

WASH Management Tool for Decision-Making in Flood Situations: Preliminary validation results in Brazil

Quintela, R.S.* and Magalhães Filho, F.J.C.**

* NESA, PPGIPH, Federal University of Rio Grande do Sul (UFRGS), Av. Bento Gonçalves, 9500, 91509-900, Porto Alegre, RS, Brazil

Highlights:

- 10% of Earth surface are susceptible to floods;
- Providing minimum conditions of WASH is a key factor to avoid diseases outbreaks in flood situations;
- WASH management tools can be useful to support decision-making and help managers find efficient solutions;
- There is no WASH tool that covers water, sanitation and solid waste management in an unique framework for flood situations.

Keywords: WASH Tool; Decision-Making; Natural Disasters;

INTRODUCTION

It is estimated that 2.2 billion people do not have safe access to drinking water, 3.5 billion do not have adequate sewage management and 2 billion do not have basic hygiene items to wash their hands (UNDESA, 2023). Within the Brazilian context, approximately 4.3% of the population do not have access to piped water, 24.3% do not have access to a sanitation system or septic tank and 9.1% do not have solid waste collection (IBGE, 2022). The historical reasons for this precariousness are diverse, ranging from a lack of investment capacity to a lack of environmental and health education among the population. In recent years, two adversities have intensified: disasters and emergencies. These include climate variability, armed conflicts and disorderly development of urban territory.

In 2022, an estimated 198 million people were affected by natural disasters, which caused 30,704 deaths and caused 223.8 billion dollars in damage (EM-DAT, 2023). Within this context, WASH decision-making tools help to bring solutions with regard to disaster and emergency situations. These tools can be used during sanitation plans and, more specifically, in the preparation of contingency plans, which are still not very present in municipalities and do not usually consider extreme events in the decision-making process.

Another relevant factor is that existing decision-making tools for sanitation management in disasters and emergencies are rarely available in Portuguese. Furthermore, they do not usually include more than one WASH axis, being focused only on sanitation or water supply or solid waste. It is in this urgent context that this research paper is inserted, which presents the preliminary version of a WASH management tool for decision-making in situations of hydrological disasters in flood conditions

METHODOLOGY

The tool is freely accessible at www.gessadeiph.eco.br and encompasses three key areas of sanitation: water supply, wastewater management, and solid waste disposal. It is structured into three sections:

- **Section 1:** Good Practices and Minimum Hygiene Standards;
- **Section 2:** Preventive Actions;
- **Section 3:** Response Measures.

Section 1 focuses on the relationship between sanitation and health, presenting minimum hygiene standards for emergency scenarios based on existing literature. This chapter also addresses diseases associated with the lack or inadequacy of basic sanitation and outlines potential control strategies for each group of illnesses.

Section 2 discusses preventive actions and serves a guiding purpose, offering recommendations for initiatives aimed at enhancing the resilience of sanitation systems to the impacts of natural disasters. Therefore, this part of the tool should only be applied in pre-event contexts, such as contingency plans and similar documents.

Section 3 encompasses response actions to be implemented during the acute phase of a disaster. This chapter is centered on providing emergency solutions for water supply, wastewater management, and solid waste disposal. The solutions are categorized by functional groups, representing stages in the chain of each sector (e.g., Solid Waste: Storage -> Collection and Transport -> Transfer -> Final Disposal). Users must select a solution for each functional group they wish to include in the process.

These solutions are presented after being filtered through a decision tree based on diagnostic questionnaires completed by the user. Each sector has an informative questionnaire (open-ended questions) and a classificatory questionnaire (yes/no answers only). Additionally, there is a general informative questionnaire common to all sectors, which must be completed. The classificatory questionnaire filters the feasible solutions for the specific emergency scenario, while the informative questionnaire helps to validate the user's selected solutions in the classificatory stage. This separation is necessary because some questions are subjective and, therefore, cannot be directly incorporated into the decision tree that filters the solutions.

The tool was designed to be primarily used at the municipal level during the pre-event planning stage and incorporated into documents such as Contingency Plans and other similar documents.

For applications in such documents, the tool was envisioned as a guide for consulting best practices in hygiene and prevention (section 1 and section, respectively) and as a decision-support tool for response actions to be implemented in the sanitation chain (section 3) during the acute phase of an emergency.

In this latter case, it is recommended to conduct simulations of different emergency scenarios. Although it is impossible to simulate all possible scenarios, it is believed that preparation for some cases can make the response faster and more effective at the time of action.

That said, Brazil faces a significant gap in the development of contingency plans, sanitation safety plans, and similar documents. Only a few municipalities and sanitation service providers have such documents, and when they do, they tend to be superficial and often do not focus on extreme events.

Therefore, the tool is designed to be flexible enough for use in post-event situations where rapid action is required to mitigate the effects of the disaster on the affected population. In such cases, the user should directly utilize section 3 of the tool, which addresses response actions for the acute phase of the emergency, and should seek the support of a specialist.

Thus, the primary stakeholders for this tool are anticipated to be:

- Sanitation service providers;
- Professionals responsible for the development of contingency plans and similar documents;
- Humanitarian aid organizations.

Finally, regardless of the scope and the entity responsible for using the tool, it is strongly recommended that the actions to be implemented are endorsed through the active participation of the affected community. This involvement is crucial for the success of the initiatives, as it ensures that the population plays an active role in the decision-making process.

RESULTS AND CONCLUSIONS

To date, only section 3 of the tool has been validated. For this purpose, 30 undergraduate civil engineering students from the Federal University of Rio Grande do Sul were asked to simulate disaster scenarios and use the tool to support decision-making.

In general, the tool proved to be functional and simple to use. One point that still requires improvement, and which was noted during validation, is that some water supply solutions should only be used as back-up solutions. For example, the use of rainwater or the distribution of bottled water are unlikely to be solutions that will serve many people, so although they are important alternatives, they should not be chosen as the main solution. For the final version, this can be easily resolved by developing more specific guidelines for each solution.

Furthermore, the tool still has the limitation of not being able to assess the compatibility of the solutions chosen for each functional group. For example, based on the diagnosis answered, the tool may indicate that it is possible to use groundwater as a water source and hydraulic ram as a pumping solution, which in practice is not possible. That is why it is important to check the solutions with an expert.

Another point suggested by the students was the inclusion of an option to automatically export the selected chain into a report or a page that would make the results more visually accessible.

NEXT STEPS

- Validate section 1 and section 2;
- Translate to Portuguese the Wash Network Compendium of Water Supply Technologies in Emergences to use the solutions on GESSADE-IPH;
- Translate to Portuguese the Wash Network Compendium of Sanitation in Emergences Emergences to use the solutions on GESSADE-IPH;

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