfe

## SPECIFICATIONS

The approach is flexible owing to its phased, scalable nature and can be applied toward both new construction and retrofitting projects. It enables the collection of segregated information from men, women, children and vulnerable persons, ensuring input from each group into the design or re-design of sanitation facilities so that they meet the needs of all. In order to ensure constructed sanitation facilities reflect community input, it is important to ensure the site environment and resources can accommodate requested modifications. Site-specific conditions and resource limitations can limit the ability of WASH engineers and constructors to respond to the preferences users express during engagement.

## IMPACT

As a result of this project's participative community engagement, 400 family latrines were constructed or improved, including 100 latrines and attached bathrooms for persons with special needs. After the intervention, about 80% of users reported that facilities were comfortable and appropriate to use. Following the success of the pilot, a group of hygiene promoters and masons from within the community offered to carry on with the process.

## GAPS

Currently, the approach has only been tested in a post-emergency refugee settlement setting, so

further testing is needed to establish its usefulness in rapid-onset emergency contexts. A minimum viable product version of a toolkit has been designed to communicate the vital importance of user-appropriate WASH facilities following rapid-onset emergencies, but has not yet been tested.

## NEXT STEPS

Currently, Welthungerhilfe is upscaling community engagement in a number of other locations in Bidibidi. The Welthungerhilfe team will continue to monitor the progress of the innovation, though further testing of the minimum viable toolkit is currently limited by funding.

Elrha is working on a user-centred design publication highlighting best practice approaches based on this study and others.

**KEYWORDS** sustainable sanitation; tiger worm toilet; desludging; vermicompost; vermifilter; communal latrines

## FIND OUT MORE

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# USER-CENTRED SANITATION DESIGN THROUGH RAPID COMMUNITY ENGAGEMENT: LANDSCAPE REVIEW AND EVALUATION OF PILOTS

OXFAM GB & LSHTM

Oxfam GB and LSHTM assessed the extent to which user-centred design is operationally feasible in the early weeks of an emergency response, evaluated whether such approaches increase community satisfaction with sanitation facilities, and summarised effective practices in guidance and tools.

STAGE OF  
INNOVATION



Search

CATEGORY OF  
INNOVATION



Research & Guidance

PHASE OF  
EMERGENCY



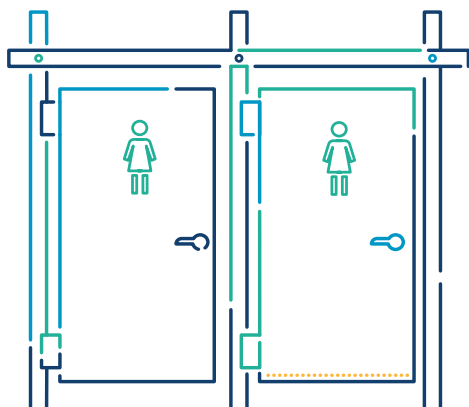
Response, Stabilisation

## BACKGROUND

Human attitudes to sanitation are complex and culturally varied; standardised designs for toilet and washing facilities can fail to deliver culturally appropriate sanitation which affected communities will use. Evidence suggests that even a few hours of quality, respectful engagement can positively influence sanitation design, community acceptance and ownership. However, practitioners lack an evidence base and guidance on how to engage effectively with communities in time-poor environments.

## METHODOLOGY

The team conducted a landscape review of existing community engagement practices and relevant approaches that could be applied in rapid-onset emergencies. Oxfam subsequently monitored and evaluated five pilot projects implemented by Qatar Red Crescent Society in Lebanon (p. 62–63), Save the Children UK in Bangladesh and Iraq (p. 64–65) and Welthungerhilfe in Uganda (p. 66–67) with each partner testing different UCD and community engagement projects. The outcomes of these tests are being evaluated. Workshops with partners



will inform the development of short, accessible practitioner guidelines.

## FINDINGS

Only 50% of the field research findings have been collected to date and analysis is not yet completed for the first evaluations. As a result, the findings are currently derived only from evidence compiled for the landscape review. These findings indicate that a lack of time, accessible guidance and construction constraints result in limited community engagement. Nonetheless, sector experts interviewed often stated that some level of engagement is always possible, even in rapid-onset emergencies.

## IMPACT

Due to security and access issues, the projects were not able to test in rapid-onset contexts – although, in two locations, interventions were constrained to a rapid-onset timeframe of 12 weeks. Findings so far indicate that across all projects, community consultation was enhanced, and sanitation facilities built as a result of this suited users better, resulting in increased satisfaction.

## GAPS

The three partners used different community engagement methods. Additionally, whilst the projects provide insights into different operating contexts, none were carried out in strictly rapid-onset emergencies. Further testing of the generic good practices identified across the studied projects is required in more typical rapid-onset contexts.

## NEXT STEPS

Project work is ongoing. Once all field data have been collected, it will be evaluated, and good practice guidelines and products appropriate for practitioner use will be developed. Further testing is needed in rapid-onset contexts.

**KEYWORDS** sanitation; innovation; rapid community engagement; user-centred design

## FIND OUT MORE

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# LIGHTING FOR SAFER LATRINES: RESEARCH ON GBV AND LIGHTING AROUND WASH FACILITIES

OXFAM GB & WEDC, LOUGHBOROUGH UNIVERSITY

Oxfam GB and WEDC, Loughborough University, researched whether lighting in or around WASH facilities reduces the risk of gender-based violence (GBV) in camp settings and made recommendations for comprehensive camp lighting strategies. Preliminary findings have informed new responses.

## STAGE OF INNOVATION



Recognition

## CATEGORY OF INNOVATION



Research & Guidance

## PHASE OF EMERGENCY



Response

## BACKGROUND

In humanitarian camps, women face the greatest risk of GBV when they leave their shelters at night. However, the main reason they leave is to use the latrines. Does lighting in or around latrines reduce the risk of GBV in camp settings?

## METHODOLOGY

Oxfam GB and WEDC conducted individual surveys, focus group discussions and key informant interviews at baseline and endline in Iraq, Nigeria and Uganda, and collected case studies across nine countries to feed into a consolidated report and recommendations.

## FINDINGS

Lighting – at latrines or elsewhere – increases feelings of safety, but alone it will not reduce the risks of GBV. Factors like build quality, condition and location of sanitation facilities also play a key role. Women and girls see communal toilets in humanitarian camps as potential places of danger that elicit high levels of concern about GBV, and they alter their behaviour to avoid areas they find risky. Camps need multiple forms of lighting: street lights, public facility lighting (eg, medical clinics) and household lanterns and torches as part of an overall lighting strategy.



## IMPACT

The research is ongoing, but findings have already been used in new responses. In the Rohingya response in Bangladesh, the approach to lighting and technical guidance has been heavily influenced by preliminary findings.

## GAPS

The research did not cover the full range of measures needed to effectively reduce risks of GBV in camps as it focused solely on lighting interventions. This evidence gap could be taken forward in the future.

## NEXT STEPS

In terms of lighting, the research makes recommendations for comprehensive camp lighting strategies which UNHCR's Energy Unit is keen to compare and potentially add to their own technical guidance work. The issue of gender and access to lighting is an issue which Oxfam GB plans to continue to research in future humanitarian programmes.

**KEYWORDS** lighting; latrines; gender-based violence (GBV); camps; gender; sanitation; safety; women



*Credit: Oxfam GB*

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# SURFACE WATER DRAINAGE



> Effective surface water drainage is critical in safeguarding the health and surroundings of refugees or internally displaced persons in emergencies. Poor surface water drainage can pose health risks by supporting the development of vector-borne diseases such as malaria or cholera, and can also pose accessibility problems by making it difficult for people and humanitarian services to make their way through a camp and maintain essential water and sanitation services.

Building on the findings of the Gap Analysis and the Problem Exploration Report on Surface Water Drainage, two core problems stood out. First, while surface water drainage solutions exist, the information is scattered across multiple sources and it is not always clear which solutions are best to use in which context. Second, most of the existing solutions come from the development sector and are therefore resource-intensive and impractical in a humanitarian crisis.

To address these challenges, we have prioritised innovations looking to:

1. Develop guidance to help field practitioners decide between existing drainage solutions in an emergency and
2. Develop affordable and effective solutions to improve surface water drainage in an emergency.



## GUIDANCE

**SURFACE WATER MANAGEMENT GUIDANCE** p. 74  
Arup worked with a wide range of WASH agencies to research and produce practical guidance including design principles, strategies and techniques for designing and implementing sustainable surface water management systems.

## INNOVATIVE SOLUTIONS

**SUSTAINABLE FLOOD RESILIENCE IN REFUGEE CAMPS: COMBINING SUSTAINABLE DRAINAGE WITH WASH** p. 76  
Coventry University and partners explored the feasibility of designing and implementing sustainable drainage solutions in collaboration with affected communities.

# SURFACE WATER MANAGEMENT GUIDANCE

BY ARUP & PARTNERS

Arup worked with a wide range of WASH agencies to research and produce practical guidance including design principles, strategies and techniques for designing and implementing sustainable surface water management systems.

STAGE OF INNOVATION



Scale

CATEGORY OF INNOVATION



Research & Guidance

PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Inadequate surface water management in humanitarian camps causes health issues, poor access and unpleasant conditions for communities, often damaging well-being and mental health. At present, there is limited guidance available to help practitioners operating in humanitarian camps to deal with surface water management issues. By developing this guidance, Arup aims to help high-level stakeholders, technicians and WASH engineers to address surface water drainage challenges.

## METHODOLOGY

Arup and partners conducted a review and gap analysis of current knowledge and literature around surface water drainage in humanitarian settings. They engaged with experts in water, site

management, shelter, governance and hygiene to understand the extent of the issue and current processes undertaken. This scoping study led them to develop guidance, which they validated in consultation with a variety of stakeholders from the WASH community as well as communications professionals to improve its usability.

## FINDINGS

Through the scoping study, Arup and partners found that there are no clear standards and very few performance criteria available to WASH practitioners on surface water management in humanitarian camps, even though drainage is widely recognised as a critical strategic consideration. To fill gaps in literature and resources, and to better support practitioners, they developed guidance which

considers: consistent use of terminology; additional forms of surface water (eg, spilled water, 'clean' greywater/sullage); silt, faeces, solid waste and other contaminants; vector control; local conditions (including both physical and human attributes); ownership, due to the cross-cutting nature of the topic; stages of emergency response; scales of implementation; rapid assessment/provision and subsequent adjustments; and sustainable solutions considering local materials.

## IMPACT

There is limited evidence of impact at this stage as the project has only recently finished. However, during engagement, practitioners were positive that this subject has been identified as a key gap and have provided significant feedback and support through surveys, workshops and interviews.

## GAPS

There has been limited time to test and evaluate impact. Further research could develop additional guides for specific contexts and other audiences. For instance, because this guidance is intended for high-level stakeholders, it provides a qualitative, overview perspective rather than a technical manual for more hands-on field practitioners.

## NEXT STEPS

Arup plans to disseminate the guide through a launch event, webinars and through partners' and stakeholders' professional networks. Alongside the guide, Arup are also developing a practical training course to encourage good use of the guidance and to obtain further feedback to improve its content and presentation.



*Credit: Arup*

**KEYWORDS** surface water; water management; design principles; communication; guidance; drainage; stormwater; greywater; flooding; toolkit

## FIND OUT MORE

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Earl et al. 2018. 'Surface water management in humanitarian crises' at 41st WEDC International Conference, Egerton University, Kenya.

# SUSTAINABLE FLOOD RESILIENCE IN REFUGEE CAMPS: COMBINING SUSTAINABLE DRAINAGE WITH WASH COVENTRY UNIVERSITY & PARTNERS

Coventry University and partners explored the feasibility of designing and implementing sustainable drainage solutions in collaboration with affected communities to improve flood resilience, manage water quality and improve the environment in camp settings.

## STAGE OF INNOVATION



Pilot

## CATEGORY OF INNOVATION



Research & Guidance

## PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Coventry University's pilot sustainable drainage demonstration at Gawilan refugee camp, Iraq aims to demonstrate how implementing sustainable drainage can contribute toward managing and improving water quality, providing amenities for residents and improving the environment. When refugee camps are planned and constructed, little attention is given to greywater management or stormwater drainage, leading to negative impacts on environmental and human health. Streams of polluted water may flow between tents, and flooding can also be a problem. This impacts health and well-being within the camp, and can also degrade the environment and communities beyond the camp.

## METHODOLOGY

Coventry University's research included community engagement (participative design) and education through workshops, demonstrations and site walks. The team met with NGOs, local authorities and specific individuals such as engineers. On the demonstration site, they carried out water quality testing, topographic and soil surveys, infiltration testing, and other tests. The team compiled this data and passed it on to a landscape architect, who translated the wishes expressed by the engaged residents into a formal design. The project team shared this design with UNHCR engineers for comment and input before beginning construction.

## FINDINGS

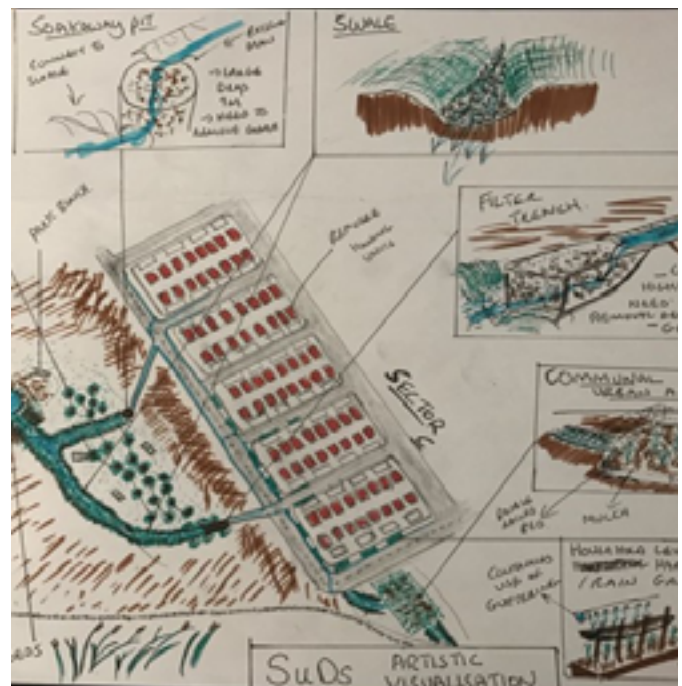
Findings so far show that the community, UNHCR and local authorities were very open-minded to the concept of sustainable drainage, indicating that sustainable drainage to manage low-flow greywater and stormwater can be implemented in a humanitarian context. However, this can only be done with the engagement of the refugee community, as well as NGOs and camp management. The demonstration has shown it is possible to obtain and communicate all the information a landscape architect needs to make the final design, and that residents are willing to be involved in the construction of an intervention with benefits they can understand.

## IMPACT

Community members have been involved in the Gawilan sustainable drainage project from the beginning, and played a significant role in the design of the solution. UNHCR, WASH engineers and local management have all approved the design. Construction of the surface water drainage system is currently in progress, so impact has yet to be established via monitoring.

## GAPS

Coventry University and partners will continue to monitor the demonstration site to establish its multiple benefits in terms of water, water quality, amenity provision and biodiversity. The team will also investigate the retrofitting of sustainable drainage systems to already-established camps. Future work supporting increased flexibility and further benefits from sustainable drainage are also possibilities.



*Credit: Coventry University*

## NEXT STEPS

Monitoring the demonstration site will provide evidence of how efficiently it kept storm and grey water on site and improved water quality. Using participatory research, Coventry University will also monitor biodiversity by counting bird, amphibian and insect species.

**KEYWORDS** sustainable drainage; sustainable drainage systems (SuDS); greywater management; community engagement; policy change

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# CROSS-CUTTING WASH GUIDANCE.....

> Humanitarian WASH guidance is often dispersed, difficult to contextualise and use in practice or incomplete. This makes taking decisions under the time pressures of an emergency even more challenging for WASH practitioners.

To help address some of these challenges, we have funded initiatives to offer better clarity on particular aspects of WASH and to make it easier for practitioners – particularly those working with small NGOs or as individual aid workers – to find relevant technical support.





## GUIDANCE

### KNOWLEDGEPOINT: CROWDSOURCING HUMANITARIAN EXPERTISE p. 80

RedR UK and partners created an online technical support network that connects humanitarians in the field to expert practitioners and researchers within specific topics for free, practical and technical advice.

### EMERGENCY WASH FOR CHILDREN SCOPING STUDY p. 82

Save the Children UK and partners documented how the WASH sector is responding to the needs of children, identified best practices and made recommendations for further research and development.

# KNOWLEDGEPOINT: CROWDSOURCING HUMANITARIAN EXPERTISE

REDR UK & PARTNERS

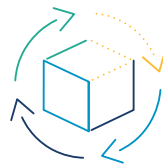
> RedR UK and partners created an online technical support network that connects humanitarians in the field to expert practitioners and researchers within specific topics for free, practical and technical advice. The platform has over 1,800 registered users and more than 1,950 average visits per month.

STAGE OF  
INNOVATION



Scale

CATEGORY OF  
INNOVATION



Product & Process

PHASE OF  
EMERGENCY



Response, Stabilisation, Recovery

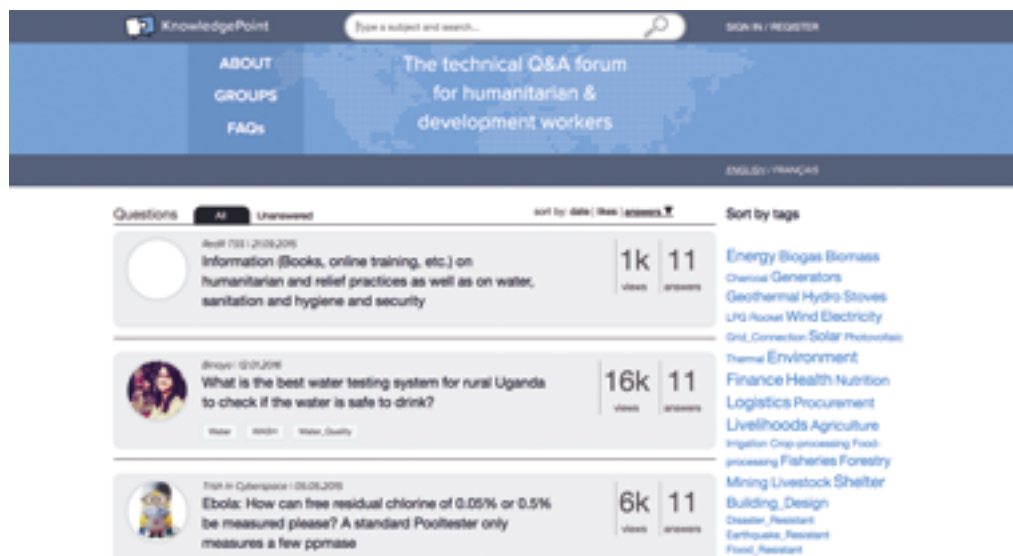
## BACKGROUND

Aid workers in the field often require support from technical experts and from individuals with local or relevant experience. Small NGOs and individual aid workers may not have access to a technical network, whilst large NGOs may have a technical support service that relies on just one or two people.

## SPECIFICATIONS

KnowledgePoint is a collaborative initiative of WaterAid, RedR UK, Practical Action, IRC WASH

and CAWST. It has over 1,800 registered users globally from 75 countries and is used by the WASH Cluster as its preferred online technical support platform. Users can search KnowledgePoint with keywords or browse tags for topics. They can attach documents and create hyperlinks to reference and connect with other existing knowledge bases. KnowledgePoint relies on a light moderation system that ensures content remains independent and non-commercial. Users can set up private groups to share and record technical questions and answers



Credit: RedR UK

pertaining to a specific project, but the platform is not designed to be a general discussion forum.

## IMPACT

The KnowledgePoint platform was successfully used in the 2014 Ebola crisis to provide advice from the global Ebola experts at the WHO and the National Foundation for the Centers for Disease Control and Prevention (CDC) to support aid workers in West Africa, with one question-and-answer thread receiving over 12,000 views. The platform has more than 1,950 average visits per month. However, as it is web-based and accessible to humanitarian practitioners regardless of their organisational affiliation and location, gathering evidence to indicate impact is a challenge. The project partners have documented a case study of one user who successfully used the platform to access otherwise unavailable technical support, with a significant impact on project design and costs. Similar case studies could help further illustrate impact.

## GAPS

Weak internet connection presents a barrier to access for potential users, but KnowledgePoint addresses this, in part, by loading with low bounding. Cultural preference for face-to-face contact can

present another barrier, as can language – currently, KnowledgePoint is entirely in English, but translation into French is planned. Further case studies examining KnowledgePoint’s impact on communities affected by humanitarian emergencies could help document its significance. Publicity of the platform is also an ongoing challenge.

## NEXT STEPS

The project partners plan for ongoing improvement to KnowledgePoint’s functionality and user experience. Several international NGOs are currently considering KnowledgePoint for use as a technical support platform and knowledge management tool.

**KEYWORDS** WASH; energy; shelter; technical support; knowledge; expert; online; digital; network

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# EMERGENCY WASH FOR CHILDREN SCOPING STUDY

SAVE THE CHILDREN UK & PARTNERS

Save the Children UK and partners documented how the WASH sector is responding to the needs of children, identified best practices and made recommendations for further research and development. This led to the 'Emergency sanitation for infants and young children under 5' report.

## STAGE OF INNOVATION



Recognition

## CATEGORY OF INNOVATION



Research & Guidance

## PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

In emergencies, the primary WASH aim is to prevent or mitigate outbreaks of related diseases. However, the sector is under-equipped to meet children's needs, putting them at a higher risk. This report established the state of the sector and identified gaps that can be addressed to better serve children.

## METHODOLOGY

The project comprised three steps: (1) a desk study, including a literature review of 74 research studies and a questionnaire receiving 140 responses from practitioners and academics to clarify gaps in knowledge; (2) fieldwork in Ethiopia and Bangladesh to verify hypotheses around knowledge gaps and

discuss ideas with field staff; and (3) a set of outputs including a discussion paper and a short briefing paper on WASH for children.

## FINDINGS

Save the Children UK and partners found that children are less able to access WASH services in emergency settings if facilities have not been designed with their needs in mind. This puts their health and lives at risk. Characteristics that make facilities unfriendly to children include difficult door and locking mechanisms on latrines, heavy handpumps and out-of-reach taps. Children's access to WASH facilities and services can be improved by: prioritising child protection and awareness of age-group needs in WASH teams; continuing

investigations into child-focused emergency water supply; involving children in emergency hygiene promotion; and improving operation, maintenance and menstrual hygiene support in school WASH facilities.

## IMPACT

Children are disproportionately vulnerable to WASH-related disease. Improving their participation in WASH could help limit outbreaks in emergency situations. Based on this report, Save the Children UK produced the 'Emergency sanitation for infants and young children under 5' report.

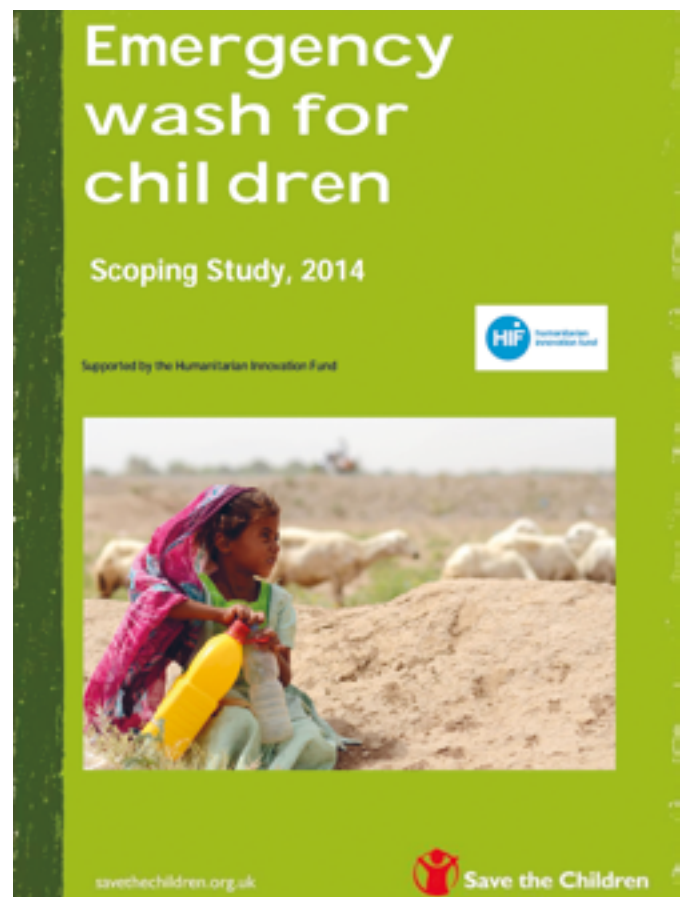
## GAPS

More evidence is needed to explore how emergency WASH can contribute to children's health and nutritional status. Defining a combined WASH, nutrition and health programming methodology for infants and young children presents an opportunity for significant impact.

## NEXT STEPS

Based on the 'Emergency sanitation for infants and young children under 5' report, Save the Children UK have initiated further innovation projects on handwashing for children and child engagement in emergencies.

**KEYWORDS** children; emergency; wash; water; humanitarian; sanitation; excreta; hygiene promotion; engagement; participation



Credit: Save the Children UK

## FIND OUT MORE

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Ferron, S. & Lloyd, A. 2014. 'Emergency WASH for children'. Save the Children.



# OTHER ELRHA WASH PROJECTS

> As well as projects focused on solving specific gaps and challenges, Elrha also supports WASH projects through an open call or undirected process. This is managed through our research programme, Research for Health in Humanitarian Crises (R2HC), which improves health outcomes by strengthening the evidence base for public health interventions in humanitarian crises, including in the WASH sector. The R2HC programme funds and supports partnerships between researchers and humanitarians to undertake rigorous research addressing key health evidence gaps. The resulting research findings aim to influence policy and practice in the humanitarian sector, and generate wider lessons about how rigorous research can be carried out in challenging humanitarian contexts.

The R2HC programme has funded four WASH-related studies\*, each of which has investigated the effectiveness of an innovation used in emergency WASH response. Specifically, the studies have investigated:

- The impact of different safe drinking water approaches on the treatment of malnutrition,
- The development of a toolkit to support menstrual hygiene management needs in emergency contexts,
- The effectiveness of approaches to the prevention of cholera transmission and
- The use of urine-diverting toilets in refugee camp settings.

\* Note that none of these project descriptions have been reviewed by the HIF's WASH Technical Working Group.



## RESEARCH STUDIES

### EVALUATING THE EFFECTIVENESS OF SAFE DRINKING WATER IN TREATMENT OF SEVERE ACUTE MALNUTRITION p. 86

Action Against Hunger investigated whether adding safe drinking water in severe acute malnutrition treatment improves recovery rates and cost-effectiveness in community management of acute malnutrition programmes.

### BUILDING A CROSS-SECTORAL TOOLKIT AND RESEARCH FOUNDATION FOR THE INTEGRATION OF MENSTRUAL HYGIENE MANAGEMENT INTO EMERGENCY RESPONSE p. 88

The International Rescue Committee and Columbia University produced a 'Menstrual hygiene management (MHM) in emergencies toolkit' following pilot testing.

### ALTERNATIVE SANITATION IN PROTRACTED EMERGENCIES p. 90

The National Foundation for the Centers for Disease Control and Prevention (CDC) researched a refugee population's acceptance and use of urine-diversion dry toilets, and the performance of these latrines in field settings.

### ESTABLISHING EVIDENCE FOR COMMON-BUT-UNDER-RESEARCHED WASH CHOLERA INTERVENTIONS p. 92

Tufts University assessed the effectiveness of household spraying, household disinfection kits and bucket chlorination against cholera.

*Elrha's R2HC Programme is funded by the UK Government Department for International Development (DFID), Wellcome, and the National Institute for Health Research (NIHR).*

# EVALUATING THE EFFECTIVENESS OF SAFE DRINKING WATER IN TREATMENT OF SEVERE ACUTE MALNUTRITION

## ACTION AGAINST HUNGER

> Testing three common household water treatment technologies, Action Against Hunger investigated whether adding safe drinking water in severe acute malnutrition treatment improves recovery rates and cost-effectiveness in community management of acute malnutrition programmes.

### STAGE OF INNOVATION



Pilot

### CATEGORY OF INNOVATION



Research & Guidance

### PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Action Against Hunger tested three household water treatment technologies to investigate whether adding safe drinking water in acute malnutrition treatment improves recovery rates and cost-effectiveness of treatment programmes. They also gathered qualitative evidence on user experiences with each water treatment method. Waterborne diseases (like diarrhoea) are a major cause of malnutrition. Contaminated water reduces the efficacy of ready-to-use therapeutic foods, a

common treatment given to uncomplicated cases of severe acute malnutrition (SAM), prolonging the standard two-month course of treatment.

## METHODOLOGY

The randomised control trial study design included four study groups. Each intervention group was supplied with and trained to use one of three kinds of water treatment options. The first group, the control, was supplied with SAM treatment and a jerry can. The other groups were supplied with SAM treatment and





*Credit: Action Against Hunger*

a jerry can, as well as Aquatabs, a Procter and Gamble purifier and a ceramic candle water filter, respectively.

## FINDINGS

Providing water treatment products significantly increased the recovery rates of SAM children in outpatient programmes, as all groups with a water treatment device had higher recovery rates than the control group. Children in the Aquatabs group had a significantly lower prevalence of diarrhoea than the control group during the study period, yet the other two intervention groups did not vary significantly from the control group for this outcome. The cost-effectiveness analysis shows that Aquatabs were the least expensive treatment per child recovered, and this method was more cost-effective per child recovered than in the control group, who received SAM treatment alone.

## IMPACT

The findings of this study contribute to the evidence base, alongside similar Action Against Hunger studies in Chad and the Democratic Republic of the Congo. This evidence also contributes to the 'WASH in nutrition' strategic practice.

## GAPS

More evidence is required to: understand the cost-effectiveness of each approach, explore other water

treatment methods and assess outcomes in other community-managed acute malnutrition programmes. More research is also needed to understand the pathway between water treatment devices and improved nutrition outcomes in this context.

## NEXT STEPS

Action Against Hunger will investigate the policy implications (in Pakistan and beyond) of these findings and explore how relevant nutrition policies can best reflect the emerging evidence and experience in incorporating water treatment in nutrition interventions.

**KEYWORDS** Severe Acute Malnutrition; safe water; treatment; chlorine; filter; flocculent disinfectant

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Doocy, s. et al. 2018. 'Point-of-use water treatment improves recovery rates among children with severe acute malnutrition in Pakistan: results from a site-randomized trial' in Public Health Nutrition.

# BUILDING A CROSS-SECTORAL TOOLKIT FOR THE INTEGRATION OF MENSTRUAL HYGIENE MANAGEMENT INTO EMERGENCY RESPONSE INTERNATIONAL RESCUE COMMITTEE & COLUMBIA UNIVERSITY

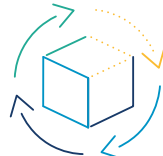
> The International Rescue Committee and Columbia University produced a 'Menstrual hygiene management (MHM) in emergencies toolkit' following pilot testing. The toolkit provides comprehensive and accessible guidance on MHM to humanitarian practitioners.

## STAGE OF INNOVATION



Pilot

## CATEGORY OF INNOVATION



Product & Process

## PHASE OF EMERGENCY



Response, Stabilisation, Recovery

## BACKGROUND

Menstruation remains an issue long neglected by humanitarian responders. Beyond supplying menstrual materials, sanitation facilities (including facilities for disposal of menstrual hygiene products) and information are often in short supply. The delivery and phasing of MHM programming is critical, with cross-sectoral coordination essential for ensuring that women and girls can manage their menses safely, privately and with dignity.

## METHODOLOGY

The researchers held focus group discussions and key informant interviews, including with women and girls in Myanmar and Lebanon, which helped to inform the development of a comprehensive 'Menstrual hygiene management (MHM) in emergencies toolkit'. The project team piloted the toolkit in Tanzania using a process and endline evaluation to establish its effectiveness and usage during an emergency. There was strong engagement by NGOs and UN agencies

in the development of the final version of the toolkit, which included guidance on MHM materials and supplies, disposal and waste management, sanitation facilities, MHM education, MHM cross-sectoral linkages (WASH, protection, health and education) and indicators for monitoring MHM programming.

## FINDINGS

Research informed the development of the toolkit and helped identify specific gaps in the pilot version. The study concluded that there are three essential components girls and women must have access to in an MHM response: (1) materials and supplies, (2) information, including menstrual hygiene promotion and health education, and (3) MHM-supportive facilities (toilets and washing spaces). Consultation with girls and women remains the single most effective tool for ensuring these three components are effectively and appropriately addressed. Direct consultation with girls and women about their menstrual experiences was successful and should be integrated into routine response operations.

## IMPACT

The toolkit, co-published by 27 humanitarian organisations, identified evidence on usage, including UNHCR's Rohingya response in Bangladesh and with displaced populations in Nigeria and Myanmar. UNFPA and UNICEF have promoted the toolkit, and it will be cited in the revised 'Sphere handbook' and Education and Child Protection Cluster guidance documents.

## GAPS

Additional evidence is required on the implementation of female-friendly sanitation facilities (toilets, washing and bathing spaces), improved systems for menstrual waste disposal and waste management, and improved coordination mechanisms between sectors in terms of data sharing and coordinated implementation of MHM responses.

## NEXT STEPS

The toolkit will require updates as further evidence on best practices is generated. The project team acquired additional funding to conduct a global assessment of improved practices around menstrual disposal, waste management and laundering for developing a compendium to complement the toolkit.

**KEYWORDS** menstrual hygiene management; menstruation, periods; sanitary pads; girls; women; menstrual health; menstrual waste

## FIND OUT MORE

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International Rescue Committee. 2017. 'Menstrual hygiene management (MHM) in emergencies toolkit' at [rescue.org](https://www.rescue.org).

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# ALTERNATIVE SANITATION IN PROTRACTED EMERGENCIES

NATIONAL FOUNDATION FOR THE CENTERS FOR DISEASE CONTROL AND PREVENTION

> The National Foundation for the Centers for Disease Control and Prevention (CDC) researched a refugee population's acceptance and use of urine-diversion dry toilets, and the performance of these latrines in field settings, to help agencies assess the intervention's appropriateness.

## STAGE OF INNOVATION



Pilot

## CATEGORY OF INNOVATION



Research & Guidance

## PHASE OF EMERGENCY



Recovery

## BACKGROUND

Urine-diversion dry toilets (UDDTs) are potentially valuable for public health in environments where pit latrines are not possible. Through this research, the CDC sought to determine if these designs can be effectively utilised at scale in humanitarian contexts.

## METHODOLOGY

Researchers administered qualitative surveys across 400 households in the Hiloweyn refugee camp in Ethiopia, representing both users and non-users of UDDTs, to determine user attitudes and practices. Laboratory tests investigated the performance of 20 UDDTs in the refugee camp which had been

seeded with known quantities of parasitic worms (*Ascaris*), and were analysed at regular intervals over a 12-month storage period to establish the safety of the end product. The CDC performed an additional research on additive use in controlled lab settings by adding several combinations of lime and ash to stored waste to enhance microbial inactivation.

## FINDINGS

Researchers found that acceptability and usability of the UDDTs were high, even after most UDDTs had been in use for several years. Satisfaction and sanitation preference did not differ between those assigned to UDDTs and other forms of sanitation.

Usability issues were identified primarily with children under 5 years, and to a lesser extent with elderly and disabled persons. The time required for users to become accustomed to UDDTs suggests they could be more appropriate in a protracted or stable emergency setting as opposed to early response phases. Results from lab tests indicated that, with reasonable precautions, waste stored for 12 months in-vault could be moved for land application. The addition of lime was found to increase the rate of microbial inactivation.

## IMPACT

Study findings have informed additional pilots of UDDTs by Oxfam and UNHCR in other locations in Ethiopia. In Hiloweyn camp, findings were used to expand the programme, including constructing more toilets and developing a management system to ensure that they can continue to be safely and effectively used.

## GAPS

More research is required to: evaluate the performance of UDDTs under different conditions (eg, climates) to understand appropriate environments for use, evaluate the acceptability among different populations and determine suitable alternative methods to helminth egg testing in order to determine microbial inactivation.

## NEXT STEPS

The researchers continue to conduct laboratory investigations to further identify additives that could improve UDDT performance. They are also evaluating the performance and acceptability in a different climate and with a different population in another location in Ethiopia where they have implemented a small UDDT pilot programme.



*Credit: CDC*

**KEYWORDS** urine diversion dry toilets; sanitation; ecological sanitation; latrines; compost; faeces

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# ESTABLISHING EVIDENCE FOR COMMON-BUT-UNDER-RESEARCHED WASH CHOLERA INTERVENTIONS

## TUFTS UNIVERSITY

> Tufts University assessed the effectiveness of household spraying, household disinfection kits and bucket chlorination against cholera. Research findings aimed to inform cholera response programming in humanitarian agencies.

### STAGE OF INNOVATION



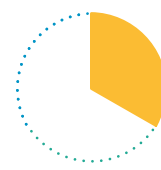
Pilot

### CATEGORY OF INNOVATION



Research & Guidance

### PHASE OF EMERGENCY



Response

## BACKGROUND

Common responses to prevent cholera transmission in humanitarian crises include household spraying, distribution of household disinfection kits and bucket chlorination. These interventions lack data on laboratory efficacy (eg, Can spraying chlorine inactivate cholera bacteria on surfaces?) and field effectiveness (eg, Does spraying as implemented in cholera response inactivate cholera bacteria?).

## METHODOLOGY

Tufts University is completing lab research to establish the efficacy of each approach to inactivate the bacteria which causes cholera. Mixed-methods research is being conducted in six humanitarian

emergency settings where cholera outbreaks have been reported to determine the effectiveness of the application of household spraying, household disinfection kits and bucket chlorination in the field. This includes household surveys, key informant interviews, focus group discussions, water quality testing and household surface testing.

## FINDINGS

Research is due to be completed in mid-2019, with research findings published when available.

## IMPACT

Findings are expected to help inform cholera response programming in humanitarian agencies.



*Credit: Tufts University*

## GAPS

At this early stage, it is not possible to determine the remaining research needed after the study, but early indications suggest additional research on household disinfection kit implementation might be necessary.

## NEXT STEPS

Throughout data collection, the research team are refining tools and processes used for data collection. Post project, they anticipate distributing findings and completing additional research on how to implement efficacious and effective cholera response interventions successfully.

**KEYWORDS** cholera; chlorine; disinfection kits; household spraying; bucket chlorination

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## FIND OUT MORE

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## LEARNING FROM CHALLENGES

> Elrha's HIF is a funder of innovation and learning. As such, not every project we fund achieves the success they planned every time, or as quickly as they had hoped for. To manage investment risks\*, we fund innovations in stages, along a defined process. This means that we avoid 'sunk-cost bias' – where a path is followed because it represents a large investment, even when it should be abandoned. Instead, with a staged approach, innovators can pursue a certain direction one step at a time, as well as pivot and change direction when it makes sense to do so.

The projects\*\* in this section are examples of innovations supported by the HIF from an early stage which in later stages met a range of challenges that led to a change in direction.

Note that none of these project descriptions have been reviewed by the HIF's WASH Technical Working Group.

\* In this context, risk is defined narrowly as the likelihood that a certain idea will not achieve the desired outcomes. In other areas, Elrha has a very low tolerance for risk: for example, we accept no risk to the safety or dignity of people affected by crises.

\*\* Note that none of these project descriptions have been reviewed by the HIF's WASH Technical Working Group.



## FAECAL SLUDGE MANAGEMENT & SOCIAL ENTERPRISE MODELS FOR EMERGENCIES

### GOAL & SANERGY

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#### PROJECT SUMMARY

The overall aim of this project was to develop a faecal sludge management (FSM) bulk consolidation container. The container would enable bag-based sanitation systems to be easily and safely disposed of in the early stages of an emergency. This would help consolidate and contain excreta, making it easy to transport to its final disposal point.

The project explored the potential of partnerships between humanitarian responders, such as GOAL, and social enterprises, such as Sanergy, to design tools, implement emergency response solutions, and assess the gradual handover from humanitarian agencies to social enterprises as a reliable exit strategy.

Together, GOAL and Sanergy designed a prototype mobile waste transfer station, that both emergency responders and social enterprises could use to safely consolidate and contain faecal sludge in densely populated areas. This isolated hazardous waste from communities and allowed for efficient transport to treatment sites.

#### OUTPUTS & CHALLENGES

However, the partnership ran into logistical challenges when GOAL and Sanergy realised the mobile transfer station was too heavy for transport over longer distances. The mobile waste transfer station required access to a treatment centre with high-quality equipment and processes to safely treat and reuse the waste. As Sanergy would not be able to set up waste treatment plants outside Nairobi, the team decided not to trial the solution in refugee camps.

#### NEXT STEPS & SUBSEQUENT DEVELOPMENT

While Sanergy's social enterprise model for faecal sludge management in the urban informal settlements of Nairobi is proving successful, there are still a range of remaining questions around its applicability in emergencies. These include how humanitarian incentives work during the early stages of an emergency response, and the potential adverse effect they might have on future market-based solutions. Sanergy are interested in exploring these questions, and in designing and testing a mobile treatment and reuse station in the context of emergency response projects, in order to guarantee waste is safely moved all the way to the end of the sanitation value chain.

## EMERGENCY TOILETS

### LOOWATT

#### PROJECT SUMMARY

Loowatt's emergency toilet project assessed how to best implement Loowatt dry toilet systems in emergencies. The team considered which partners could help introduce the technology to the humanitarian system, and how to structure a pilot exploring the potential for on-site energy generation from waste processing.

Loowatt established partnerships with a range of key partners, including UNHCR, and carried out a feasibility study for using the technology in emergencies. This study found that the Loowatt bag-based toilet technology would be appropriate for:

- Stabilisation and recovery stages of emergencies
- Latrines with robust superstructures (ie not early-stage emergency solutions with plastic sheets or similar)

#### OUTPUTS & CHALLENGES

Through the feasibility study, Loowatt identified three key barriers to introducing innovative toilets in humanitarian responses:

- **Low-tech:** Rural response has driven a preference for dug latrines and a view that faecal sludge can be managed using traditional rural solutions that are extremely low-tech. It is expected that any innovation will face this barrier to entry.
- **Inadequate understanding of the cost of existing solutions:** There is a wide range of set-up costs for pit latrine solutions and inadequate documentation of long-term costs related to latrine use – such as pit emptying and disease propagation due to inadequate faecal sludge management (FSM).

- **Shifting FSM priorities:** Over the immediate period (one to two months), the priority is to contain and localise sources of disease; in the short-term (six months), to reduce morbidity and mortality; and in the long-term (several years), to sustain health and well-being. These priorities do not prescribe a consistent approach to FSM, but rather one that evolves over time.

#### NEXT STEPS & SUBSEQUENT DEVELOPMENT

The project deepened Loowatt's knowledge of and engagement in the humanitarian sector. This informed the subsequent pilot of their technology in an urban setting in Malawi in partnership with WASTE advisers on urban environment and development, the FSM in emergencies specialist group. This pilot was successful, and the team are currently planning next steps for scaling the solution.

## LATRINE LIGHT DECIWATT

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### PROJECT SUMMARY

Deciwatt's project addressed the lack of low-cost, reliable and easy to install lighting options for users of temporary and re-locatable latrines in emergency settings. Based on the principles of Deciwatt's GravityLight solution, the team developed the self-contained, freestanding lighting solution LatrineLight. Because it could easily be moved around, this lighting would overcome certain limitations of other, less mobile solutions. The LatrineLight would be very suitable for intermittent use as the user would only generate the light needed at the time of use. This would minimise wastage and improve overall product life. A demonstration prototype was presented as the final outcome to emergency WASH experts.

### OUTPUTS & CHALLENGES

When the lighting prototype was presented to the experts, the Deciwatt team experienced a lack of interest and never received the detailed feedback and specifications they needed to be able to finalise the design; neither did they secure a humanitarian partner for field testing, so the project was closed. HIF reflected that stakeholder engagement throughout the process could have been better facilitated and supported to strengthen the potential outcomes.

### NEXT STEPS & SUBSEQUENT DEVELOPMENT

The HIF-funded LatrineLight prototype became the foundation for developing new iterations of a lighting solution more appropriate for emergency contexts. Feedback on the prototype led Deciwatt to propose an alternative to the ballast bag that could make the product more versatile and lighter by shifting reliance away from gravity, and instead using a spring and gearing mechanism. This led Deciwatt to develop the Now Light: Gravity Light 03. This next-generation light is still human-powered, but also contains a battery.

The Gravity Light 03 is lightweight, portable and can be mains charged or solar charged. It is capable of generating 160–180 lumens of watt (very bright light) for 5–6 hours. It also charges mobile phones and can drive a water purifier. Deciwatt will be targeting the humanitarian market with this lighting solution and are currently trialling it with the Red Cross.

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# HOW CAN YOU GET INVOLVED?

> Our WASH Innovation Catalogue is an overview of some of the most promising new solutions in WASH, offering the WASH practitioner community a unique opportunity to access over 30 innovations that could help to solve some of the most pressing problems.

We hope the WASH community will use the innovations featured in this catalogue for new ideas, solutions and partnerships – and that through this, we will begin to see some of the bigger problems in the sector being addressed.

*You have the power to help these innovations succeed in making humanitarian WASH more effective. **Here are three ways you can get involved:***

## 1. USE THE INNOVATIONS IN THE FIELD



Some of the new evidence and solutions are ready to be used in the field.

*Will you be an early adopter?*



## 2. PARTNER UP FOR FURTHER FIELD TESTING

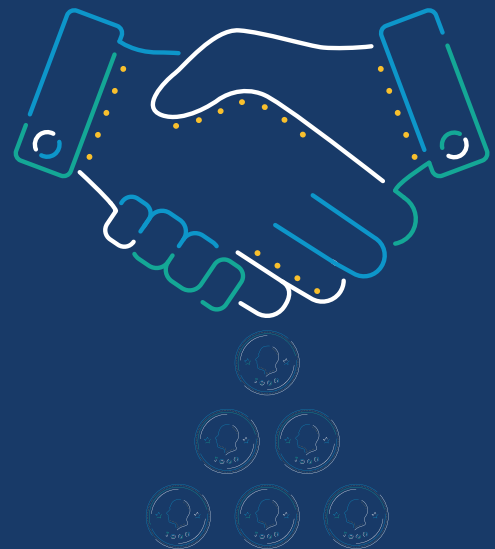
Many of our innovation teams are looking for humanitarian agencies or researchers to help them pilot and evaluate in the field.

*Are you ready to collaborate?*

## 3. SUPPORT THE INNOVATIONS TO SCALE

Taking an idea and seeing it through to impact at scale can be a long and expensive journey. A lot of the featured innovations need further grants, investment, support and advice to continue their journey.

*Can you support?*



If there is a particular innovation you want to adopt, work with or support you can contact the innovators directly – each innovation has contact information listed with their entry.

*If you want to get involved further or talk to us directly about these innovations or our wider work in WASH, get in touch with us [info@elrha.org](mailto:info@elrha.org).*

# elrha

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