

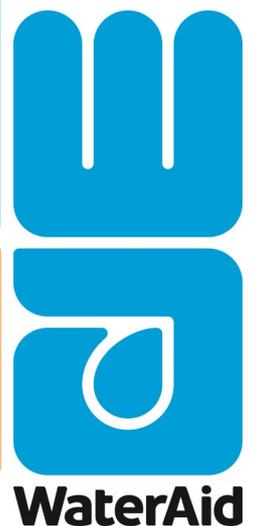


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Working paper

Assessing the usability of personal protective equipment for sanitation workers in tropical countries

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Executive summary

Despite efforts to achieve the Sustainable Development Goal (SDG) target 6.2 of providing 'safely managed' sanitation to all by 2030, the health, safety and dignity of sanitation workers is rarely taken into account.

In most low- and middle- income countries (LMICs), sanitation workers operate in hazardous environments, with little to no personal protective equipment (PPE), making them vulnerable to injury, illness and even death. But even when workers have access to PPE, they may not use it consistently; the reasons for this remaining largely overlooked.

This study is an attempt to explore these issues, focusing on the usability of PPE, specifically that used by sewer line cleaners and pit/septic tank emptiers in tropical countries. We carried out this research through a review of literature and key informant interviews (KIIs) with nine experts.

A key reason for the low usage of PPE is related to the fact that neither the design nor the materials are adequate to the needs of workers in tropical countries.

The design of PPE should provide ease in moving and performing the tasks. The material performance should protect the workers from chemical spillage and physical hazard, at the same time providing breathability and allowing a high level of dexterity.

Government agencies need to set clear standards for PPE by reviewing safety policies and building accountability in the system. There is also a need to create an enabling environment for innovation, research and development to redesign PPE to better suit the needs of sanitation workers in tropical contexts. This involves in-depth research and a human-centric design approach to identify suitable product features, materials and manufacturing techniques.

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Background

National governments and international stakeholders have been putting significant effort across LMICs to improve water, sanitation and hygiene (WASH) and achieve SDG target 6.2 of providing 'safely managed' sanitation to all by 2030. Whilst these efforts are essential, policy makers tend to overlook the safety and wellbeing of a crucial stakeholder in the sanitation service chain: the sanitation worker.

In order to achieve the ambitious targets of SDG 6, more must be done to ensure the safe working environment for sanitation workers. Without their services, the efforts to achieve this goal would fail – yet their rights to safety, dignity, health and wellbeing are not seen as a priority. Instead, sanitation workers are forced to work for little pay in unsafe environments, and are at constant risk of injury, illness and even death. Furthermore, they face humiliation and discrimination, as sanitation work is often viewed as a stigmatised occupation. Despite this, policies, laws and regulations are non-existent in many countries, so sanitation workers are not protected by legal frameworks. Even when legal frameworks and regulations exist, these are not enforced properly, and many sanitation workers are not able to benefit from any protections these can offer.

The World Health Organization (WHO) recommends that 'sanitation workers should be protected from occupational exposure through adequate health and safety measures'.¹ However, sanitation workers in many countries lack access to PPE – which is critical in ensuring their occupational health and safety. Additionally, it has been observed that even when PPE is provided, workers may be reluctant to use it.² This can be due to the type of PPE that is made available to them being uncomfortable to wear and work in.³ There have been observations that PPE has not been adapted to suit the needs of sanitation workers working in tropical and hot climates – however, this remains an under-researched area.

Objective

This study aims to further the understanding on the usage of PPE for sanitation workers, with a specific focus on the adaptation of PPE to suit hot and tropical climates. The study focuses on workers involved in sewer maintenance and pit/septic tank emptying, as they face high levels of risk. The key objectives are as follows:

- To identify the key deterrent factors for use of PPE in sanitation work (with a focus on the problems related to heat/humidity).
- To assess if there are any past or existing efforts to make PPE for sanitation workers more user-friendly, especially adaptations to suit hot climates.

¹ WHO (2018). *Guidelines on sanitation and health*. Available at: [who.int/iris/bitstream/handle/10665/274939/9789241514705-eng.pdf?ua=1](https://www.who.int/iris/bitstream/handle/10665/274939/9789241514705-eng.pdf?ua=1) (accessed 13 Jul 2020).

² WaterAid/WHO/ILO/The World Bank (2019). *Health, Safety and Dignity of Sanitation Workers: An initial assessment report*. Available at: washmatters.wateraid.org/sites/g/files/jkxooof256/files/the-health-safety-and-dignity-of-sanitation-workers_0.pdf (accessed 14 Jul 2020).

³ SNV (2019). *The 'invisible hand' behind human waste disposal*. Available at: snv.org/update/invisible-hand-behind-human-waste-disposal (accessed 14 Jul 2020).

- To recommend ways to adapt PPE so it better suits the needs of sanitation workers in tropical environments.

Methodology

The following methods were adopted to undertake the research:

- I. A desk review of existing literature, including grey literature such as blogs, presentations and minutes from conference discussions, was conducted through internet and journal searches.
- II. Technical experts, who have been working or researching in the sanitation sector from various tropical countries, were identified using both WaterAid's and the author's networks. These experts had either directly interacted with sanitation workers or had observed them during field work and research trips whilst they performed various tasks related to their jobs. Key informant interviews (KIIs) were conducted with nine experts who had experience working in tropical countries like Tanzania, South Africa, India, Madagascar, Senegal and Burkina Faso. Based on key exploratory ideas identified during the literature review, an open-ended questionnaire was designed with detailed questions.

While conducting the interviews, all participants were briefed about the objective of the study. Informed consent was taken before recording the conversations and privacy has been maintained during the study period.



PPE in sanitation work

Based on literature review and interviews, the following list of PPE has been identified as crucial for protecting the body while performing various types of sanitation work:

S. No.	Part of body	Item	Purpose
1	Head	Safety helmet	The safety helmet protects the head from potential injuries caused by falling or flying objects.
		Safety helmet with headlamp	The headlamp attached to the helmet helps with visibility in confined spaces (like sewers) without blocking the hands from performing other tasks. The helmet also helps protect the head from injuries caused by falling or flying debris.
2	Eye	Safety goggles	Safety goggles protect the eyes from flying debris and chemical splashes.
		Safety goggles with strap	Safety goggles with a strap prevent the goggles from falling off, and protects the eyes from flying debris and chemical splashes.
3	Nose and mouth	Particulate mask	The particulate mask is essential for respiratory protection from low and moderate concentrations of all types of toxic gases and vapours.
		Respirator mask	Particulate masks should not be used in oxygen deficient atmospheres, in unventilated locations or areas where high concentrations of poisonous gases may exist. Hence, for confined spaces like septic tanks and sewers, full face respirators that have replaceable filter cartridges are essential.
4	Hands and lower arms	Gloves	Gloves are required to prevent direct contact with faecal matter and contaminated water, and to protect the hands from injuries caused by sharp objects.
5	Feet	Safety shoes/ gumboots	Safety shoes are essential to prevent slipping and avert contact with faecal matter and contaminated water.
6	Body	Diver suit	A protective layer of clothing, preferably waterproof, is important to prevent skin irritation or any kind of infection that may be caused due to coming in contact with wastewater and faecal matter.
		Reflective jacket	
		Full body wader suit	
		Wader suit attached with boots	
		Safety body clothing/bodysuit	
		Apron	

Factors affecting PPE usage

The secondary research highlighted that most sanitation workers in tropical countries do not use PPE while performing sanitation work, including pit/septic tank emptying, desludging or even while entering a sewer. This was further stressed by the experts during the interviews whose detailed interactions with respondents threw light on the following reasons for sub-optimal use of PPE in tropical countries:

Perceived barriers of wearing PPE

According to the respondents, based on their experience working with sanitation workers, the main barriers affecting PPE usage was lack of access to 'comfortable' PPE. Upon investigation, the 'comfort' was broken down into further characteristics, which included materials used, design features and the fit of the safety gear.

In tropical countries, given the high temperatures and humidity, sanitation workers prefer to wear clothing and PPE that is 'breathable'. However, most of the PPE is reported to make sanitation workers sweat – with the high temperatures making it unbearable to work. The quality of material used for manufacturing PPE is often poor, resulting in frequent wear and tear. Even if PPE, such as gloves or safety helmets, follow specifications as required by international organisations like the American National Standards Institute (ANSI), Occupational Safety and Health Administration (OSHA) or European Norms (EN), they tend to stick to the skin of the workers. Furthermore, safety goggles tend to fog up easily, leading to poor visibility. The respondents also reported that sanitation workers do not want to wear masks because they can often feel suffocated while wearing them.

Access to PPE in LMICs with tropical climates is often limited due to lack of budget and proper procurement plans. Many local urban bodies and municipal bodies prefer purchasing PPE in bulk to help bring down the costs. As a result, sanitation workers are provided with oversized or undersized PPE – such as reflective jackets, body suits and gumboots. The loose fitting of PPE acts as a hindrance and also poses a risk to the safety of sanitation workers. This may have a significant effect on female sanitation workers, given that PPE is generally designed for male bodies.⁴ Thus further contributing to the reduced use of PPE by sanitation workers.

The respondents shared that apart from being loose, the PPE given to the sanitary workers often has design flaws. Most of the PPE has been designed and standardised for other industries, including construction, mining or medical. For instance, while few workers have been given protective gumboots, these do not have the necessary features that prevent slippage on a wet floor or allow for workers to bend their knees while entering septic tanks.

Another issue highlighted by experts was that sanitation workers do not have access to all requisite PPE. In most of the cases, gloves and reflective jackets are easily available to sanitation workers, whereas helmets, boots and respirator or particulate masks are generally missing from the PPE kits.

⁴ Criado Pérez C. *Invisible Women: Data Bias in a World Designed for Men*. London: Penguin Random House; 2019.

Perception of risk

During the study, one of the respondents shared the following; “Perception of risk is dented in India overall, for any industry. They do not fathom what it can do to them. I have spoken to workers whose friends died on [the] work site in front of them and they acknowledge that it’s a dangerous job and give the impression that acceptance of such deaths comes naturally to them. They do not link lack of safety measures to prevention of deaths”. The same was reiterated by another WASH expert working in Tanzania, who mentioned that sanitation workers’ lives need to be valued more.

As a huge majority of sanitation workers are from a low socio-economic part of society and have been engaged in sanitation work for years, their perception, attitude and belief play a huge role in using PPE. Many experts acknowledged that the workers have a very limited understanding of how their work can affect their health. Thus, many do not know of the benefits of wearing PPE while performing their jobs. This is also the reason why very few sanitation workers demand PPE, even though they may call for compensation after workplace injuries or deaths.

Key priorities to make PPE more accessible

Sanitation work in many countries is affected by caste and class systems. Working on sanitation jobs without PPE has been considered ‘normal’ by many sanitation workers who belong to families of a ‘lower caste’ who have been doing the same job for centuries. This means that access to adequate PPE is still not a priority for sanitation workers, as they lack information and/or access to many human rights, and social and economic safety nets. This study, based on our literature review and interaction with key experts, also highlights the following key issues that should be addressed in order to make sanitation work safe and reduce the risks sanitation workers are exposed to.

Ensuring formation of and compliance to safety policies

There is a strong need to formulate and ensure compliance to safety policies for sanitation workers both by governments and private contractors. Many tropical countries lack regulations and specifications on the manufacturing of PPE, whilst taking into account local climatic conditions. For instance, in India, *The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013*,⁵ clearly lists various PPE that should be provided to sanitation workers. However, the Bureau of Indian Standards does not provide any guidelines about the material, design and fit of the different types of PPE.

Furthermore, ensuring awareness regarding effective use of PPE is a vital aspect of compliance by the management/contractors of sanitation workers. There should be regular inspections of the work sites and facilities in order to strengthen the monitoring system, along with a process to register and resolve issues with PPE.

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GOI (2013). *The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013*, New Delhi: Ministry of Law and Justice.

The experts shared that effective compliance requires clear specifications, rules, policies and processes that have been issued by the government and duly disseminated amongst the manufacturers of PPE, as well as employers and sanitation workers.

Training of sanitation workers and stakeholders on the use of PPE

The respondents confirmed that there is currently a huge gap in the understanding on the use of PPE by sanitation workers. The respondents reported that sanitation workers are not aware of the correct way to use safety gear, which in turn, increases the risk of accidents. To avoid such situations, most of the workers prefer not to use them. To overcome this gap in understanding, there is a need for training and capacity building of sanitation workers on the use of PPE. Such capacity building workshops will not only increase awareness and usage of PPE, but also the liability of sanitation workers – ensuring their engagement in the safety processes.

It was also acknowledged that there is a lack of awareness amongst workers on their social entitlements for their employers to supply adequate PPE. The respondents shared that there is confusion on ‘who will do what’ in the government system, which creates problems for the workers who are less educated and have limited resources. A clear understanding and sharing of responsibilities can help build a sector that is more efficient and secure for sanitation workers. The role of key stakeholders is critical in providing services for the sanitation workers.



Recommendations

Based on the field experiences and observations given by experts from the various countries, the product characteristics recommended for PPE are organised into two groups: design features and material performance. The design features suggested should provide ease in performing the tasks and the material performance stresses that the PPE is able to protect the worker from chemical spillage and at the same time maintain comfort in tropical climates.

Design features

The features of PPE design should ensure the complete protection of vital and sensitive body parts when exposed to toxic and hazardous gases, and contaminated solid and liquid waste. In particular, the design of PPE should be modified so there is a sufficient seal at the seams to reduce liquid and pathogen penetration. Furthermore, as reiterated by many experts, the current design of PPE, such as goggles and gumboots, obstruct the vision and performance of sanitation workers. Goggles and helmets should be designed so that the field of vision is not limited and also enables ventilation when used in hot and humid climates. While redesigning PPE, the industry should also aim to minimise discomfort for the workers wearing the protective equipment while they are moving and performing tasks. Moreover, as a lot of sanitation work is carried out on slippery surfaces and handling wet objects, PPE such as gloves and gumboots should have anti-slip features. In addition to modifications in the design to suit sanitation workers, the manufacturing industry and employers should also focus on producing equipment of varying sizes of PPE, to allow for unrestricted movement and improved work performance for both male and female workers. Alternatively, the designs of PPE should have features that allow the wearer to adjust the size based on their height, shape and weight.

Some tasks require sanitation workers to wear certain items of PPE for long periods of time and to change into other items of PPE while performing certain sections of the task. Therefore, the PPE should be designed to make the process of donning and doffing easier and reduce number of steps in between jobs.

Material performance

Working in tropical climates is particularly difficult for sanitation workers as they can sweat a lot due to excessive heat and humidity. Keeping this in mind, the most critical feature to consider while designing PPE is the breathability and the level of dexterity offered by the materials used. There is a need for research in developing material that is durable and lightweight, with enhanced ventilation. Sanitation work involves dealing with rough and sharp objects, so the materials used for the PPE, especially gloves and masks, needs to be of a quality that can endure hazardous working environments. Additionally, given the nature of work, the PPE material should have an impermeable layer to protect the wearer from chemical splashes and getting wet whilst carrying out their work. The efficacy of the protection should last for a work period of 40 minutes to 4 hours.

Sanitation workers are advised to thoroughly clean and disinfect PPE after they have completed their work – removal of dried sludge may require multiple rounds of

intense cleaning. The PPE material should be able to withstand rigorous cleaning and disinfection and maintain its integrity and function for multiple uses. These features are important, as workers often receive a limited supply of PPE from their employers or have to spend a significant proportion of their income on purchasing the PPE for themselves. As most tropical countries do not have proper workstations for sanitation workers, they also lack adequate storage areas. Hence, it is advisable that PPE manufacturers also provide containers that allow for storage of PPE to protect it from potential damage.

Conclusion

There is lack of research on the effectiveness and accessibility of PPE used by sanitation workers in tropical climates. Literature review and interviews with key informants highlight the fact that sanitation workers use PPE that has been designed for other industries, such as construction and fishing, and that existing guidelines and advisories fall short of setting standards and specifications of PPE to be used for different types of sanitation work. Interest and innovation for developing user-friendly PPE seems to be lacking or going undocumented, as sector experts are unaware of any such case studies or best practice. The ignorance surrounding the plight of sanitation workers and occupational safety in the hazardous sanitation sector has resulted in greater risks to the health of these workers.

To ensure the health, safety and dignity of millions of sanitation workers in tropical countries, there is need for strong political will to facilitate access to the correct types of PPE. There is also a need for more research into the design of PPE and the development of materials that suit the specific needs of sanitation workers.

The current knowledge gaps on PPE can be filled by practitioners, academics and safety experts working on WASH. They can also provide their technical expertise to governments, to help guide new policies and codes to ensure sanitation workers have access to PPE that suits their needs whilst working in tropical environments.

Bringing recognition to the essential role of sanitation workers and alleviating their profession should be the key aim of stakeholders and society. Immediate attention and action from stakeholders will contribute to the protection of the basic human rights of sanitation workers and their lasting wellbeing, as well as bringing the world closer to achieving the SDGs.



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