

# sustainable sanitation alliance

## SuSanA - fact sheet

### Sustainable sanitation for emergencies and reconstruction situations

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This factsheet deals with the planning of sustainable sanitation for emergencies and reconstruction situations in low and middle income countries. The United Nation's International Year of Sanitation 2008 has highlighted the need for improved access to sanitation systems in general. Sustainable sanitation systems take into consideration all aspects of sustainability, with regards to health, environmental resources, economic viability, and socio-cultural acceptance as well as technical and institutional appropriateness. Thinking about sustainable sanitation in emergencies is relevant to ensure that solutions remain functional in the long term after the emergency is over. Also, certain conditions such as flooding may require alternative sanitation solutions to immediately prevent contamination of the water resource.

This fact sheet is aimed at field practitioners who are interested in finding out some important aspects of how emergency sanitation can become more sustainable. This is part of an ongoing dialogue including the SuSanA umbrella where development and emergency communities get together and exchange ideas between the emergency events. This has emerged from a growing realisation that current emergency sanitation practices is not working efficiently and that there are needs for new developments and benefits from interaction with the sanitation community. The emergency community often has knowledge about the different sanitation options but would need context specific information to aid decision making. Here, we first address shortcomings of current approaches. Then, we illustrate different sustainable sanitation solutions with case studies of where challenges during emergencies have been addressed to improve sanitation.

## Introduction

Emergencies occur after a disaster has taken place which is defined as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources"<sup>1</sup> This is often exacerbated by some key elements related to development and environmental conditions:

**Poverty** - The major factors influencing disaster risks are human and social vulnerability, which determines the overall capacity to respond to and reduce the impact of natural hazards. Poverty is therefore a major reason for the lack of appropriate actions and building of adequate coping capacities. Disasters make development go backwards when a large-scale hazard hits a highly vulnerable community with low capacity to cope and can reverse hard-won development gains, keeping people locked in poverty cycles, and increasing vulnerability.<sup>2</sup>

**Insufficient management** - is one of the main reasons that sanitation facilities fail in emergencies as well as after. Insufficient consultation with users at the design stage, leading to facilities that are not used as intended; insufficient resources provided for maintaining and cleaning public facilities; and inadequate supervision of self-build sanitation programmes, lead to incorrect siting and construction of latrines. At the same time, emergencies pose a huge challenge to contain excreta as quickly as possible.<sup>3</sup>



► figure 1 Stream contaminated with metals & sewage (UNEP, Iraq)

**Lack of long term thinking and planning** – Many sanitation technologies are introduced to a community without enough long term planning. During emergency situations, aid agencies tend to implement sanitation

systems that are well know to them without much regard for long-term effects or sustainability, since these sanitation

<sup>1</sup> UNISDR 2009 Terminology on disaster risk reduction

<sup>2</sup> UNDP and UNISDR 2008 Linking disaster risk reduction and poverty reduction

<sup>3</sup> [www.alnap.org/ressources/guides/participation.aspx](http://www.alnap.org/ressources/guides/participation.aspx)



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systems are not meant to be long-term solutions. Often, the key criterion is to contain excreta as quickly as possible, which is truly the most important priority. The problem is that in developing countries, these quick fixed measures are often used for a much longer period than originally anticipated. There is also a disconnection between the development phase and the emergency phase where a lot of funding is available the first 6 months but not much after that to implement longer term solutions.

*Challenging conditions* - Some conditions are also challenging to sanitation such as flooding and unstable soils. The result is overflowing, leaking, malfunctioning, or unused latrines which impedes on human health even in the emergency situation. Some challenging environments include:

- 1) Unstable soils (e.g. due to sandy soils or termite infestation). In many cases the lining of pits is necessary to stop them from collapsing and becoming dysfunctional.
- 2) High water tables and flooding. The problem is containment of the excreta where contamination of pathogens and nitrogen can occur for example from overflow of pit latrines or groundwater seepage. Latrines loose capacity due to flood water intrusion and there is risk for flooding can also make latrines inaccessible.
- 3) Rocky soil makes digging difficult and uneven capacity of the ground for infiltration (sand mixed with rocks) creates risk for contamination by pathogens and nitrogen.
- 3) High density populations and space constraints. This category includes urban areas



► figure 2: Devastation after the tsunami in 2004 (WEDC)

Due to urbanisation, emergency agencies are increasingly required to respond in this setting. However, this is where they have least capacity and influence. Urban systems are complex, with advanced technologies and using collective systems operated by many different (private) service providers.

Unplanned areas (informal settlements or slums) in developing countries have conditions similar to emergency situations. The trade off however remains how sanitation systems can be improved and more sustainable without inflicting too much on the time it takes to put them in place.

**Displacement** - Emergency agencies distinguish between three main ways in which people are displaced during emergencies 1) in situ 2) displaced 3) a combination. These categories help understanding how to manage latrines. For example, often the individual families are solely responsible in 'in situ' situations, while camp managers are often responsible in displaced. The combination is very common when displaced people that live in communal shelters at night, return home during the day where they clean, repair and re-start their livelihoods. The attachment to the shelter gives them supplies (food, hygiene kits, shelter kits, etc.) Communal sanitation is required, but also re-establishing units at a household level. A dilemma is where the refugee camps provide better sanitation facilities so the refugees stay.



► figure 3: Camp in Afghanistan (Action Contre la Faim)

## Sustainable sanitation systems

This section presents some sustainable approaches to sustainable sanitation during emergencies. A sustainable sanitation is a system which is economically viable, socially acceptable, and technically and institutionally appropriate as well as protects the environment and the natural resources. There are some key aspects to consider:

- Health and hygiene including the risk for exposure to pathogens and hazardous substances in the catchment.
- Environment and natural resources including the inputs and the emissions into the system.
- Technology and operation including the construction, operation, monitoring and robustness of the system.
- Financial and economic issues including the capacity to pay for the sanitation and its costs and benefits and possible externalities.
- Socio-cultural and institutional aspects including acceptance, gender and legal compliance.<sup>4</sup>

<sup>4</sup> SuSanA vision document 1





The sustainability of facilities can also refer to how long they are likely to be able to be used and maintained in a safe and appropriate manner, without detrimental effect to the community or environment. This includes latrine pits and superstructure life, as well as the ability and the willingness of users to maintain facilities, appropriate funding, equipment and staff skills.

### Planning sustainable sanitation

There is no 'silver bullet' for planning for sustainable sanitation - each approach has specific advantages and disadvantages depending on context and available skills and capacity. Community involvement and consultation with stakeholders is often a crucial initial element in any sanitation planning. The Community Health Club (CHC) Methodology has been used in Zimbabwe for over a decade but usually in a long term development hygiene promotion programme. However, the CHC model has now been adapted to an emergency context and been put to the test for cholera mitigation<sup>5</sup>.

One milestone of sustainable sanitation in emergencies was the publication of the field manual "excreta disposal in emergencies" by Peter Harvey in 2007 (WEDC) available at [www.wedc.lboro.ac.uk/publications](http://www.wedc.lboro.ac.uk/publications). This document collected examples of many sustainable sanitation initiatives from the field. Since then, projects have started, but not many have been documented and evaluated.

### Consideration for vulnerable groups

There are some vulnerable groups which are important to take extra consideration to. These are children, women and disabled. Below are some useful approaches relevant for them.

#### Children's approaches<sup>6</sup>

- Children's faeces are generally more infectious than those of adults, due to more infections and lack of antibodies<sup>7</sup>, and many children can't control their defecation
- Mothers need to clean up and dispose of children's faeces rapidly and hygienically as disposable napkins may not be available (and they may become a waste problem)
- Design hand washing facilities for smaller sized people

- Adult latrines should be equipped with accessories adapting it to children (e.g. staircase, potty)
- Children are not comfortable in dark latrines, therefore only providing a slab is good. A toilet without roof and door is also suitable<sup>8</sup> (good when hand washing is not available).
- Put the children's toilet near the adult's, especially women's
- A trench for adults who then can put the children on top of their own legs when the children need to defecate.

### Disabled persons

- Disabled are part of a group that are not always catered for although as many as 1 out of 5 people can be disabled in an emergency<sup>9</sup>
- Disabled need to be able to access the toilet and support for sitting.

#### Box 1: case study of children's sanitation system

In Ethiopian relief camps in the mid-1980s, special defecation trenches for children were used successfully by the Save the Children Fund. Mothers sat on one side of the trench with their feet propped on the other side, and placed the children between their feet. When the children had defecated, they left via a hand-washing facility. Each time a mother left, a latrine guard shoveled earth over the faeces (Appleton & Save the Children Fund Ethiopia Team, 1987).



► figure 4 Children friendly latrine in a camp in Sri Lanka post Tsunami 2004 (Action Contre la Faim)

### Gender aspects

- Users (especially women) should be consulted on the design of the toilet, as women and girls more vulnerable to attack, especially during the night.<sup>10</sup>
- In some cultures toilets and the training should be separate for women, men and children.

<sup>5</sup> Juliet Waterkeyn, AfricaAhead, Community Health Clubs in a time of Cholera: organised community response to the epidemic in Manicaland, Zimbabwe.

<sup>6</sup> Much research in the UK, e.g. see Curtis et al 1995; ADAAG 2002

<sup>7</sup> [www.sphereproject.org/content/view/43/83/lang.english](http://www.sphereproject.org/content/view/43/83/lang.english)

<sup>8</sup> WEDC

<sup>9</sup> Jones, H. & B. Reed, 2005, Water and sanitation for disabled people and Other Vulnerable Groups, WEDC

<sup>10</sup> Adams, J, 1999, Managing Water Supply and Sanitation in Emergencies. Oxfam GB.



## Technologies and stage of emergency

There are different stages relevant to emergency situations. Design lives for toilets are divided into immediate term (<one month), short-term (three-six months), recovery and long-term (>one year). However, immediate solutions that only are suitable for a couple of months often end up being used for

► table 1: Overview of different priorities and technology choices depending on the phase of emergency

several years. Also, natural disasters that are recurrent for an area (e.g. floods) can justify the building of more long lasting structures. Right at the initial stage, there is a need to plan intermediate steps, i.e. as communal latrines, setting up a slab manufacturing facility and about collecting local materials for superstructures.

	Immediate (<one month)	Short term (three to six months)	Recovery (six months – one year)	Long-term (>one year)
<b>Priorities</b>	Containment of excreta in the quickest possible time	Promoting use and organizing people to operate and maintain toilets	Longer term use and sharing	Developing to higher technology in sanitation where people want to do this
<b>Stakeholder involvement &amp; methods used</b>	Community level	Community & Household level	Household level	Household level
<b>Technology choice</b>	Defecation fields, shallow trench latrines, and deep trench latrines	Communally managed latrines, Family latrines	Simple pit latrines, ventilated improved pit (VIP) latrines, UDD toilets, Fossa Alterna, Arborloo, Borehole latrines, Pour-flush latrines, Septic tanks, Aquaprvies, Wastewater treatment systems, Latrines for institutions (schools, clinics etc.)	Previous factors + Individual simple pit latrines, either hand-dug or drilled, may be an option in lower-density, longer-term emergency settlements.
<b>Socio economic factors</b>	- Consultation - Disabled - Children - Gender - Information, - training and sensitising about hygiene	Previous factors +  - Monitoring and controlling (if toilet is full) - Logistics and handling (Need to contain the excreta in the transport and handling) - Accountability	Previous factors +  - Financial resources & willingness to pay - Local champions	Previous factors +

## Immediate solutions

Immediate solutions should aim for containing excreta in the quickest possible time. Any type of sanitation system that separates humans from faeces should be a priority over more sustainable options to save human lives in the short term, however there are sustainable solutions. Many times defecation fields are mentioned in emergency literature but these are often not implemented. The minimum is often a simple pit latrine structure. Often emergency agencies go in with ready made solutions and try to rapidly install communal toilets. Emergency agencies have realised that the more permanent these initial structures are, the better. Also, as these solutions are already prefabricated, these may just as well be made more sustainable in the first place. Below are some technologies:

- The Peepoo bag<sup>11</sup> is a small plastic bag made from biodegradable plastic and is self-sanitising via the action of urea granules which convert to ammonia gas when wet. Peepoo bags have been tested in urban slums in Kenya and Bangladesh. During emergencies they could be useful during the time it takes to build other toilets, during flooding and for night time use (especially by women). Collection and burial or composting of the filled bags need to be ensured to make it a safe system.



► figure 5: How to use Peepoo bags ( www.peepoople.com)



- Rapid latrines (see box below) including latrines made of cardboard.

### Box 2: The rapid latrine used by the Red Cross

The Rapid latrine is built to cater for the first 1-4 weeks (which includes pit latrines with plastic slab, and a superstructure with wooden frame and plastic sheeting). The plastic often got ripped and compromised dignity and security and therefore the Red Cross developed a prefabricated superstructure that can be shipped and easily erected on site over the latrines.

Design principles for the rapid latrine:

1. Easy ACT (assemble, clean and transport)
2. Rapid (20-25 superstructures per day)
3. Light weight
4. Durable for 3-6 months and stable
5. Cheap

The materials can be 1) corrugated plastic (light but expensive) 2) plywood 3) foam board. Used in Pakistan and Zimbabwe.

### Multi functional slab

Emergency organisations (e.g. Oxfam) are developing specifications for a multi functional (UD) slab that can be produced by local manufacturers. This could be included in the emergency kit distributed in emergencies. It allows for immediate separation of urine which prolongs the latrine life.



► figure 6 left: UD slab from community toilets in India ([www.whereverthe need.org.uk](http://www.whereverthe need.org.uk))

► figure 7 right: UD separating toilet ready for use ([www.separett.com](http://www.separett.com))

### Trench latrines and other wet latrine systems

Many times, the excreta are buried in deep trench latrines. If water is available, wet systems may be chosen. In any case, the most important from a sustainability point of view is to design and place the latrines in a way that avoids groundwater contamination. Pit latrines and soak-away's (percolation into ground) should be at a distance (15-30 meters) from any groundwater source and the bottom of any latrine at least 1.5 metres above the water table. Drainage or spillage from latrines must not run towards any surface water source or shallow groundwater source. In disasters, groundwater pollution may not be an immediate concern if the groundwater is not

consumed. Ideally, environmental health staff should be involved ensuring that sites are chosen and laid out to provide suitable conditions for sanitation.

### Long term solutions

#### Communal solutions

Below is only a selection. More examples can be found in Eawag's compendium on sanitation options<sup>12</sup>:

- Urinal helps keeping liquids out of the latrine, extending its life.
- Manual desludging pump. Oxfam piloted in rural Indonesia with stakeholders during 2008 (see fig 11)<sup>13</sup>
- Drainage of grey water is important to reduce water in latrines from anal cleansing<sup>14</sup>
- Glass fibre systems built in advance of need and affordable and light weight (see fig 9)
- Some solutions include solar and wind power, and washing water from



► figure 8 Urinal for girls at school in the Andes (Unicef)



► figure 9 Prefabricated fiberglass container after earthquake in Indonesia ([www.bordanet.org](http://www.bordanet.org))

rain water.  
15

- Constructed wetlands – helps mitigate downstream environmental pollution

### Box 3: UD communal toilets in Bolivia

In March 2008, an estimated 20,000 people from areas surrounding Trinidad (Dept. Beni) had gathered because of the floods of Rio Beni. It was crowded and open defecation was rife, the ground was waterlogged, and shelters occupied all of the empty space. Most importantly, there was no elevation, so impossible to dig down. UD toilets were built as a successful intervention. The local authorities were responsible for collecting the faeces filled bags on a daily basis and provided a reliable O&M service. (Oxfam, see picture below).

<sup>11</sup> <http://www2.gt.z.de/Dokumente/oe44/ecosan/en-benefit-from-using-peepoo-bags-Kenya-Bangladesh-2009.pdf>

<sup>12</sup> [www.eawag.ch](http://www.eawag.ch)

<sup>13</sup> Invented by Steve Sugden, LSHTM, <http://desludging.org/>

<sup>14</sup> Semiond & Gonzalez Water, sanitation and hygiene for populations at risk

<sup>15</sup> Saburo Matsui, Kyoto University, Japan





► figure 10 left: UD communal toilet, Bolivia (Oxfam)  
► figure 11 right: desludging hand pump (Steven Sugden)

### Household solutions

- Fossa Alterna – mixing urine and faeces and letting it decompose until harmless using two alternating pits. This has been successfully introduced in camps in Harare<sup>16</sup>
- Urine-diverting alternating twin-vault ventilated improved vault (VIV) latrines. When combined with good greywater management they form a sustainable sanitation system.<sup>17</sup>
- Biogas from latrines to fuel stoves – help saving fuel wood and reducing respiratory diseases
- Arborloos are small, short-life, and low-cost pit latrines designed to cultivate high-value trees. Can be combined with greywater use for irrigation. The most appropriate to use in dispersed rural communities.<sup>18</sup>

#### Box 4: The importance of hygiene education

The Dec 26 2004 a tsunami's destroyed freshwater supply lines and purification systems in Indonesia's Aceh province, Sri Lanka, southern Thailand and southern India. Indonesia's Banda Aceh, a city of some 230,000 people was flattened by the tsunami, and close to 70 % of the water supply system was destroyed. In Sri Lanka and southern India, wells, water pipes, hand pumps and public taps were crushed or uprooted. WHO and UNICEF issued warnings that water-borne diseases such as diarrhoea and cholera could spread easily, and could kill the most vulnerable in the population: young children. But there was no massive outbreak of water-borne diseases amongst children as initially feared. The credit for this success has been attributed to the massive response by U.N. and humanitarian agencies in the days after the tsunami, in addition to awareness efforts to educate the survivors about hand washing and personal hygiene.

#### Key socio-cultural considerations

**Consultation** is crucial and even though time is short during emergencies it is more feasible than people think.

**Accountability of the toilet's operation & maintenance** can be created by e.g. limiting access (e.g. by using a padlock) to families that keep the toilet functioning.

**Information, training and sensitising** - The most significant reductions of diarrhoeal diseases are achieved via sanitation and hygiene promotion improvement.<sup>1</sup> Training can be done most successfully in camps but also to schools and to community groups.

**Cultural considerations** – e.g. People who practice anal cleansing need to have access to water and will choose a toilet near the water. Toilets towards Mecca are unused in Muslim cultures.

#### Integrated solutions for urban slums aiding development

Emergencies also mean an 'opportunity' of receiving substantial international support which could be used to build sustainable long term solutions in WASH. Examples of this is for example in Maputo, Mozambique during the flood in 2000, where MSF (Medicines Sans Frontiers) installed a sustainable system of water, sanitation, drainage, waste collection and hygiene education in a suburb and organized a local association to manage it. Near 2010, ten years after, the association is still working to provide a safer living environment with less cholera and other water related diseases, and the association is also making money out of the business including collecting waste from other suburbs<sup>19</sup>. In every day disasters' such as in the Kibera slum of Nairobi, comprising 60% of the urban population, some communities have even managed to earn enough money in a similar way to buy land outside the city for resettlement<sup>20</sup>.

#### Ecosan and the feasibility in emergencies

Sustainable sanitation and ecosan is not the same thing. Ecosan, or ecological sanitation, is an approach to sanitation which aims to guarantee sustainability in all aspects and enable safe *reuse of the nutrients, water and biogas in excreta and*

<sup>16</sup> P. R. Morgan (2007). Toilets that make compost. Available at: [http://www.ecosanres.org/toilets\\_that\\_make\\_compost.htm](http://www.ecosanres.org/toilets_that_make_compost.htm).

<sup>17</sup> Duncan Mara, Sanitation Practices - good and poor. University of Leeds

<sup>18</sup> <http://www.personal.leeds.ac.uk/~cen6ddm/Arborloos.html>

<sup>19</sup> WaterAid Maputo, field visit to Urbanicacao

<sup>20</sup> Nancy Githaiga, Maji na Ufanisi personal communication

wastewater, which is otherwise discarded. Ecosan is not limited to a specific technology and may include all sorts of toilet types (with or without flushing, with or without urine diversions). One type of toilet which is often used in ecosan systems is the UDDT (urine-diversion dehydration toilet). Research conducted on three case studies for sanitation provision during/after emergency situation in El Salvador (hurricane 1998), Afghanistan (civil war 1992-1995) Guara Guara in Mozambique (flood 2000 - see box) and Pakistan (earthquake, October 2005), showed that ecosan-compatible technologies can be successfully implemented in the long-term phase of the emergency: LASF latrines (LA Letrina Abonera Seca Familiar) were used in El Salvador, and vault latrines were used in Afghanistan (both were UD dehydrating toilets but without reuse of urine).<sup>21</sup>

If sustainable sanitation options were to be adopted more widely by aid agencies for emergency sanitation, awareness would be raised in the affected country and within global institutions. Arguably, this would facilitate the implementation of more eco-friendly technologies in many rapidly urbanising centres in developing countries. However, reuse (ecosan) may be difficult to apply in rapidly growing areas.

### Beneficial situations for ecosan implementation:

- UD is **prolonging the life of a latrine** by reducing the liquid in the toilet. Separating urine means also that the composting process of faecal matter starts. However, diarrhoea, often occurs in emergencies, adding liquid.
- Urine Diversion solutions **reduce smell and flies**.
- Ecosan is mainly a **household option**, but also suitable for communal uses such as schools. Communal latrines need to have someone who maintains the units. The exposure to germs that ecosan implies is normally taking place in a family group, and guidelines should apply if selling UD produce to outsiders.
- Possible to **educate and train** and thus **manage** the facilities properly. This could be combined with health education.
- **Time for planning the camp** - If installing an alternative solution that requires space, planning needs to be done beforehand
- **Social acceptance** at community level may be a challenge; however the reuse element could be omitted
- **Material** needs to be available

<sup>21</sup> Mwase, H. 2006. The Potential of Ecosan to provide Sustainable Sanitation in Emergency Situations and to achieve "quick wins" in MDGs, MSc Thesis, UNESCO-IHE, Delft, NL.

- **Reuse of urine** makes most sense when **growing vegetables** is possible. There is often some kind of agricultural activity of growing vegetables in camps.
- **The environment is challenging** (high groundwater, frequent floods, rocks, unstable soils), and a conventional sanitation system will fail soon after installation anyway

### Challenging environments

Some challenging environments and their solutions include:

- **Rocky ground (difficult to dig down)** → raised latrines
- **Floods and high water table** → water tight or raised latrines, latrines on higher ground
- **Urban areas** → temporary repairs to broken sewers and sewage treatment works for people to use their own existing toilets, or providing public facilities in schools etc or temporary public toilets.

#### Box 5: High groundwater in Mozambique

In 2000 floods affected the Sofala province in Mozambique and more than 4000 people resettled near Guara Guara. Sanitation was the major problem due to high groundwater table and the emergency water supply was provided from shallow aquifers. First 16 emergency latrines were constructed using drums of 210 liters' capacity designed to prevent groundwater contamination. During the resettlement period the families had already started to construct low cost latrines but encountered difficulties since they always would reach the groundwater table in digging the pit. Their solution to the problem was to pile up earth and then make a hole in it. The acceptance and understanding of ecosan was based on the obvious advantages and it was quickly accepted by users and the local administration. To get the concept accepted by among advisors and donors took 1 ½ year – a considerably longer time.

Source: PAARSS programme; L. Macario & M. Fogde, Ecological Sanitation in Guara-Guara paper: third international conference on ecosan

### Planning from assessments

In **urban situations** with existing facilities an assessment of the damage to the sewage system is required, the number of households without functioning toilets and a list of the repair equipment required. Many people also did not have access to a toilet before the disaster.

In **displacement emergencies**, key information includes the number of people currently affected and likely population movements; existing excreta disposal; normal excreta-disposal practices; ground conditions; construction materials and tools; labour availability; water-supply and drainage situation; general health of the displaced population; and the incidence and/or risk of excreta-related diseases.







## Recommendations

- A case by case approach is essential, which makes the initial assessment important
- While implementing a rapid emergency response think as well of the long term solution
- Document your case and send it to be included in the future toolbox on [www.waterdisaster.net](http://www.waterdisaster.net)

## Further readings

- ▶ **Harvey, P.A.; Baghri, S. ; Reed, R.A. (2002). Emergency sanitation: assessment and programme design.** Loughborough, UK: WEDC
- ▶ **WEDC technical briefs**
- ▶ **Oxfam (2001).** Guidelines for public health promotion in emergencies. Oxford, UK: Oxfam.
- ▶ **Oxfam resources site** <http://oxfam.org.uk/resources/learning/> including briefs on UD and composting toilets in emergencies
- ▶ **The Sphere handbook** [www.sphereproject.org](http://www.sphereproject.org)
- ▶ **Wisner, B. ; Adams, J. (2002).** Environmental health in emergencies and disasters: a practical guide. Geneva, Switzerland, WHO.
- ▶ **WHO technical notes for emergencies** 13 & 14

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