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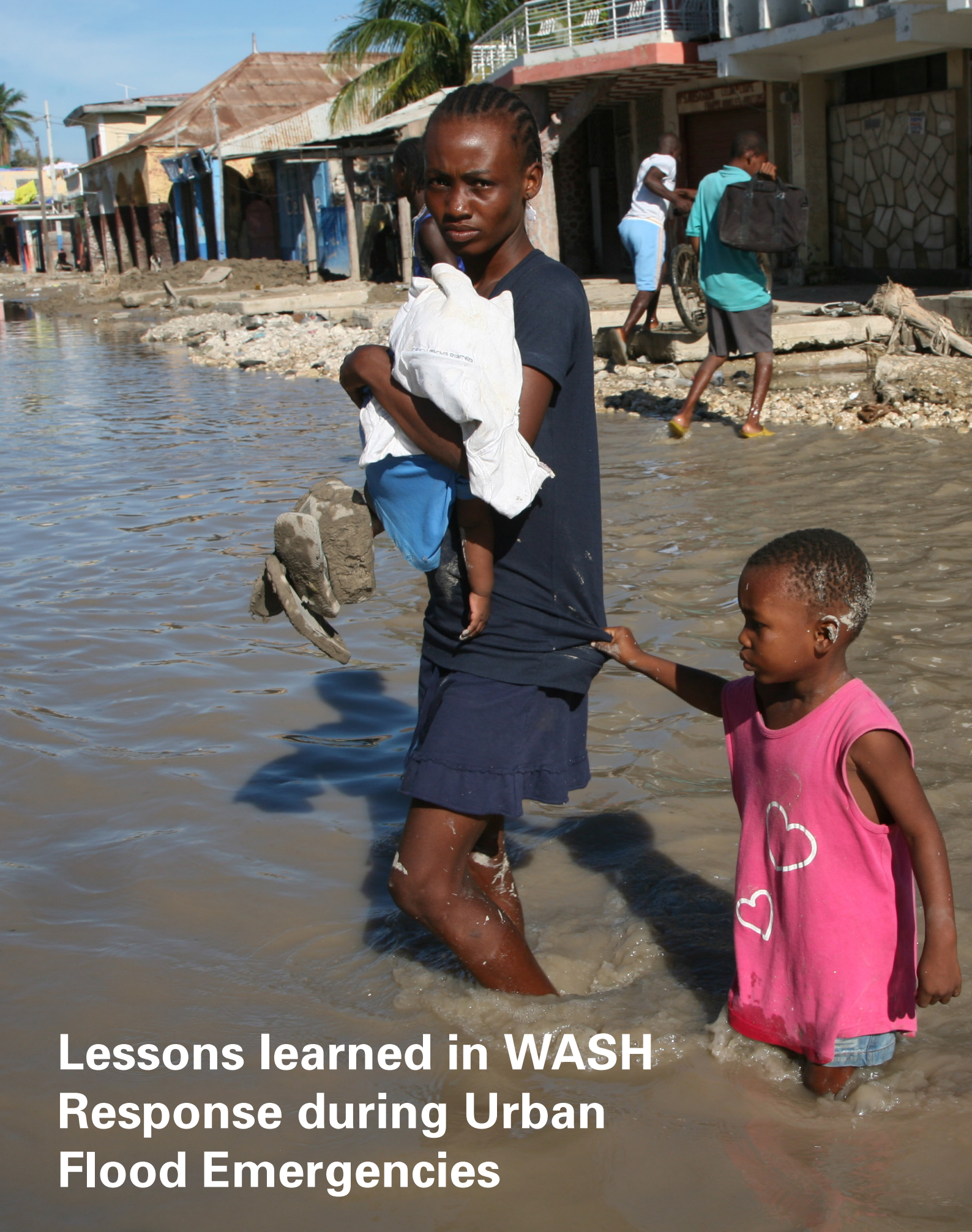
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Lessons learned in WASH Response during Urban Flood Emergencies

The Global WASH Learning Project

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The Global WASH Cluster, led by UNICEF, was established as part of international humanitarian reform, and provides an open, formal platform for all emergency WASH actors to work together.

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Contents

1. Preamble

Water, sanitation and hygiene (WASH) response in urban contexts has been identified by the Global WASH Learning Project as a priority for technical learning in the sector. The increased numbers of earthquakes and cyclones have brought us all closer to urban environments, yet it is recognised that many agencies lack adequate skills to address the complex challenges involved. Urban flooding is one type of emergency that requires a WASH response.

This paper is intended for WASH technical advisors and personnel involved in planning and delivery of WASH programmes in urban flood emergency situations. Material in the paper is based both on a rapid review of literature, and on outputs from a learning workshop held in Haiti in March 2009. The workshop was attended by international inter-agency WASH advisors and practitioners and allowed for sharing of experiences from Haiti and other urban flood emergencies. The focus of the Haiti workshop was on WASH responses, with an emphasis on three words: Flooding, Urban, and Technical. This paper aims to:

- *capture good practices and lessons learned in WASH response to flooding in urban contexts; and*
- *identify associated common technical challenges and gaps.*

This paper identifies various lessons that can be learned from the experiences of relief agency staff when responding to urban flooding emergencies. The paper does not claim to be comprehensive, but can serve as a helpful document, which captures some important lessons to help improve future responses to floods in urban areas, and which can be added to in the future. In addition, these lessons have provided a framework for the development of technical guidance materials to support technical learning in the sector. A series of technical briefs have been developed on issues identified in this paper and are available via the WASH Cluster website www.humanitarianreform.org/Default.aspx?tabid=770.

We would like to thank the participants at the learning workshop in Haiti (March 2009) and members of the project Steering Group (including representatives from Care, CRS, Oxfam, REDR, UNICEF and ACF) for their contribution to this paper.

2. Introduction

Flooding is an expected and regular occurrence in many places, and in rural areas it may be welcomed as the floodwaters carry sediments that improve the fertility of the soil. Residents may use different terms to distinguish between beneficial and harmful floods. In urban areas, floods are less welcome. They often affect the poorer urban residents, who cannot afford to build in areas above flood-level. Few (2003) includes a quote from IPCC (2001) that "squatter and other informal settlements with high population density, poor shelter, little or no access to resources such as safe water and public health services, and low adaptive capacity are highly vulnerable." Poorer residents also suffer more, because they have fewer resources to assist in dealing with floods. Floods can be dangerous to humans, and can destroy houses including water and sanitation infrastructure, either by the force of the floodwaters or because materials are weakened when wet. Damage can be more severe when flooding is associated with strong winds.

Various different circumstances may cause flooding, or increase the likelihood of serious flooding. Deforestation, construction in flood-prone areas, obstruction of drainage channels are a few examples of human activities that may contribute to severe flooding. This document does not discuss approaches to minimise floods, but primarily considers responses to floods.

Flooding can be caused by either freshwater or saltwater. Each presents specific problems. Freshwater carries suspended solids, which leave mud and soil behind when the floodwaters recede, and saltwater can make water sources unsuitable for use, because of the salinity of the floodwaters.

Urban flooding causes considerable damage and disruption, with serious social and economic impacts. The effects of flooding vary, because of local physical, geographical and meteorological conditions, and therefore each situation requires individual responses. In addition to the need for individual assessment, some general issues, having wider relevance, deserve further study. Based on the experiences of relief agency staff, and published documents, suggested lists of topics that require further study and research have been included in this report.

2.1   Urban floods

Harvey (2007) identifies three principal types of flood: rapid-onset, slow-onset and annual seasonal flooding. Examples in an urban context are identified for each:

- Rapid-onset floods – these include flash floods, tidal surges, floods provoked by cyclones or accompanied by strong winds, high runoff from heavy rainfall, dam bursts and overtopping, canals and rivers bursting their banks; typically water rises to dangerous levels within 48 hours. Urban growth has often happened on floodplain areas, with some areas below the flood level. Flood embankments often protect such areas, but there is a high risk that these are breached, causing devastating urban flooding.
- Slow-onset floods – prolonged rainfall causing low-lying areas to gradually become flooded over a period of days or weeks. Urban slum areas may be particularly vulnerable to this type of flooding because there are few drains and the ground is highly compacted, causing pathways and alleys to become streams after heavy downpours, and existing drainage channels or culverts may be blocked by refuse.
- Annual seasonal flooding – many communities around the world are flooded annually and may be under water for some considerable time each year. Wet season flooding may affect some areas in lowland and coastal cities for two of more months per year because rain and river water combine to raise levels in former swamp areas. Reclamation of land in such areas tends to exasperate rises in levels. Such areas are also at high risk of storm surges.

Oxfam (2008) also note that a rapid assessment should establish the cause of the flood, whether it was expected, and the likely time period for which floodwaters will remain.

Assessment of the effectiveness of WASH responses to urban flooding depends on various considerations: whether an emergency response plan was prepared, how well the agencies co-ordinated their efforts, whether agencies had adequate resources, and whether the victims received assistance.

A very useful document published by the Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP) (Alam, 2008) provides a detailed review of key lessons learned from evaluations of emergency responses to flooding over a 20 year period. The study considered flooding in Africa, Asia and the Americas, but does not draw separate lessons for urban and rural floods. Some of the characteristics of urban flooding are identified, such as that natural resources may not be readily available in urban areas, and that people living in urban areas are often dependent on single sources of income for their livelihoods.

The ALNAP document includes a useful classification of the various types of flood, (including urban floods), identifying the characteristics and likely duration of each type. It also draws out lessons for 9 topics, these being:

- Lesson 1 – Flood risk reduction
- Lesson 2 – Building ownership and engaging with local capacity
- Lesson 3 – Needs assessment
- Lesson 4 – Targeting and monitoring
- Lesson 5 – Livelihoods recovery
- Lesson 6 – Local economy and market
- Lesson 7 – Water, sanitation and health
- Lesson 8 – Shelter and housing
- Lesson 9 – Managing nationwide response and coordination

Two key cross-cutting issues identified in the ALNAP document by Alam (2008) are:

"Early warning has little relevance if people do not have the ability to respond to warnings in terms of taking decisions on preventive actions and evacuation."

"The core idea is to address people's critical vulnerabilities to floods and to ensure that the gap between demand and supply of key services (i.e., clean water, sanitation, early warning, food and health) is met through sustained preparedness and contingency planning."

Key preparedness and response lessons identified by Alam (2008) specifically for 'Water, sanitation and health' topics are:

> *"Good understanding of water and sanitation conditions, disease surveillance, speedy response to warning and above all, preparedness of health agencies are the preconditions to reduce the spread of diseases and preserve the quality of the environment during and after flooding."*

> *"Initiatives to improve water supply or water systems should incorporate long-term sustainability."*
> *"Water and sanitation interventions need to be locally appropriate and take into consideration possible problems regarding the availability of water, local perceptions regarding water quality and purity, testing water purity regularly and prevalent sanitation practices and needs."*

> *"Water-borne diseases are preventable through provision of clean water and sanitation."*

One of the more important lessons to be learned is the importance of good communication and co-operation between different agencies (national and international) when responding to floods, so that responses are well co-ordinated, and information and resources can be shared during and after the emergency.

Another key lesson is that the effectiveness of responses to flooding emergencies depends on the level of preparedness of agencies to respond to an emergency. Adequate preparation and preparedness prior to an emergency can significantly assist the response provided when an emergency occurs. Response should therefore not be considered in isolation, but should be considered as one component of an integrated flood management programme. Siddique and Chowdhury (2000) identify the four stages of a flood management programme as:

- Pre-disaster mitigation
- Pre-disaster preparedness
- Response to disaster
- Post-flood recovery

It is likely that the agencies involved in planning for emergencies will be different from those involved in providing emergency response. The agencies that respond to urban emergencies are therefore unlikely to have previously participated in emergency preparedness planning. The effectiveness of responses provided by one group of agencies therefore depends on what preparedness planning was done by other agencies, and what arrangements were in place prior to the emergency.

Participants attending the workshop in Haiti identified four categories of people who may be affected directly by urban floods:

- those who stay in their homes,
- those who relocate to official shelters,
- those who relocate to unofficial shelters,
- those who stay with host families.

There are differences in how agencies respond to each category, in terms of provision of services, health messages, etc.

Official shelters are usually assumed to be temporary. If people lose their homes, however, they will need somewhere to stay, and may wish to stay in an official centre for longer than anticipated. Schools (for example) may be used as temporary shelters, yet people cannot continue to stay in schools once teaching resumes. Additional temporary water supply and sanitation facilities will probably be required in official centres, because normal facilities may not operate because of the floods, or may be insufficient to meet the needs of those seeking shelter.

Unofficial shelters present additional problems, as people may take refuge without seeking permission from the owner. Agencies providing responses during emergencies should not provide any permanent facilities for unofficial shelters without the permission of the owner, as this could be interpreted as condoning or encouraging illegal occupation of property.

During flooding, Harvey (2007) says that local people may be able to identify solutions that are more creative and cheaper than solutions proposed by NGOs; and that *"to ensure an environment free from faecal contamination, three main areas must be addressed:*

1. *promotion of good excreta disposal practices by the affected population through the involvement of the community in the design and siting of the latrines;*
2. *prevention of overflowing of raw sewage from pits and septic tanks during flooding which would result in a very serious environmental health hazard; and*
3. *provision of adequate excreta disposal facilities for displaced people during flooding."*

Various practical and cultural difficulties experienced during urban floods in Dhaka are identified by Rashid (2000). Those most severely affected were women living in poor areas. Basic sanitation was not readily available, so many women urinated or defecated in their homes, wrapped faeces in paper or plastic bags, and threw them into the flood waters. Women and girls also threw menstrual cloths into the flood water, or washed them in dirty water. Some women went together to use latrines located on higher ground, but were embarrassed at having to use latrines in the presence of men whom they did not know, and feeling inappropriately dressed in wet saris that clung to their bodies. Not everyone was able to obtain free safe water, or to afford safe water where it was sold. Some therefore drank the dirty floodwater. As also mentioned by Alam (2008), some water purification tablets were distributed, but many families did not use them because they spoiled the taste of water.

WASH professionals emphasise the importance of water supply and sanitation during floods, but a paper by Rashid et al. (2007) provides a ranking of the perceived adverse impacts of flooding, illustrating the importance of WASH interventions for those affected by floods in Dhaka, Bangladesh. Water-borne diseases are ranked third, contamination of water by sewage and wastes is ranked fourth, and contamination of drinking water is ranked sixth. Respondents in the two districts surveyed relied on tube-wells and municipal taps as their sources of drinking water. The major perceived adverse impacts, and their rankings, are:
1. Damaged property/house
2. Undesirable odours
3. Water-borne diseases
4. Contamination of water by sewage and wastes
5. Mosquito infestation
6. Contamination of drinking water
7. Stagnant water in depressions
8. Growth of aquatic weeds.

Douglas et al (2008) suggest actions and policies to mitigate the effects of flooding, and note that "limited access to critical services such as food, income, health, water, education during flood time is the key factor reducing poor people's ability to adapt to a worsening flood situation" (Douglas et al., 2008). Their paper does not, however, include any details of possible interventions in response to flooding.

A paper by Few (2003) considers both the positive and negative impacts of flooding. Floods may provide increased work opportunities for labourers. Negative impacts include increased risk to health from water-borne pathogens, insect-borne infections and snakebite. The paper also draws attention to the potential negative health effects of flooding in the longer-term: mental health impacts resulting from stress, and effects of malnutrition resulting from disruption to food supplies and incomes.

IFRC (1998) also mentions the psychological damage caused to victims of floods. Some victims experienced a revival of traumatic events from their past, suffered from "survivor guilt", had nightmares, resorted to alcohol abuse, suffered from fear of water, panicked at the sound of helicopters, or felt suicidal.

2.2   WASH challenges in responding to urban floods

Each flood emergency presents challenges, and requires an individual response. This section, based on experiences of flooding in Gonaives (Haiti) gives examples of some of the challenges that may be encountered.

- **Access:** Roads are under repair and remaining very vulnerable to flash flooding. Access to the city is severed at the onset of seasonal/hurricane-induced flash flooding.

- **Coordination and building of partnerships between relief agencies**, local authorities and private suppliers of water to restore municipal water supply as quickly as possible.

- **Weak state institutions and poor existing WASH resources**. In situations where services (such as water distribution and solid waste management) are already poor, an emergency can result in a breakdown of services until outside assistance is provided. Such reliance may leave local agencies further weakened, lacking adequate resources, and unable to provide an adequate service when outside assistance is no longer available. Emergency facilities may continue to be used for longer than intended, if there are insufficient resources to provide replacement permanent facilities.

- **Lack of community awareness about flooding**. Prior to a flood, those likely to be flood victims may have received little or no education and awareness training specifically in relation to flood emergencies. Without such training, they are likely to be ill-prepared to respond to a flood.

3. Overview of Lessons learned

The following list of good practices is a combination of those identified from literature and by participants at the Global WASH cluster workshop in Haiti in March 2009. The list does not claim to be comprehensive, and some of the practices may not be specifically WASH-related.

3.1   Summary of key lessons learned relevant to urban flooding

The Haiti workshop and the associated literature review focused on the three words: flooding, urban and technical. Findings relevant to urban flooding identified non-technical lessons to be of greater priority than technical issues. The main lessons identified were:

- The importance of good communication and co-operation between different agencies (national and international) when responding to floods, so that responses are well co-ordinated, and information and resources can be shared during and after the emergency.
- Effective integration of emergency preparedness planning and implementation of the plan when responding to an emergency.
- The importance of an integrated WASH response to floods, where both hardware and software considerations are taken into account. Far too often, hygiene promotion is seen as an optional add on to a programme and a limited understanding of the term means that it is seen only as the dissemination of messages about handwashing. Hygiene promotion should ensure the optimal use, care and maintenance of water and sanitation facilities and can also be a mechanism to involve affected populations in the design and delivery of an effective and appropriate response.
- The importance of using hygiene promotion approaches that stress dialogue with affected populations and are integrated with the hardware aspects of the response
- Demonstrating cultural sensitivity, and providing responses that demonstrate awareness of social and cultural beliefs and practices.
- The most vulnerable people in communities are at greatest risk from floods. Priority should be given to vulnerable groups, in terms of both responses to flooding and Disaster Risk Reduction activities.

3.2   Priorities for responses to urban flooding

Table 1 (overleaf) summarises the priority responses identified during the Haiti workshop, for each of the four categories of people who may be affected directly by urban floods. For all categories, priority should be given to given to responses that benefit the most vulnerable people. The poorest people in a community are most likely to live in areas at risk of flooding, they have fewest resources to cope following a flood, and they have greatest difficulty in recovering following a flood.

Table 1. Priority responses for those affected by urban flooding

Those who stay in their homes	Those who relocate to official shelters	Those who relocate to unofficial shelters	Those who stay with host families
Arrange distribution of safe water during the flood phase (from regular distribution system, rainwater collection or compact water treatment unit ❶). Provide safe excreta disposal. Arrange distribution of appropriate NFIs. Provide water quality testing services, or advice and information on water quality. Communicate appropriate hygiene messages to those remaining in their homes based on ongoing dialogue to understand barriers to change and feasible actions. Rehabilitate WASH infrastructure as soon as possible (desludging wells, boreholes and latrines, repairing electromechanical equipment, etc.)	Arrange distribution of adequate quantities of safe water. Provide or procure additional latrines with handwashing facilities and ensure care and maintenance. Encourage local people to assist with clearing debris, possibly under cash for work programmes, as part of hygiene promotion response. Arrange distribution of essential and appropriate NFIs Ensure ongoing dialogue with the population to promote optimal use of facilities, handwashing and management of diarrhoea. Rehabilitate infrastructure, including electromechanical plant, as soon as possible.	Provide emergency/ temporary water supplies, and emergency/temporary sanitation (chemical toilets, for example.) but without permanent infrastructure. Provide containers for water storage. Provide advocacy assistance to obtain permissions for people to remain in unofficial locations. Arrange distribution of essential and appropriate NFIs Ensure ongoing dialogue with the population to promote optimal use of facilities, handwashing and management of diarrhoea.	Arrange distribution of adequate quantities of safe water, with increased supplies to meet additional demands. Identify host families, and provide assistance to both hosts and guests, to encourage people to continue staying. Arrange distribution of essential and appropriate NFIs Ensure those affected are aware of how to reduce hygiene risks. Provide additional, tools, materials and support to host families for water supply and sanitation (e.g. containers for storage of water). Provide tools and facilities for collection of flood debris and household wastes. Rehabilitate WASH infrastructure as soon as possible (desludging wells, boreholes and latrines, repairing electromechanical equipment, etc.)

Note: ❶ If household water treatment is promoted, this requires preparedness, promotion and distribution of equipment prior to the emergency.

4.   Water

4.1   Water supply: good practices and lessons learned

Water distribution networks should be repaired, and normal water supplies resumed, as soon as possible after the emergency. Normal municipal water supplies should be provided as soon as possible, and more expensive temporary water supplies should not be used for longer than necessary. Provision should be made to ensure that people who have lost possessions and possibly livelihoods as a result of the floods continue to have access to water, even though they may be unable to buy water.

Accurate maps showing water supply system facilities should be maintained at all times, so that local and international staff have knowledge of water distribution systems and other WASH facilities. This is very important in an urban context.

A roster of individuals having relevant specialist skills should be maintained, so that they can be called upon to provide assistance after floods. Repair or reinstatement of pumping equipment (for example) is a priority, and this requires skilled electro-mechanical engineers.

Wells and boreholes should be rehabilitated and returned to service as quickly as possible after an emergency. As identified in Table 1, desludging of wells should be an early priority for any flood response.

Temporary facilities should be safe, observing good practice and similar standards to those for permanent facilities. Box 1 contains two examples of safe practices, as cited during the Haiti workshop, held in March 2009. The two examples illustrate the importance of having qualified people available to provide advice and assistance.

Box 1. Two examples cited during the Haiti workshop that illustrate the importance of adopting safe practices.

- Heavy bladder tanks, used as water reservoirs, should be supported on structures able to bear the considerable weight of the tanks when filled with water.

- Temporary water distribution pipes should be laid where they are unlikely to be damaged or allow contamination to enter the pipe, so should not be placed in or near drainage channels.

4.2   Water treatment: good practices and lessons learned

- Good collaboration and communication between relief agencies and other stakeholders in the response, including the affected population, is critical to an effective response.

- Volunteers and technicians could be trained to assist with centralised or household water treatment, and also to provide surveillance of water quality, such as by monitoring concentrations of residual chlorine in water. This should be included in the hygiene promotion response. (Oxfam, 2008).

- Interventions that include household water treatment including distribution of chlorine or filters must be accompanied by information and education on correct use and maintenance. This should be a key aspect of the hygiene promotion component and must include monitoring of effective use.

- Where populations have low literacy rates, the use of leaflets or demonstrations at distribution points will not be sufficient to provide effective information on correct use of household water treatment and follow up must be provided.

- Temporary water tanks may be installed to provide water treatment and storage facilities, for sedimentation, chlorination, etc (Oxfam 2008).

4.3   Topics needing further investigation

Preparedness

- Identification of practical measures that can be taken to prevent or reduce the damage caused by floods.

- Recommending how to invest in, and maintain, network supplies in areas that are vulnerable to flooding.

- Identification of practical measures to ensure immediate water supplies for populations affected by flooding, until relief agencies can respond.

- Recommending what practical measures can be taken to reduce flood damage to water supply facilities and infrastructure.

Response

- Investigation into whether simple household treatment techniques can improve the quality of turbid flood waters. McCluskey (2001) identifies several possible responses to water supply in urban floods, and provides a table (see Appendix 1) showing options for supplying water during floods, both to those living in the flooded area and those displaced by floods. There are no simple treatment methods that can be used to remove salinity from salt water.

Figure 1: *A standpipe installation supplying about 1000 inhabitants*

5. Sanitation

5.1   Excreta disposal: good practices and lessons learned

- Sanitation facilities should be kept clean and well-maintained. This encourages people to use the facilities provided, and to help keep them clean and well-maintained. This should be a key aspect of the hygiene promotion component of an intervention and can also include information on the importance of putting toilet paper in the toilet (see example below) or not throwing disposal bottles (sometimes used for anal cleansing) into the latrine etc. Consideration should be given to the possibility of paying someone to ensure that latrines are well maintained, kept clean and that people are encouraged to wash hands with soap following use. Where attendants are employed, they can be trained in key aspects of communication and hygiene promotion. Plastic sheeting or local materials should be used as screening to give privacy to those (especially women and adolescent girls) when using latrines (Oxfam, 2008).

- Adequate lighting should also be provided, so that people are able to use latrines safely at night (Oxfam, 2008). The provision of torches with hygiene kits is sometimes useful in this regard.

- Emergency preparedness planning should include identification of suitable sites for the safe disposal of sanitary wastes, such as sewage and faecal wastes from latrines. Suitable sites should also be identified in advance for the disposal of solid waste and flood debris. The WASH cluster should establish a technical working group to advise on debris management in flood situations.

- Latrines should be rehabilitated and returned to service as quickly as possible after an emergency. As identified in Table 1, desludging of latrines should be an early priority for any flood response.

- Attention must be given to the provision of handwashing facilities where public toilets are provided and to encouraging handwashing with soap following defaecation in all other situations.

Box 2 provides brief details about emergency excreta disposal facilities in Bolivia, following the Rio Beni floods in 2008.

Box 2. Emergency sanitation in Bolivia.

Following flooding of the Rio Beni in Bolivia in March 2008, approximately 20,000 people moved to higher ground on flood protection embankments. Open defecation presented a health risk, and sanitation units were installed as quickly as possible. The latrines were urine-diversion toilets, and were supplied from the local authority contingency stock, following floods in 2007.

Faeces were collected in 200 litre drums lined with bin liners, and urine was drained into containers for disposal. The faeces were collected each day, and transported by truck to a landfill site.

One problem that was experienced was with disposal of toilet paper. In Bolivia, people throw their used toilet paper into a bin next to the toilet. If no bin is provided, they throw the used toilet paper onto the floor beside the toilet. For communal toilets, this caused a hygiene risk and a litter problem. Toilet cleanliness could have been improved if people could have been encouraged to throw their used paper into the toilets.

Source; Oxfam (undated).

5.2   Solid waste: good practices and lessons learned

- Containers for storage of rubbish should be provided at shelters where people have sought refuge. The containers should be emptied frequently, to prevent rubbish being spread around the containers, and transport should be provided for collection and disposal of the rubbish (Oxfam, 2008).

- Sites designated for disposal of wastes should be in uninhabited areas, away from centres of population, and with good access for vehicles.

- Tools can be issued to members of the community, and the community can be encouraged to clear away mud and debris from areas that suffered flooding (Oxfam, 2008).

- Communication with affected communities through the use of radio, outreach workers and/or posters and leaflets is a key aspect of solid waste disposal.

5.3   Vector control: good practices and lessons learned

Vectors such as flies, mosquitoes and rats are insects or animals that can transmit disease-causing bacteria or other organisms from one host to another. Following a flood, conditions may be favourable to the survival and reproduction of vectors, and pathogenic organisms may also be widespread in the environment. Transmission of diseases by vectors is therefore likely to be a serious health risk within affected communities. The publication 'Emergency vector control using chemicals' (Lacarin and Reed, 2004) provides further details of vector control techniques. Lessons learned are as follows:

- The risks of disease transmission by various different vectors should be assessed as quickly as possible following a flood, and appropriate vector control interventions should be planned and

implemented at the earliest opportunity, with interventions maintained throughout the emergency. Plans should be reviewed and modified, as necessary.

- People affected by floods need to have knowledge of the potential risks posed by the vector, the resources to protect themselves from possible infection from contact with vectors that can transmit diseases and an understanding of what to do if they get sick. This should be integrated into the hygiene promotion aspect of the intervention.

- Vector control should be seen as being closely associated with other WASH responses. Safe water supplies, good sanitation, and effective hygiene promotion can all contribute to vector control, but additional responses may also be needed, in the form of medical diagnosis and treatment following infection, chemical or biological control of vectors, safe excreta disposal and personal protection.

5.4   Topics needing further investigation

Excreta disposal

- A detailed review of excreta disposal options during floods could lead to recommendations for preferred options. Harvey (2007) identifies various possible emergency responses for sanitation, including bucket latrines, packet latrines, chemical toilets, elevated latrines (of various designs), and sealed latrines (vaults).

- Undertaking a review of what 'temporary' excreta disposal options are appropriate for use in 'unofficial' shelters, leading to practical recommendations.

- Identification of approaches to raise the status of excreta disposal in emergencies. (Water projects receive more attention and funding than sanitation projects).

Solid waste

- Investigation into options for solid waste management and debris disposal during and following urban floods.

Figure 2: *A floating latrine in an urban flooded city of Borneo:*
A coping mechanism with poor public health implications

6. Hygiene promotion (including NFI distribution)

6.1 Hygiene promotion: good practices and lessons learned

- Hygiene promotion should not simply be seen as the dissemination of key hygiene messages to an affected community. As has been shown in the previous sections communication and dialogue with the affected community is vital if people are to make optimal use of water and sanitation facilities and if WASH personnel are to understand the barriers to effective use. Therefore hygiene promotion must be integrated with all the other 'hardware' aspects of the programme and not seen as a separate project.

- Interaction and communication with the affected population will identify if people are using e.g. water purification tablets or water filters, or using and maintaining handwashing facilities or toilets.

- Communicating with large numbers of flood affected people can be very challenging. Large group meetings that try to feed people with information on hygiene or WASH diseases and don't allow dialogue are to be discouraged. Smaller group sessions that stimulate dialogue, clarify hygiene issues and emphasise people taking action work much better but require skilled facilitators or community organisers. A large team of outreach workers carrying out home visits can be effective but they will need to be trained, supported and supervised.

- A variety of media (as well as interpersonal communication) should be used to provide information and mobilise communities including local or national radio.

6.2 NFI distribution: good practices and lessons learned

- The provision of NFIs can be fraught with problems. A balance has to be struck between distributing quickly and finding out what the population wants which can lead to delays. Often a two phase distribution is used so that general items can be distributed immediately and others that need to be based on consultation with affected populations are distributed a bit later.

- The distribution of hygiene or health related NFI's should always be accompanied by information on why it is included in the distribution and on optimal use whether this is in relation to water purification tablets, water filters, mosquito nets, sanitary towels or soap for handwashing. For example, an evaluation in Bangladesh found that water filters had not been taken out of their packaging and people were saving them as a valuable asset to be sold in times of need.

- Post distribution monitoring must be carried out to identify if items are being used as intended. For example people may choose not to use water purification tablets because they may affect the taste of the water (Rashid, 2000; Alam, 2008).

- It is important that there is consistency between different agencies in the NFIs that are distributed, and standardisation of hygiene kits, to avoid potential jealousy among recipients receiving different items, or confusion caused by distribution of similar, but not identical, items. For example different sachets of chemicals for improving the quality of water may treat different volumes of water.

- Disposable sanitary towels may be unfamiliar to many women and different groups and cultures will have different ways of dealing with menstruation (women in Moslem societies, for example, may not use green sanitary towels, because it would be considered disrespectful).

- Oral rehydration salts (ORS) are sometimes distributed in floods as the risk of diarrhoea increases. However, mass distributions are probably best avoided unless the population is very familiar with how to use ORS. Discussions with the MoH and the health cluster should identify the best mechanisms for managing diarrhoea.

- If possible, essential supplies should be stockpiled at designated official shelters in advance of a flood.

- Blankets and plastic sheeting should be provided to vulnerable families, so that they are able to keep dry and warm (Oxfam, 2008).

- Impregnated bed nets should be provided in areas where malaria, or other diseases transmitted by mosquitoes, presents health problems (Oxfam, 2008) but they should not be distributed without information on correct use.

6.3   Topics needing further investigation

- Research into how relevant hygiene promotion, prior to urban flooding, can prepare people for likely and necessary changes in hygiene practices during an emergency, resulting from resource limitations.
- Research into methods for collecting and using baseline data about the level of awareness of hygiene issues in affected communities before floods.
- Investigation into approaches for increasing awareness among engineers of the importance of hygiene promotion, and appreciation of hygiene promotion challenges. Many engineers concentrate on technical aspects of water and sanitation responses, and give less priority to complementary non-technical issues, such as hygiene promotion.

7.   Cross cutting issues

7.1   Disaster preparedness: good practices and lessons learned

- Planning for possible emergencies is important, so that agency staff and local people are prepared in advance. Having, and following, a Disaster Preparedness Plan is therefore an important example of good practice. All relevant agencies should contribute to the development of the Disaster Preparedness Plan, which should be readily available for use by those who may need to follow it, or refer to it, in the event of an emergency.

- Technical staff in municipal water authorities should receive training in emergency response, so that they know what to do in the event of an emergency, and are able to assist staff from relief agencies. Based on experiences of floods in Bangladesh, Siddiquie and Hossain (2006) propose two recommendations for training and disaster management. The first calls for training and capacity-building of field officials and community workers, volunteers and NGO staff in activities including relief activities. The second calls for more interaction with the affected population in flood disaster management, and clear identification of roles.

- The inclusion of hygiene promotion in disaster preparedness is often neglected but much can be done to prepare communities for the health risks that they might face and to stress the importance of safe excreta disposal, clean drinking water, handwashing and ways to manage diarrhoea.

7.2   Coordination: good practices and lessons learned

Co-ordination of activities by different agencies, through the WASH cluster or other co-ordination system, is very important. There therefore needs to be good cluster co-ordination, with one person having overall responsibility for co-ordination. Good co-ordination involves having a small number of actors sharing a common methodology, sharing information with each other, and having a clear understanding of individual responsibilities and areas of activity. Alam (2008) identifies the importance of good collaboration between agencies, and mentions successful use of appropriate and participative interventions in Guatemala.

Good co-ordination and communication between different agencies includes good engagement between relief agencies and local agencies (especially water authorities) during the emergency. Local agencies should be fully included in all aspects of planning and implementation of responses to an emergency. Relief agency staff need information from national agencies about local resources and facilities when planning their response to a flood, and national agencies need to know what facilities have been provided by relief agencies when the emergency is over and national agencies take control of services once again. As an example of the negative impacts of poor co-ordination, Pelling (1998) says that in Guyana "a weak civil society was unable to counteract the influence (of) deep-rooted and long-standing political rivalries and subsequent inefficiencies in political institutions in managing the urban environment" (Pelling, 1998).

Communication of information to the public is important, so that people are kept well-informed. This can be done via an outreach hygiene promotion or information provided on the radio. There should be transparency in dealings between NGOs and beneficiaries, and communication should be a dialogue, with beneficiaries having a means of providing feedback to NGOs.

Relief agencies should remain in place only for as long as necessary. From the start of an emergency, they should plan an exit strategy for when they no longer need to assist in providing relief. Throughout the emergency, relief agencies and local agencies should work in close partnership, so that local agencies can receive some capacity building for disaster preparedness.

When relief agencies withdraw, they should provide documentation for local agencies, detailing what problems were addressed, what actions were taken and interventions made, and what future maintenance will be needed.

7.3 Assisting different groups in the response: good practices and lessons learned

People who stay in their homes or with host families

- Wherever possible, existing water supplies should be continued during the emergency, so that normal water distribution arrangements to homes are maintained.

- If water supplies are interrupted, water distribution should be started as soon as possible after the emergency, so that any interruptions to supplies are kept to a minimum.

- Water service reservoirs should be kept as full as possible, to meet varying demands, and to increase the likelihood of meeting demand for a period in the event of an interruption to supply.

- Host families should be identified and provided with assistance to make sure that they have adequate resources (water, food, NFIs, latrines etc.) and support to look after those who are staying with them. The additional health risks associated with living in overcrowded conditions as well as the provision of additional facilities will mean that hygiene promotion will still be relevant.

People who relocate to official or unofficial shelters

- Many men living in shelters, return to their homes, when possible, during the day. WASH facilities at shelters may therefore be used less than expected during the day, but may be used more during the evenings. This highlights the importance of dialogue with the affected population in planning WASH provision.

- In order to ensure the quality of water supplied to displaced people, water samples should be taken and analysed to monitor water quality, especially bacterial quality. In some situations, such as where saltwater flooding has occurred, chemical quality should also be monitored.

- Adequate numbers of excreta disposal facilities should be provided, and kept clean and well-maintained. Hygiene promotion efforts should be focused on mobilising community involvement to ensure that this happens. In some cultures, special groups or castes are paid to clean private toilets

and many castes or groups will not be willing to help clean shared public facilities, even if they are offered payment. In this instance it will be necessary to pay attendants to clean the facilities. Depending on the situation, it may be feasible for the attendants to provide hygiene information to users and to encourage handwashing with soap.

- It may be possible to provide permanent facilities in 'official' shelters, but only temporary facilities should be provided in unofficial shelters, unless specific permission for provision of more permanent facilities has been obtained from the owner of the property.

- Attention must be paid to the provision of handwashing facilities and encouraging handwashing with soap or ash following the use of toilets and before eating especially.

7.4   Gender issues and vulnerable groups: good practices and lessons learned

Responses to the needs of adults and children of both sexes should be appropriate, considering local social and cultural attitudes. Women and adolescent girls are vulnerable during emergencies, and women may have a low status in society. It is therefore important that assistance is provided to women's groups or organisations, to ensure that adequate attention is given to women's safety and gender issues.

Some women who relocate to official or unofficial shelters may be extremely vulnerable, and require support and protection if their normal support networks have become disrupted. They need privacy, particularly when visiting latrines, and protection against sexual harassment, violence or exploitation. Relief agency staff need to be aware of these needs, and provide adequate assistance and protection. Men, women and children should all participate in the planning, decision-making and management within shelters and hygiene promotion teams can help to facilitate this involvement.

7.5   Phased approach to flood response

The type of intervention will not be the same for all flood situations, and it may be necessary to work in a phased approach. In reality, the response phase can be considered to consist of separate phases:

- An immediate response phase (typically lasting for 1 to 2 months), typified by instability and a rapidly changing situation;

- A short to medium term stabilisation phase (typically lasting from 2 to six months); and

- Medium to longer term actions, typified by the early recovery phase and resettlement of the affected communities.

Further information about appropriate WASH activities at each phase of the response are included in the series of Technical Briefings developed by Forster, Oess and Sow (2009).

7.6   Topics needing further investigation

This section considers the preparedness and responses phases of an emergency.

Preparedness

- Development of guidelines for relief agencies, suggesting how they can best provide support, in the form of assistance and advice, to households following a flood in an urban area.
- Development of practical messages providing advice for those affected by floods, suggesting what they should do to increase their chances of survival immediately after an emergency, until relief operations can begin.
- Research into how people can survive when they stay on house roofs during floods. This could identify coping strategies, and lead to the development of practical guidelines to assist people to survive and maintain security in such situations.

- Research into the specific needs of vulnerable groups of people (for example the elderly, the young, the disabled, those with HIV/AIDS) during urban floods, and whether there are particular flood-related issues that apply to these vulnerable groups.
- Research into cultural differences within communities, to establish whether different responses may be needed for different sections of society.

Response

- Research into how state actors, agencies, local NGOs and communities can engage and collaborate more effectively in relief responses during floods, and with cleaning mud and debris resulting from urban floods.
- Research into how agencies and communities can obtain improved support, financial assistance and political will for resettlement and reconstruction. Currently most support is directed to relief efforts, rather than for resettlement and reconstruction.
- Development of training materials to assist relief agencies to make use of Global Positioning System (GPS) as a mapping tool during emergencies, particularly in urban areas. Assessment and response teams can use GPS to map flooded areas, water supply facilities, communal latrines, shelters, etc.
- Development of guidelines for relief agencies, suggesting good practices for provision of assistance to people who move to unofficial shelters.
- Research into how relief agencies can track population movements, and provide responses that match local demands for services as people relocate during emergencies.
- Development of practical guidelines suggesting how particular groups of vulnerable people (for example the elderly, the young, the disabled, those with HIV/AIDS) can be identified for priority assistance during urban floods.
- Research leading to recommendations as to whether return and reconstruction following floods could provide an opportunity for better urban planning to reduce future flood risks or damage.
- Research into when health interventions are most needed following an urban flood.

8.   Conclusions

Urban flooding occurs in many locations, sometimes predictably, sometimes unexpectedly. Many individuals and agencies have experience of providing WASH responses following urban flooding, yet comparatively little has been documented to record what was done, or what practices were successful and appropriate.

Specific lessons can be identified for both planning prior to a potential emergency, and response to an emergency. These are two distinct stages of a flood management programme, yet they are closely linked, as planning directly affects the effectiveness of responses. Different agencies are likely to be involved at different stages of an emergency, and it is important that they communicate and collaborate with each other, sharing information regularly. Agencies responding to an emergency need to plan their exit strategy carefully, and exchange of information is of particular importance when there is a transfer of responsibility from one agency to another, such as when relief agencies arrive or depart.

Urban floods systematically affect the poorest (immigrants, new settlers, and people living in un-planned and areas vulnerable to flooding). Disaster Risk Reduction activities should attempt to identify those who are most vulnerable, and pay particular attention to them.

Most publications concentrate on short-term responses, rather than addressing longer-term needs; and on providing support to those who relocate to official shelters following floods. Very little has therefore been written about resettlement after urban floods, on providing support to host families that provide shelter for friends or relatives following urban floods, or on appropriate responses to support those who remain in their homes during floods.

This report draws on publications and the recent experiences of individuals. It identifies a number of important lessons that can be learned, good practices, and topics needing additional research or study. It is hoped that those who help in providing responses to urban flooding emergencies will benefit from the lessons learned, and examples of good practice. It is also hoped that it may prompt others to suggest and document additional findings, and to investigate some of the topics requiring further investigation.

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Appendix 1. Options for supplying water during floods

Options for supplying water during floods	Where the option might be appropriate/used	Advantages	Disadvantages
For those Living in the Flooded Area			
Boiling	Often promoted, but not usually realistic.	Can provide acceptable quality of drinking water.	Requires fuel which may be unavailable or expensive; can be easily recontaminated when stored.
Bleaching Powder	On a household level; either distributed, or used with instructions for purchased chlorine; can be locally prepositioned for predictable flooding events.	Usually easily available in country; safe active % of chlorine.	Difficulties for users in understanding instructions; different products of different active % available; often unreliable potency and sustainability.
Water purifying tablets	Distribution for household level use.	Set amount of chlorine for a set amount of water; can be locally pre-positioned in predictable flooding.	Varying strengths with same sizes of tablet can cause confusion; because they have to be able to cope with the highest chlorine demands, they can leave a strong smell and taste.
Chloro-flocculants sachets	Distribution for household use where waters are turbid and chlorination is either not completely effective or acceptable to the user.	Can produce clear water which has a residual chlorine level; ensures effective disinfection of turbid waters; can be locally pre-positioned in predictable flooding.	More expensive; can suffer from same disadvantages as water purifying tablets.
Transport of chlorinated water in sealed plastic bags	Transported and distributed to affected families; Half volume of water half air to ensure bags float.	Gets some clean water to families where there are few options.	High logistics demand and cost; bags can be perforated; difficult to store in the house.
Raising level of tubewell above water level (pre/post flood)	Where regular floods with predictable water levels.	Allows access all year round to existing protected water sources; can be very cost effective; can be a preparedness mechanism done at construction or pre-flood.	Need to ensure access during floods (eg near building); can't cope with unpredictable bigger floods.
For those Displaced by Floods			
Access to free water from existing paid-for sources	Where free or maintenance-cost only water sources are unavailable due to flooding (usually the choice of the poor).	Gives access to clean water for all; can increase availability of water; can be useful in urban settings.	Difficult to target the poor, requires blanket access; using existing suppliers of water (eg tanker suppliers) will not always increase the total availability of water. *Oxfam Public Health Assessment of Floods, Haiti, November 2000, unpublished.*
Provision of protected water supplies at special shelters on high ground	Sites or specially designated 'flood shelters' can serve large numbers of families for extended periods of time.	Provides clean water for the displaced in the area in which they are sheltered. Water is nearby and boats are not needed for collecting water.	Space is often limited in such shelters; sanitary seals are therefore important; shelters are often located in areas which will not be used at other times of the year - maintenance can therefore be a problem.