

MANUAL FOR ENVIRONMENTAL HEALTH CONTINGENCY PLANNING FOR FLOODS IN THE CARIBBEAN



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This manual was prepared by the Caribbean Environmental Health Institute (CEHI) for the Pan American Health Organization (PAHO). It was developed as a follow up project to a workshop on Disaster Preparedness and Environmental Health held in Barbados in 2000 where the need for environmental health contingency planning guidelines and environmental health rapid needs assessment tools was identified. The manual is for use by Environmental Health Units as planning guidelines prior to a flood event and in the field as an assessment tool during and after flood events.

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Working definitions

A Contingency plan is a management tool used to ensure adequate arrangements are made in anticipation of a crisis, that adequate follow-up actions are undertaken and that subsequent revisions of plans are made.

- *United Nations Inter-Agency Standing Committee Reference Group on Contingency Planning and Preparedness (2001)*

An Environmental Health Rapid Needs Assessment (EHRnA) is conducted to determine immediate resource needs of an affected area. The EHRNA is designed to provide a snapshot of the potential need for resources, so that decisions can be quickly made about how much and what resources should be activated.

- *US Federal Emergency Management Agency (2001)*

How to Use this Manual

This Manual has been designed as a guide to assist the Environmental Health (EH) sector in the development of contingency plans for flood events. It outlines the basic steps in the contingency planning process and provides instructions on the structure and elements of the plan. It also outlines the key management issues in contingency planning. The Manual also includes some assessment tools for use by EH Units both during and after flood situations.

The main themes in EH have been addressed by providing detailed information and directions, which must be factored into the contingency planning process. These are Water Quantity and Quality, Sanitation and Hygiene, Vector Control, Food Sanitation, Chemical Hazards and Epidemiological Surveillance.

It is recommended that users of this Manual first work through Sections 2 and 3 on the Contingency Planning Process, followed by Section 4 on the several EH thematic areas in which information and key issues specific to each theme are flagged.



Part I

Environmental Health Contingency Planning for Floods in the Caribbean



Introduction

Contingency planning is a management process used to ensure that adequate arrangements are made in anticipation of a crisis, that adequate follow-up actions are undertaken and that subsequent revisions of plans are made. It involves:

- Analyzing potential emergencies and their impact on human and ecosystems;
- Prioritizing potential areas of intervention;
- Developing appropriate plans and procedures to deal with prioritized emergencies;
- Ensuring that necessary measures and follow-up actions are taken.
- Ensuring the availability of adequate human and financial resources

Caribbean states are extremely vulnerable to the devastating impacts of floods events. One major impact is on environmental health in particular and as a consequence, it is important that adequate and workable tools are in place to help the persons responsible for EH to make quick and timely management interventions in the case of floods. In this regard, EH contingency plans and EH rapid needs assessment tools must be available to them.

The potential impact of a flood depends on the characteristics of both the flood and the potential flood site. Relevant flood variables include the velocity of the currents, and the depth and rate of rise of floodwaters. Pertinent site characteristics include population density, types of industries, agricultural activities and infrastructure. Depending on the combination of flood and site characteristics, there may be differing impacts from site to site and from one flood event to another. There may be direct impacts to the population in terms of injuries or deaths or indirect impacts through disruption of services and damage to infrastructure. Potential environmental health impacts of floods include disruption of primary health care systems and emergency medical services, as well as damage to health care facilities. Additionally there may be damage to the water supply infrastructure, and contamination of the water supply. Disruption of excreta and solid waste systems is also possible. Other potential impacts could include an increase in vectors and chemical contamination of the flooded areas.

Having determined potential impacts, addressing these impacts must be prioritized. Prioritizing in turn can be based on scenarios. Scenario building identifies potential characteristics at one point along a flood event or an overall dynamic picture of the sequence of characteristics during the flood event. Scenarios in turn may be based on an assessment of

previous flood impacts in an area, a detailed knowledge of the flood prone areas (including vulnerable elements) and substantial technical knowledge of flooding mechanics. Once the scenarios have been developed priorities can be established based on the extent to which services, structures or the population is likely to be affected. To give an example, if flooding is likely at an industrial site, greater priority may be given to controlling chemical contamination.

Other environmental health aspects should not be overlooked however especially as contingency planners often have to consider multiple scenarios. A multiple scenario can for example be coping with chemical contamination coupled with a disruption in waste disposal. Scenarios usually include estimates of the numbers of deaths and injuries, costs of damage to infrastructure, and costs of providing interim services to displaced persons. Scenarios should be location specific.

Once priorities have been established the next step is to develop appropriate plans, which clearly articulate the objectives, policies and procedures to deal with prioritized emergencies. A contingency plan basically identifies coping mechanisms for a set of scenarios. These coping mechanisms must be laid out in an easy to understand format. The plan should outline preventative activities during the pre-flood stage as well as response activities during the flood and post flood. The plan should clearly outline all the activities to be carried out as well as designate responsibility for each activity. After the plan is developed care must be taken to ensure that the necessary preparedness measures and follow-up actions are taken. It is not enough to develop the plans. Methods must be outlined for the operationalization of the plan.

The Contingency Planning Process

Main Steps in the Contingency Planning Process:

- STEP 1** Co-ordination and preparation for the contingency planning process
- STEP 2** Context analyses, scenario building and defining planning assumptions
- STEP 3** Definition of strategies and objectives
- STEP 4** Definition of management and coordination arrangements
- STEP 5** Development of response plans
- STEP 6** Consolidating the process and follow-up actions
- STEP 7** Activation of the contingency plan

Guidelines For Environmental Health Contingency Planning

It must be clearly understood that the EH Contingency Plan does not exist in isolation of other disaster management processes. The EH Contingency Plan must be part of the national health sector plan which in turn should seamlessly fits into the national emergency response plan.

The process of EH contingency planning is more important than the production of the planning document. The document only serves as a record of the agreements and decisions made during the contingency planning process.

STEP

The co-ordination and preparation for the contingency planning process

1. *Establish the Contingency Planning Team (CPT).*

The composition and size of the CPT should take account of potential scenarios (being considered) and the manageability of the planning process. Representatives from the key stakeholder groups should be included e.g. health sector, water authority, solid waste management authority, industry and civil society organizations. The CPT needs to clearly define

the roles of its members and other organizations that should be involved in the process.

2. *Collect and review all existing preparedness measures, and systems and plans.*

It is important to build on previous efforts in order to reduce duplication. Private sector and civil society plans should not be overlooked. Un-documented contingency plans may have validity and should be captured. This process could also assist in the identification of skills and knowledge gaps in the CPT.

3. *Establish a time frame for the development of the contingency plan.*

Define how the contingency planning process will be structured, managed and undertaken. This should include scheduling of planning meetings and the management support required for the process.

4. *Identify and mobilize external human resources needed.*

Seek external expertise if there is limited experience within the CPT.

STEP 2

Definition of planning assumptions, context analyses, and scenario building

1. *Examine all possible impacts of the flood.*

This is a complex process. Consideration must be given to the numerous emergency EH scenarios, variable time frames as well as the resources required to manage them. The use of historical information may provide direction to this process. Scenario building will help to identify early warning indicators.

Critical EH areas to be considered in the planning process

- Quantity and quality of water supply
- Food sanitation
- Vector control
- Solid waste disposal – inclusive of adequate disposal of dead animals
- Excreta and sewage management
- Epidemiological surveillance mechanisms
- Health education and information

More extensive details on the themes can be found in Appendix 1 of this manual.

2. *Prioritize the scenarios examined during the profiling exercise.*

Given the multiplicity of scenarios that could occur during and after a flood, priorities

have to be identified during the planning process. Priority should be given to those situations that are deemed most critical based on the analysis of risks

3. *Establish planning assumptions for the prioritized scenarios.*

Planning assumptions must take into consideration vulnerability assessments of the area. Assessments should focus on drainage, geography, the amount of rainfall over time that would lead to a flood situation, adjacent human settlements, the number of persons likely to be affected, etc.

STEP

3

Definition of strategies and objectives

Strategies and objectives must be established to guide the CPT response to each scenario.

- 1. *Define the overarching principles and strategies that will guide the response of each actor/agency involved in the process.***
- 2. *Clearly define operational objectives.***

These objectives must be such that they will result and support the principles and strategies that have been defined. It is advisable that objectives be:

- Specific
- Measurable
- Achievable
- Relevant
- Time based

3. *Determine a termination strategy.*

The termination strategy should indicate when to stop taking action and is important to the planning process. The termination strategy will force the development of an indicator that will give some idea or estimate of how long EH interventions will be required.

STEP

4

Definition of management and coordination arrangements

- 1. *Clearly define operational roles, functions, responsibilities and accountability by the likely responders.***

Once these are undertaken they will lend to the facilitation of effective management and

coordination of responses during the flood. An EH officer (e.g. Chief Environmental Health Officer) should be given the responsibility for overall coordination of EH aspects.

2. *Clearly define external coordination arrangements.*

This will allow for managed interaction with government, civil society, the media, etc.

STEP

5

Development of response plans to scenarios

1. *Identify likely responders.*

These may be individuals, agencies, institutions or government departments that are likely to be involved in the expected response. A clear chain of command must be detailed to the responders.

2. *Estimate projected needs for each scenario.*

The CPT must make estimate human, technical and financial resource requirements. Careful consideration must be given to what would be required to source and mobilize these resources. The population at risk and the length of response time also need to be factored in when making these estimates.

STEP

6

Consolidating the process and follow-up actions

1. *Arrange periodic meetings of the CPT to gain consensus and agreement on all aspects of the contingency plan.*

2. *Ensure that follow-up actions identified during the planning process are undertaken.*

Follow up actions should be reviewed at each planning and review meeting and amended accordingly. The review process is a feedback mechanism that ensures that required actions have been undertaken or where actions have not been carried out, reasons for the inaction are determined.

3. *Develop a regime to continuously update and review the contingency plan.*

A schedule for the review and updating of the contingency plan should be developed and adhered to. This will ensure the planning process is dynamic and can respond to new challenges.

STEP



Activation of contingency plan.

1. *Operationalize the contingency plan under the authority of the designated entity in response to predetermined indicators and triggers.*



Structure and Elements of the Environmental Health Contingency Plan

A contingency plan should comprise:

1. Executive Summary
2. Introduction
3. Scenario(s)
4. Context Analysis and Risk Assessment
5. Overall Management and Coordination
6. Strategies and Objectives
7. Sector and Agency Response Plans
8. Preparedness and Maintenance Actions
9. Annexes

Note – A good contingency plan should:

- Be comprehensive but not overly detailed and allow for flexibility
- Provide guidance and direction on the intention of agencies and how to proceed
- Be well structured, easy to read and easy to update
- Serve as a template of what will be done, by whom and by when

Contingency Plan Checklist (Adapted from IASC 2001)

1. *Cover Page*

The cover page provides, at a glance, a brief summation of the key points related to the contingency plan. These would be:

- Country /Region covered
- Date the plan was produced
- Date plan was last updated
- Period covered
- Version number
- Level of confidentiality

2. Executive Summary

The executive summary concisely documents the most important points presented in the contingency plan. Generally, an executive summary should not exceed one page and should include:

- Summary of the situation or crisis
- Background for the contingency plan
- Summary of contingency(s) and scenario(s)
- Intervention strategy and plan summary
- Summary of the management and coordination arrangements

3. Introduction

This should give a brief introduction to the planning process and relevant background information

4. Scenario (s)

This section details the scenario(s) for a particular contingency. It gives the planning assumptions and should describe the potential environmental health issues that face the population under threat. This section aims to:

- Outline the scenario
 - Detail main elements or factors
 - Indicate constraining factors
- Identify main actors
 - Determine governmental capacity to respond
 - Identify other sources of assistance immediately available
- Describe main environmental health consequences
 - Focus on the possible impact on the population and basic services
 - Identify coping mechanisms of the affected population
- Determine probable early warning indicators, triggers for operationalising the contingency plan and monitoring arrangements
- Identify gaps and constraints
 - Consider the major gaps and obstacles to the provision of environmental health services
- Detail major planning assumptions

5. Context Analyses and Risk Assessment

This section details:

- Country information and context analysis
- Summary of contingencies
- Brief summary for planning scenarios(s) for each contingency
- Risk assessment of the scenarios

It briefly documents the background information on the country or region and on the current situation. It outlines each scenario by describing the events that may occur, the magnitude of the potential emergency and the likelihood of such an emergency occurring (an assessment of the risk). Note that historical information will be valuable in this process. Generally this section assists users to develop a feel for the environment in which the planning process is being initiated.

6. Overall Management and Coordination

This section of the plan informs how the EH department will work along with other mobilized agencies. Focus should be placed on the assignment of roles and responsibilities as well as coordination arrangements. These would be based on the planning assumptions developed above and would aim to:

- Determine operational roles, functions and accountability
- Detail internal and external management and coordination arrangements
- Work out the mechanisms for immediate response
- Determine the resource mobilization paths or options
- Devise a media strategy
- Formulate an information management process
- Outline safety and security measures

7. Strategies and Objectives

This section focuses on the common objectives of the responders to the flood event, their direction and type of response. It should include:

- Intervention – an entry and exit strategy
 - The role of EH practitioners during a flood event
 - The overall objectives to be accomplished during the intervention
 - The exit strategy and its indicators
- Operational objectives

- Operational objectives by partner. These must be specific, measurable, achievable, realistic and time-related.
- Levels of preparedness required
 - Preparedness targets
 - Stockpile levels
 - Equipment requirements
 - Resources (Human, cash, materials) on stand-by

8. *Sector and Agency Response Plans*

This section of the plan presents the Environmental Health response that is likely to be undertaken within specific scenarios and covers the areas outlined below.

- Immediate response
 - Identification of immediate responses to the situation
 - Identification of resources to support the actions
 - Arrangements with collaborating partners
 - Identification of information needs
- Needs Assessment and monitoring arrangements
 - Determination of the types of assessment to be undertaken and the required team(s)
 - Implement the reporting and monitoring regime

9. *Preparedness and Maintenance Actions*

This section of the plan proposes actions to strengthen the EH departments' capacity to respond to the EH threats in a flood episode. Details should include:

- Review and updating of plan
- Undertake preparedness actions
 - Identification and warning of early warning indicators
 - Need for baseline assessment and field visits
 - Training requirements of staff
- State of preparedness of EH department
 - Understanding current and future capabilities
 - Know resource inventory and staff required per scenario
 - Clearly identify point persons for specific activities and related responsibilities

10. Appendices

The contingency plan must be precise. Information that is useful but not essential for inclusion in the main document should be attached as annexes. The information below could be included.

- A list of the participants in the contingency planning team
- A clear link between the contingency plan and national disaster emergency preparedness operations
- Contact details and emergency directory
- Inter-agency agreements (e.g. Memoranda of Understanding)
- Staff training requirements
- Maps
- Communications information (e.g. radio frequencies to be used)
- Terms of Reference of the lead coordinator
- Other useful information

Note – The contingency plan:

- Should be shared widely with persons involved in its development and with as many potential responders as possible. The assumption here is that the plan is not politically sensitive.
- Should have an on-going review of early warning indicators and actions by responders to guarantee validity.



Contingency Planning Considerations

Drinking Water Quality and Supply

The most serious consequence of flooding is large-scale contamination of drinking water. Under these conditions, water-borne diseases, usually associated with poor hygiene and sanitation, can affect a large portion of the population. Such diseases include typhoid, cholera, dysentery, infectious hepatitis and gastroenteritis. Given the possible disruption in normal water supplies, the proper storage of water is also of great importance, as poorly stored supplies may become contaminated and also act as a breeding ground for vectors. Even if the water service has not been interrupted, there may be cross contamination from sewage systems due to breaks in the network. Whenever access to normal water sources is hampered or cut off, it is critical that authorities make adequate quantities of potable water available to the population in need. After a flood, it is necessary that a survey of all public water supplies be undertaken, priority being given to drinking water distribution systems.

Some potential sources or causes of drinking water contamination are:

- Contamination of surface source due to cadavers near intake;
- Excessive increase in turbidity making water difficult to purify;
- Physical damage to water treatment plants causing water to go untreated;
- Flood levels surpass height of well head walls or water that flows directly over wells and intakes;
- Rise in water levels in sewer outfalls can cause contamination of groundwater used to supply potable water;
- Fuels and other chemicals may mix with floodwaters and contaminate intakes.

When there is damage to the water supply infrastructure, it should be assumed that water quality is compromised. In this regard, the Contingency Planning Team needs to consider:

- That the public, inclusive of victims, relief workers and essential services such as hospitals, in the flood-affected area can access drinking water from reliable and clean sources.
- That the public water supply is carefully evaluated in order to eliminate risk of water-borne infection and poisoning.
- That water suspected of contamination by human or chemical waste is not used until it

has undergone laboratory analysis to ensure that it meets acceptable quality.

- That water delivered to disaster-stricken population is kept safe until consumed.

Guidelines

Ideally, the plan should outline all anticipated emergencies and should include a description of:

- Emergency response management structure, plan for coordination of activities specific roles for actors and lines of authority;
- Management of internal and external communications and information;
- Identification, mobilization and coordination of financial, technical and human resources, both in-country and abroad.

1. Identify members for the Assessment Team with expertise in water quality/water supply and ensure that they can be quickly and easily mobilized at the onset of a flood.

This expertise could include structural and environmental engineering as well as water quality laboratory skills.

After the flood an assessment of the water quality and supply should be conducted. This assessment should:

- Determine size of affected population: The size of the population affected is necessary to determine the allocation of resources;
- Determine damage to water distribution infrastructure (pipes, dams, pumps, electrical installations) that may impact water quality;
- Determine whether current and projected weather conditions will exacerbate the situation;
- Identify alternative sources of water which can be accessed by the affected population;
- Ascertain the condition and working efficiency of relevant water treatment plant(s);
- Ascertain the quality of the public water supply – Aesthetics, Residual Chlorine, Microbiological testing where possible. Water must be tested as soon as possible after disaster;
- Ensure sufficient vessels are available to public for water storage.

- 2. *Ensure mechanisms are in place for developing water quality/water supply profiles for flood prone areas for review by the Assessment Team prior to the flood event.***

These profiles should form part of the overall flood prone area profile and should include any vulnerability assessment that has been previously undertaken.

The profiles should form part of the overall flood prone area profile

- 3. *Ensure mechanisms are in place for the collection and review of all background information by the Assessment Teams.***

This background information should include a detailed description of the entire water distribution system (from source to endpoint) and alternate sources. In reviewing the background information, attention should be paid to system capacity, physical components as well as past water quality monitoring results. This can be done in conjunction with the Water Utility personnel.

- 4. *Ensure mechanisms are in place to facilitate communication between the EH coordinator and field assessment teams.***
- 5. *Ensure public advisory and public education materials are developed and mechanisms are in place for their dissemination should the need arise.***

The material should focus on water quality and water supply for pre, during and post flood and should advise the general public on the proper water storage and disinfection. (See Appendices 2 and 3).

- 6. *Ensure mechanisms are in place at temporary shelters for water management and sanitation.***
- 7. *Identify possible alternative water sources and put in place mechanisms to mobilize supply if needed.***

This could include the mobilization and deployment of water tankers to affected areas and/or onsite storage. The quality of water supplied by truck or tanker should be of acceptable quality. This is ensured by conducting residual chlorine and bacteriological quality analyses. In cases where water quality is not adequate, consideration should be given to the installation of a disinfection system. Where disinfections systems are to be installed simple rather than sophisticated technology should be used.

Where water is stored (including shelters and other public places), the water quality and storage containers must be checked. In addition the quantities should be checked in shelters since the minimum daily requirement of water per person is 20 Litres.

All public storage containers must be checked for cleanliness cracks and secured covering prior to storing water.

8. *Ensure adequate supplies of chlorine tablets are available for water purification.*

In the event of poor water quality, microbiological contamination is of greatest priority for public safety, and chlorine disinfection is relatively cheap, effective and usually readily available. A set dosage should never suggested without knowledge of the concentration of the disinfectant. The planning process should give consideration to the assignment of disinfection responsibility for water at the shelter to one person, so that the process is better controlled.

Apart from biological concerns, another possible threat to water quality is chemical contamination and toxicity. In this case potential chemical contaminants will have to be identified and samples collected for further analysis. If it is established that there is contamination of the water supply with a toxic substance, alternative water sources should be sought

The level of residual chlorine and water pressure should be increased, since low water pressure tends to increase the possibility of infiltration of pollutants into the water mains.

Planning should include the testing of water quality immediately after the flood event using simple residue chlorine test kits, and should continue until conditions return to normal. A minimum residual chlorine level of 0.7mg/L should be maintained.

Chlorine content in water should be ascertained even when there are no test kits available. This may be determined with a simple check for chlorine smell in water.

Unless microbiological testing (which has a relatively long incubation period) proves otherwise, where testing reveals an absence of chlorine, microbiological contamination should be assumed.

Plans should include disinfection where repairs are made to mains, reservoirs and other units.

9. *Identify equipment, supplies and resources for water quality monitoring and water supply assessment and ensure mechanisms are in place for their mobilization.*

A critical piece of equipment is the water quality field testing kit. This should be equipment capable of testing for the following parameters: residual chlorine and bacteriological quality. The actual water quality testing could be done directly by the RNAT however if the necessary equipment is not available then a competent agency with the capability to conduct the required tests should be utilized.

A detailed checklist of equipment required for water quality/supply assessment is attached as Appendix 4.

10. Ensure mechanisms are in place for the resuming the water quality monitoring programme if it was disrupted during the flood.

Vector Control

Vectors carry disease-producing microorganisms from one host to another. These potential disease carriers are capable of rapidly reproducing and dispersing within favorable environments. Floods often provide conditions for proliferation and in particular, a variety of species of flies and mosquitoes pose the greatest threat for vector-borne diseases. Vectors of significance in the Caribbean include mosquitoes, flies, rats and mice, cockroaches, ticks, fleas, lice and mites. It is important to note that a disaster such as a flood does not cause new diseases. However, altering the environment may predispose a particular area to increases in the transmission of diseases already present and introduction from another area. This increase in the prevalence of a particular disease may be due to the following:

- Creation of new breeding sites
- Disruption of on-going vector control programs
- Presence of poor sanitary conditions in areas that are overcrowded
- Faecal and urine contamination
- Increase in the number of vector and/or disease host species
- Movement of people from one location to another
- Increase in vector and human contact

The increased risk of transmission of vector-borne diseases following a flooding episode must be viewed very seriously. It is a priority that the potential for the transmission of vector-borne diseases be assessed as early as possible in the post-flood period, bearing in mind that flood conditions do not automatically result in outbreaks of vector-borne diseases. Of importance however, is the fact that some flood-associated diseases may appear several weeks or months after the event. This time lag may be the direct result of physical damage to larval and/or adult habitats as well as physical injury or death of adult vectors. The principal diseases transmitted by vectors that are of importance to the Caribbean are listed in Table 1. These areas are likely to need surveillance to control vector proliferation:

In carrying out any surveillance programme, special attention must be paid to the following areas:

Table 1
Principal diseases transmitted by vectors that are of importance to the Caribbean

Disease/Condition	Vector
Dengue Fever, Dengue Hemorrhagic Fever, Malaria, Yellow Fever, West Nile Virus, etc	Mosquitoes
Leptospirosis, Hanta	Rats, mice, toads, domestic pets
Diarrhoeal diseases	Flies, cockroaches
Hemorrhagic conjunctivitis	Gnats, flies, humans

- Food areas (preparation, storage and eating)
- Waste storage, collection and disposal sites inclusive of transfer stations
- Storm-water drain systems
- Low lying flooded areas
- Damaged warehouses
- Damaged livestock pens
- Dead animals
- Burst sewerage pipes
- Damaged or flooded on-site sanitation systems
- Cemeteries
- Any area where people congregate

Guidelines

The major activity for vector control should occur as soon as possible during the post-flood period. However, if the contingency planning process is to be effective it is necessary to ensure that resources can be rapidly mobilized and an operational management framework activated to allow the activities listed below to be undertaken.

The following guidelines identify the areas that must be adequately managed if the Contingency plan is to be effective.

- 1. Identify Assessment Team members with expertise in vector control and put in place mechanisms for their mobilization at the onset of a flood.***

2. *Develop vector profiles of flood prone areas (FPA).*

Knowledge of the areas prone to flooding will assist the Assessment teams in rapidly locating areas that are likely to develop stagnant pools of water. In addition the Assessment teams would also be able to quickly identify commercial and domestic situations that could provide possible sources of food to rodents and other vectors. Knowledge of the biology and ecology of vectors that are potentially problematic will also be a critical factor in determining the risk factors. For example flooding usually flushes out mosquito breeding sites but can subsequently create new breeding sites that can produce greater mosquito density. If the potable water system is damaged the storage of water could lead to the creation of mosquito habitats. This will be invaluable in assessing the potential of vector and rodent related problems after flooding. The profiles should form part of the overall flood prone profiles.

3. *Develop systems for the collection and review of all relevant background information.*

The background information should include the overall profiles of the flood plains, disaster management plans for the flood-prone areas, and information on vectors within the areas. Having background information on the recent history of the incidence of vector diseases will be a useful guide in assessing the risk of disease outbreak or spread. Accurate and updated information will provide a baseline that will allow for proper evaluation and assessment in a post-flood situation. Be familiar with all disaster management plans and coordinators in FPA. Being aware of official or unofficial community disaster management plans will allow the Assessment Teams to better manage and acquire support for his activities. In this way it will be clear whom the Assessment Teams should report to and interact with thus allowing for better receipt of information and more effective interventions.

4. *Identify equipment, supplies and resources for vector monitoring and control and ensure mechanisms are in place for their mobilization .*

This should include a field kit which would allow the environmental health practitioner(s) to undertake the basic tasks related to monitoring and surveillance of vectors following a flood episode while providing an acceptable level of personal protection. (See Appendix 4).

This process should also include developing an estimate of the manpower requirements required to undertake the vector control and monitoring.

These supplies should also include insecticide, rodent bait stations and other equipment. Knowing the location of these resources will allow for faster deployment as and when required.

5. *Conduct pre-flood inspections.*

This is key for undertaking an environmental health surveillance programme for persons displaced by the flood.

6. *Ensure that an assessment programme to estimate the potential of vector related problems is in place.*

This programme should include:

- Determination of the geographical area and the size of population affected
- Determination of any redistribution of human populations
- Assessment of the extent of damage to the water supply system and sanitary facilities
- Derivation of an estimate from authorities on the time required to restore potable water services
- A determination of the status of established mosquito breeding habitats and the extent to which new ones are created
- An assessment to identify all possible food sources for rodents and flies, inclusive of human and animal faecal sources. A determination of the best methods for securing or disposing of these is also required
- A regime is developed to ensure that dead animals are properly disposed of as soon as they are discovered
- That the public is to be notified that discarded containers, and virtually any household receptacle that can hold water is a potential breeding site for mosquitoes. They must also be made aware of the necessity to keep food and drinking water stored safely away from rodents, cockroaches and flies. The importance of the sanitary disposal of faecal matter cannot be overstated. Information must also be disseminated about the importance of keeping ones hands as clean as possible when handling food or providing any form of medical attention.

7. *Ensure mechanisms are in place to resume routine vector control programs which may have been disrupted as a result of the flood.*

This is a pre-emptive and precautionary strategy that should be implemented particularly if standing bodies of water are prevalent. It should also include a continuous vector density surveillance programme. Undertaking such a programme will assist the EHP to become aware of any increases in specific vector populations and by extension determine possible disease outbreak. The vector control programme should be guided by the disease surveillance programme. This is critical as it will confirm the first signs of the appearance of a vector-borne disease and will provide guidance on additional action that should be taken to avoid spread.

Should there be an outbreak of a vector-borne disease all efforts should be made to reduce infective adult insect or rodent populations by space spray methods such as vehicle-

mounted and portable thermal foggers, aerosol generators or portable mist ultra-low volume blowers.

8. *Ensure appropriate management of solid waste in the flood area.*

Monitoring of waste collection areas and food preparation areas is important to ensure that such facilities are properly managed given that they can provide a food source for rodents and cockroaches.

9. *Develop public advisory and public education material and identify mechanisms for their dissemination.*

These advisories should include information about mosquito and rodent proofing of commercial, domestic and temporary compounds. In addition public service announcements should include the methods that citizens could use to reduce the chance of contracting a vector borne disease. For example, the use of mosquito nets and repellents, the wearing of clothing that covers arms and legs, etc.

Advisories should be issued when spraying and fogging is scheduled to take place.

Food Safety

Food Safety refers to the wholesome condition of food such that its consumption does not result in food borne illness. This may include the absence of or relatively low occurrence of disease causing organisms or substances that could be potentially harmful to consumers. Food borne illness may result from the irritation of the alimentary canal as a result of rapid bacterial multiplication, the production of toxins by pathogens (food poisoning), or as a result of the impact of chemical or physical substances in the body, introduced through the consumption of contaminated food.

The risk to food safety may result from direct contamination from floodwater, indirect contamination from food contact surfaces and humans, and from poor storage of food that can lead to the proliferation of microorganisms, some of which produce toxins. Improperly stored food can also serve as a habitat and source of food for vectors e.g. flies and rodents.

The various aspects of food safety management in a flood situation should encompass all processes related to the production, storage, processing, preparation, handling and distribution of food, and should include the elements of food operations, management and personnel. Where possible, established procedures for food safety should be used. Alternatively, the Hazard Analysis of Critical Control Points (HACCP) approach may be used. This approach to food safety encompasses 7 principles and prerequisite guidelines. HACCP methodologies can be used to accommodate contingency planning for food safety in the event of a flood. (See Appendix 5).

Ideally, a contingency plan should anticipate the opportunities and points along the food system that are vulnerable to risks as a result of flooding, whether directly or indirectly. Once these points have been identified, measures should be put in place to eliminate or control those risks. Proper planning should allow for the measurement of risks, the maintenance of surveillance and planning for remedial action. However, it must be emphasized that this should not be a complicated plan. Although these follow the basic HACCP principles, it is not expected that such a detailed plan would be operational in a flood situation where persons may not even have been exposed to HACCP training. It should be ensured however, that at least the four basic rules of food safety be observed:

1. Clean and sanitize food and food contact surfaces to eliminate pathogens as much as possible. Attention should also be paid to the personal hygiene practices of food handlers.
2. Separate ready-to-serve foods from those in the process of preparation, in order to eliminate cross-contamination. The utensils used for both types of foods should also be separated, or thoroughly sanitized between usage from one type to the next.
3. Cook foods thoroughly to the recommended minimum temperatures for the specific food types to kill pathogens.
4. Chill foods to the appropriate storage temperatures to ensure that bacterial proliferation is either slowed down or stopped.

The main areas of concern for Food Safety in a Flood are outlined in Table 2.

Table 2
The Main Areas of Concern for Food Safety in a Flood Disaster

Time Frame	Potential Problems	Common Effects
Pre-flood	Poor communication	Poor coordination of flood disaster committee members leads to poor communication and possible logistical failures such as inadequate preparation time for issuing advisories.
Flood conditions	Contamination	Floodwater comes into contact with stored food. Animal carcasses are slaughtered for food. Drinking water used for food preparation is contaminated by floodwater.
	Power outages	Spoilage of refrigerated food.
	Damage to food preparation facilities	Loss of some food that cannot be prepared; spoilage of some.
	Flooding of facilities	Contamination of food, utensils and preparation surfaces.
	Poor storage	Containers in contact with floodwater.
Post-Flood	Poor storage	Containers in contact with floodwater. Containers allow for entry of pests. Contamination of food in storage. Food storage may be lead to spoilage. Storage temperature may be inadequate, leading to spoilage.
	Poor sanitation and hygiene practices	Contamination of food during preparation.
	Transport failures	Risk of contamination if transport vessels were previously used for hazardous materials/substances. Spoilage of refrigerated foods

Guidelines

- 1. Identify members of assessment teams with food safety expertise (e.g. public health/environmental health officer, public health inspector, veterinarian, food microbiologists or other food safety specialist), and put in place mechanisms for their mobilization.***

2. *Ensure collection of necessary background information on the flood prone areas.*

This includes food safety profiles for flood prone areas, pre-flood (e.g. maps highlighting food storage areas and locations of potential hazards such as sources of chemical contamination and septic tanks).

3. *Ensure availability of effective and efficient communications systems and develop communication protocols for exchanges between the field officers and the coordinating EH officer.*

4. *Identify all necessary equipment and supplies to test for food safety, and ensure mechanisms are in place for their mobilization.*

- Make provision for the safe transfer of food taking into account the containers and modes of transport to be used.
- During transportation, ensure protection of food from the elements.
- Most efficient mode of transport should be identified and made available for food transfer
- Ensure that there is adequate fuel (for 3 to 5 days) and spare parts for the proper functioning of vehicles or vessels used for food transportation.
- Ensure that there are generators and adequate fuel stored for at least 3 to 5 days duration.
- Ensure thorough sanitation of food preparation facilities (including contact surfaces and utensils).
- Ensure availability of adequate volumes of safe drinking water for use in food preparation.
- Ensure the availability of thermometers for determining storage and heating temperatures and clocks for determination of heating or cooling time.

5. *Ensure that there is adequate training of persons responsible for food preparation and management in food safety at shelters.*

- A list of recommended sanitation procedures have been detailed in Appendix 6
- Training should include an operations protocol for the preparation and handling of food that allows for the:
 - Identification of hazards,
 - Mechanisms for controlling these hazards,
 - Establishment of procedures,
 - Quality assurance,

- Monitoring,
- Recording and
- Remedial action.
- Training should cover a personal hygiene code for food handlers.
- Training should emphasize that when unplanned for situations evolve, all precautions must focus on keeping food from contact with floodwater.
- Establish clear roles and responsibilities persons involved all aspects of food management, including supervision and record keeping.

6. *Ensure that EH requirements are met for food storage, handling, preparation and distribution at facilities by conducting EH inspections.*

- Food storage areas should be clean
- Containers should be waterproof
- Containers should seal tightly (to keep out floodwater and pests)
- Food items should be stored above ground
- Storage should allow sufficient ventilation and sunlight (where possible)
- Food should be stored by entry date to allow distribution according to the "first in/first out" system, (or any other system that would reduce the chances of food stored past their expiration dates).
- Non-perishable food items should be stored,
- Where perishable items such as meats are readily available in large quantities, they should be dried or salted to ensure a longer shelf life.
- Food should not be stored if the expiration date has passed
- Inspections should include monitoring of personal cleanliness of food handlers.
- Inspection should include the system for the collection and disposal of contaminated and decaying food material to ensure that these items are not returned for consumption.
- Disposal sites should never allow for open dumping, but preferably burying (if possible) and burning. The site should not encourage pests.
- Inspections should be carried out prior to and during the flood period.
- In the event of power outages, there should be a back-up generator for electricity for lighting, refrigeration etc.
- There should be adequate amounts of fuel for generators and food preparation requirements for 3-5 days duration.

7. ***Ensure a system is in place for determining the suitability of injured animals for consumption (including inspection by a veterinarian or other competent authority prior) to slaughter.***
8. ***Ensure development of a public advisory and public education programme to include systems for dissemination of materials.***

Public advisories should:

- detail proper food sanitation practices (as outlined in Appendix 5)
- strongly advise against the use of floodwater for any domestic purpose
- highlight the need to secure at least 3 days' supply of non-perishable food items and potable water.

Sanitation and Hygiene

The importance of maintaining good sanitary conditions following a flooding event in order to protect public health cannot be overstated. It is necessary in the development of good contingency planning to put measures in place for the immediate assessment of the affected areas in an effort to ensure that human health is not compromised. This assessment should include among other areas, considerations for maintaining good sanitary and hygienic conditions with specific reference to water supply, excreta disposal and solid waste management. The following represents elements that should be considered when undertaking contingency planning for sanitary and hygiene conditions following a flood event.

Table 3 gives an indication of the related possible impacts.

In the case of floods it is important to ensure proper water quality in an effort to prevent the spread of diseases, which include diarrhoeal diseases, parasitic infections, typhoid fever as well as epidemics such as cholera; all of which can affect human health. Raw sewage contains a large number of disease causing pathogens which might include: Hepatitis viruses, *Shigella* spp., *Salmonella* spp., *Vibrio cholera*, typhoid bacillus, pathogenic bacteria such as *Klebsiella pneumoniae*, *Leptospira* spp., pathogenic protozoa such as *Entamoeba histolytica*, *Giardia lamblia* and other parasitic organisms such as *Schistosoma* spp., *Ascaris lumbricoides* and hookworm. Illnesses can be transmitted by these microorganisms through an oral faecal route, either directly or through water (including ice), food, milk or hands contaminated with excreta. Also playing an active role in this process are vectors such as insects, rodents, etc.

The important relationship between improper solid waste disposal and the cases of vector borne diseases cannot be overstated. Therefore it is important that arrangements be in

place to collect, store and dispose of refuse and manure. In emergency situations solid waste management can pose a range of problems as there is a need to deal with not only refuse and garbage but also debris from buildings, utilities, trees, plants and dead animals.

Table 3
Flood Disaster Effects on Sanitation and Hygiene

	Common Effects	Severity
Water Supply and Wastewater Disposal	Damage to Civil Engineering Structures	Severe possible effect
	Broken Mains	Less severe possible effect
	Damage to Water Sources	Less severe possible effect
	Power Outages	Less severe possible effect
	Contamination (Biological or Chemical)	Severe possible effect
	Breeding of vectors (stagnant water/wastewater)	Severe possible effect
	Transportation Failures	Severe possible effect
	Personnel Shortages	Less severe possible effect
	System Overload (Due to Population Shifts)	Severe possible effect
	Equipment, parts, and supply shortages	Severe possible effect
Solid Waste Handling	Damage to Civil Engineering structures	Less severe possible effect
	Transportation failures	Severe possible effect
	Equipment shortages	Severe possible effect
	Personnel shortages	Severe possible effect
	Water, soil and air pollution	Severe possible effect
	Solid waste accumulation – vector breeding sites	Severe possible effect
Home Sanitation	Destruction or damage to structures	Severe possible effect
	Contamination of water & food	Severe possible effect
	Disruption of power, heating, fuel, water supply or waste disposal services	Severe possible effect
	Solid waste accumulation – vector breeding sites	Severe possible effect
	Overcrowding	Least or no possible effect

Source: PAHO

Guidelines

The following guidelines are intended to assist Environmental Health Departments to develop contingency plans to ensure the maintenance of sanitation and hygiene following a flood.

- 1. Identify members for the Assessment Team with expertise in sanitation and hygiene and put in place mechanisms for their mobilization at the onset of a flood.***

Members should include sanitary engineers and environmental health officers.

- 2. Develop sanitation and hygiene profiles for flood-prone areas for review by the Assessment Team.***

This profile should include location of existing sanitary landfills/dump sites, areas that can be used as temporary disposal sites, communities surrounding potential disposal sites, sewage treatment systems including on-site excreta disposal systems. This profile forms part of the overall flood prone area profile.

- 3. Collect and review of all background information by the Assessment Team prior to the onset of the rainy/hurricane season.***

- 4. Ensure mechanisms are in place to facilitate communication between the EH coordinator and the Assessment Teams.***

- 5. Ensure that provisions are made for a safe and adequate supply of water, storage and distribution.***

This supply should take into consideration quantities for domestic use, personal hygiene, and food preparation in public and private places among others. See section A.3.2 for more details.

- 6. Identify equipment, supplies and resources for excreta disposal systems and ensure mechanisms are in place for their distribution and effective use.***

There should be adequate and efficient facilities for excreta disposal at public places including shelters. Plans should ensure that existing toilets be repaired or rebuilt which may have been damaged as a result of the flood. The use of chemical toilets should be made available where possible.

The number of latrines to be installed should be estimated on the basis of the number of potential users of the shelter (1 waterless toilet 25 women and 1 waterless toilet and 1 urinal per 35 men [PAHO]). The latrines should be easily accessible and located in close proximity to users. Design and location should take into account the elderly and the handicapped.

Plans for the installation of excreta disposal systems should not be undertaken without an initial assessment of the situation (i.e. existence of sanitation services, number of users, site characteristics etc.).

Attention should also be paid to the capacity for treating exposed pit toilets. Where septic tanks may have been affected plans should include their rehabilitation.

Where there is no access to excreta disposal services plans should incorporate the construction of latrines (individual, collective or portable). If latrines are to be constructed, plans should include the evaluation of the soil, topography conditions, user access, and the presence of surface or ground water in the area. Pit latrines should not be sited above potable water intake points.

In cases where the land is not appropriate for latrine construction (i.e. due to rocky soil or high water table), above ground latrines with removable tanks should be made available. The excreta collected in this case must be transported to pits appropriately located for burial.

Attempts at the implementation of excreta disposal technologies should focus on simple rather than sophisticated technologies.

7. Identify equipment, supplies and resources for personal hygiene and ensure mechanisms are in place for their distribution and effective use.

Personal hygiene facilities must include basic hand washing facilities as well as facilities for washing, cleaning and bathing. Ensure close proximity to the excreta disposal facilities.

8. Identify equipment, supplies and resources for the proper storage, collection and disposal of solid waste, including waste from shelters and public places, and ensure distribution and effective use.

This would necessitate establishing arrangements with the Solid Waste Management Authority and/or other relevant agencies and contractors for the coordination of refuse collection activities from the shelter, camp or households, taking into consideration the accessibility of the regular collection service or creating new arrangements if necessary.

Where the required services are not available/disrupted as a result of the flood, the contingency plan should include provisions for the organized collection, transportation and final disposal of waste. Provision should therefore be made to ensure that additional transportation is available to service these areas.

The plan must ensure that waste collection services are provided to temporary shelters. The generation rates and frequency of collection must be determined. In cases where collection of waste cannot be done directly at the shelter site, arrangements should be made for the creation of waste pick up sites located in an accessible area. However, storage bins and containers should be covered and located away from water sources.

The waste collection and disposal system in shelters should take into consideration the number of people, the existing services, collection service, topographic conditions, accessibility and soil type (in cases where the waste has to be disposed of on site). Provision should be made for the availability of three to four containers per 100 persons and those should be distributed so that every family has access to a container (or plastic bag).

Solid waste containers in the shelters should be positioned off the ground e.g. they should be placed on a wooden platform, emptied and washed as necessary. Garbage should be stored in covered containers.

If disposal sites are inaccessible/inoperable alternative temporary disposal sites should be identified. Very often once disposal commences at a site it continues and becomes a permanent. Therefore selection of such sites should be done carefully. Disposal sites should take into consideration topography and proximity to watercourses and human habitation.

To minimize the volume of waste to be handled at the disposal site, consideration should be given for the burial or burning of degradable waste material. Consideration must also be given to separation of waste so that non-biodegradable waste can be collected at lowest rate and priority given to biodegradable waste if burial or burning is not an option. Open dumping is not recommended.

9. Ensure systems are in place for the collection and disposal of carcasses.

Where carcasses have been collected and await burial, it is recommended that they be sprinkled with kerosene (PAHO 2000) to protect them from predatory animals. It should be noted that the burning of large carcasses is difficult unless there are special incinerators built for that purpose and these consume a large amount of fuel.

10. Ensure methods and procedures for the temporary collection and storage of hazardous waste.

Special storage containers and a secure location should be made available for the temporarily storing of hazardous material, e.g. damaged transformers containing PCB's etc. EH departments should coordinate the management of the hazardous wastes with necessary inputs from relevant agencies such as the Solid Waste Authority. Provision should be made for the later retrieval and proper disposal of such wastes. Disposal should be handled by experts.

11. Ensure that EH requirements are met for sanitation, hygiene and solid waste disposal at shelters and other public facilities by conducting EH inspections.

These inspections should be done prior to and during occupation of these facilities.

Facilities to be inspected include food collection, storage and preparation areas, waste collection and disposal (solid and liquid) and facilities for washing, cleaning and bathing

In locating sanitary services and like bathing and washing facilities there should consideration of the site characteristics (i.e. topography, soil type, accessibility, proximity of water bodies etc.).

12. Ensure public advisory and public education material are developed

and mechanisms are in place for their dissemination should the need arise.

The public should be issued a simple advisory outlining the proper use of sanitary facilities and associated hygiene practices. Where there is no access to sanitary facilities persons should be provided with advice on treating excreta. Until collection services resume, human excreta can be collected and properly secured in plastic bags. The bags should be stored at site away from the household (to minimize odors and health risks). The storage site should not be accessible to vermin and should not come into contact with floodwaters.

Where no solid waste collection services are available the public should also be issued an advisory on solid waste handling (e.g. burning or burying of waste) where there are no collection services available.

13. Ensure mechanisms are in place for resuming normal EH monitoring for sanitation and hygiene.

If the normal EH monitoring programme was disrupted as a result of the flood, steps should be taken to have it reinstated as soon as possible.

Chemical Hazards

Contamination during a flood is always a matter of great concern, and although the focus is often on biological contamination, chemical hazards can have a significant impact where they occur. EH contingency planning must take account of the possible chemical hazards of an area and the emergence of unknown chemical substances displaced by floodwaters.

Chemical hazards may originate from a number of sources including households, industrial plants, petrol stations, agricultural activities etc. They may contaminate floodwater as a result of spillage, leakage or damage to containers. Even where chemical substances are intact in containers, they may be problematic if the warning labels are not visible on the surface, or if they become buried under debris.

The routes of entry of chemical substances into the body can include ingestion of contaminated food or water, inhalation or dermal contact. Because there are so many possible chemical hazards, there are also a variety of potential health effects. These effects may be acute e.g. acute poisoning, skin lesions, rashes, irritation of the gastrointestinal tract, irritation of the mucus membranes of the throat and nasal passages. They may also have chronic

effects e.g. carcinogenic and teratogenic effects, and chronic neurological dysfunction.

Some chemical substances can become assimilated into the food chain, and bioaccumulate in some organisms that may eventually be consumed by humans. This is a problem that persists beyond the period of the flood. It is therefore important to take mitigative action to limit the impact of chemicals in floodwaters, and put in place contingency plans to deal with any possible chemical contamination beyond those measures.

Particular attention should to be paid to agro-chemical products (pesticides and fertilizers), petroleum products and industrial products.

As chemical hazards are of environmental health significance, the EH unit may be responsible for some aspect of chemical hazards management in some countries, particularly where no other agency is given that responsibility, even though it may be in a coordinating role. In reality however, given the complexity of chemical hazards management, and the often limited resources and expertise in the EH Units, the responsibility as well as the resources and expertise to deal with contamination for chemical hazards are normally assigned to an agency other than the EH Unit, such as a Pesticide Control Board, or private industries with the knowledge of the chemicals. The level of involvement of chemical hazards management in a flood situation will therefore vary from one country to the next.

Guidelines

- 1. Ensure that a list is prepared of the various types of chemical substances that may be a threat in the country, and compile a directory of the agencies and individuals with the expertise to address them in the event of a flood.***

Such expertise could reside in:

- Fire departments
- Police departments
- Municipal and provincial agencies
- Medical services
- Laboratory services
- Private sector
- Transport services

- 2. Ensure that protocols, supported by an efficient and effective communications system, are in place for immediate contact with the relevant specialist(s) in the event that reports of chemical spills etc. are made to the EH Unit.***

3. *Ensure that protective clothing is available for EH officers required to be out in the field in the vicinity of a chemical spill.*

4. *Develop chemical profiles of flood-prone areas.*

This should include an inventory of all chemicals found in the flood prone area such as in storage warehousing, industrial processes, and transportation. Information should detail:

a) Chemicals:

- Types e.g. – Agricultural, Industrial
- Properties - Physical/chemical/biological
- Level of Toxicity
- Level of Flammability
- Storage Facilities – on-site, offsite, above ground, underground, bulk
- Quantities- Normally stored, in use, handled
- Mode of transport of chemicals

b) Threatened objects.

- Public Buildings e.g. schools, hotels, etc.
- Rivers
- Community Population
- Livestock

c) Risk objects

- Industrial Plants
- Power station
- Docks "Oil terminals/warehousing"
- Underground storage installations

d) Other factors.

- River flow-rate
- Soil and river pH
- Area meteorological conditions
- Hydrological conditions

5. *Ensure collection of necessary background information on the flood prone areas for review by chemical experts when required.*

Relevant background information could include all local laws, standards, regulations, codes of practice and conventions that may apply to chemical management/environmental

protection and environmental health including Pesticide Legislation, Toxic Chemical legislation, Occupational Health and Safety Legislation, Hazardous Waste Legislation, Environmental Protection Legislation.

In addition, background information should include the current status of community planning and co-ordination for hazardous material emergency preparedness. This type of information will reduce potential overlaps in planning as there may already be contingency plans developed by interagency committees, task forces, or local industries.

Other background information can include standard operating procedures for carrying out chemical assessments and responding to chemical threats.

6. In the event that the Environmental Health Unit has responsibility for dealing with chemical hazards the response procedures should include incident detection, information gathering and action decisions. Likely activities are as follows:

- Identify the nature of the environmental health threat
- Locate the source, the area of immediate risk, and assess the potential for escalation
- Activate the appropriate warning system
- Mobilize the appropriate resources to isolate the hazards as far as possible and to implement "First Aide" remedial actions
- Initiate procedures for the protection of environmental health. Consider the need to evacuate persons
- Implement procedures for the protection of vital resources.\
- Activate emergency communication links, notify the appropriate agencies/institutions
- Liaise with officers of the emergency services and with other personnel as they arrive on site and cooperate as required.
- Call for further emergency assistance as necessary
- Implement approved procedures for rehabilitation as appropriate.

7. Ensure public advisory and public education material are developed and mechanisms are in place for their dissemination should the need arise.

Surveillance and Disease Control

Surveillance is the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know (Centers for Disease Control, 1988).

There are two aspects to surveillance: one is the EH aspect and the other from the epidemiological aspect. Both are closely linked. EH surveillance programs generally cover vectors, food safety, sanitation and hygiene, chemical hazards and water quality. Epidemiological surveillance normally entails monitoring communicable diseases.

Although epidemiological surveillance and disease control do not fall within the purview of EH units, the information and data generated by the other units within the Ministry of Health, such as the Epidemiology Unit are important. Information and data will be required to inform decision-making and the interventions, which EH units are required to take as part of their regular roles and responsibilities in a flood situation. It is therefore necessary that EH units establish working mechanisms with these other units.

During a flood the normal EH surveillance program is likely to be disrupted. As a result it is critical that some quick and simple monitoring mechanisms be put in place to give EH personnel an early warning of any changes. These changes should be investigated and where necessary, control measures designed and implemented.

EH Assessment Teams should determine the adequacy of the EH surveillance system to monitor the flood-created conditions and recommend guidelines for the establishment of simple and rapid monitoring and reporting systems.

Guidelines

- 1. Ensure that all pre-existing EH surveillance data and information for the flood-prone areas are collected and reviewed.***
- 2. Ensure effective two-way communication between the field-reporting units and the coordinating EH officer***
- 3. Ensure that mechanisms are in place to conduct field investigation of unconfirmed reports of EH related diseases and illnesses.***
- 4. Ensure access to laboratory facilities should testing be required.***
- 5. Ensure that information from EH surveillance and field investigations are transmitted rapidly to key decision-makers.***
- 6. Identify resources required for the control of EH related disease after a flood and ensure that they can be quickly and easily mobilized***



Appendices

Appendix 1

Critical Environmental Health Decisions to be Made in a Flood

Decision	Indicator
Medical Personnel/Supplies	
1. Send medical/paramedical personnel	1. Increase in demand
2. Send drugs/medicines	2. Selective increase in frequency of certain illnesses
Water Supply	
1. Establish Temporary/emergency alternative water source	1. Total interruption of the normal system/interruption great enough to jeopardize public health
2. Initiate small-scale chlorination	2. Poor water quality at source
3. Recommend chlorination/boiling	3. Poor drinking water quality
4. Distribute chlorine tablets	4. Poor drinking water quality
5. Provide parts and equipment for system rehabilitation	5. Faulty parts/equipment (determined after detailed survey of the system)
Sewage Disposal	
1. Provide parts and equipment for system rehabilitation	1. Faulty parts/equipment (determined after detailed survey of the system)
2. Provide alternative methods of sewage disposal	2. Total interruption of the normal system/interruption great enough to jeopardize public health
Solid Waste Disposal	
1. Obtain equipment for a) debris removal, b) reconditioning of dump and c) garbage collection	1. Inadequate collection/removal and dumping site

Decision	Indicator
Human Settlements	
1. Provide basic sanitation in settlements	1. Unsanitary living conditions
2. Improve water supply system	2. Unsatisfactory condition of general water supply system
3. Provide sewage disposal system	3. Poor sewage disposal
Food Hygiene	
1. Provide additional personnel for food hygiene inspections	1. Infrequent inspections (determined after quick survey)
Corpses	
1. Initiate mass burials	1. Large number of corpses
Mosquitoes	
1. Initiate Spraying and larval control	1. Increase in vector population and breeding sites and interruption of routine program of control
2. Select best spraying time and larvicide application	2. Determination of the biological life cycle
3. Select appropriate insecticide	3. Sensitivity of mosquitoes, availability, cost and familiarity to personnel of insecticide
4. Order insecticide	4. Amounts likely to be used in 6 months, availability in markets, cost and transport facilities
5. Request equipment	5. Insufficient resources
Other Pests	
1. Start dog-catching campaign	1. Increase in stray dogs reported to be biting
2. Import/bring rabies vaccine	2. Increase in number of dog bites in rabies-endemic areas
3. Import/bring snake venom serum	3. Increase in number of poisonous snakes and/or in proven cases of poisonous snake bites

Decision	Indicator
Food and Nutrition	
1. Establish food aid program	1. Destruction of local crops and stocks, disruption of transport and marketing system and community's earning capacity
2. Select appropriate type of food (dry versus cooked, perishable versus stable)	2. Food habits, availability, cost, transport facilities, distribution facilities, fuel and cooking facilities and refrigeration.
Health Centres	
1. Provide relief supplies to centre	1. Depleted supplies
2. Provide laboratory back-up	2. Increased number of suspected disease case of epidemic potential and lack of adequate local laboratory facilities
3. Send additional health care personnel	3. Manpower shortage, increased demand, remote referral centres
Evacuation Camps/Shelters	
1. Set up camp/shelter	1. Life-threatening conditions in area, destruction of housing and impossibility of providing other shelter on original terrain, and/or spontaneous migration
2. Dismantle camp/shelter	2. Danger of epidemic within camp, danger to life passed, or camp found not justified
3. Provide health and sanitation services	3. Camp set up and not possible to dismantle quickly, disease outbreaks detected or predicted, unsanitary conditions, and/or no access to routine health care.

Source: Assessing Needs in the Health Sector after Floods and Hurricanes, Technical Paper No. 11, Pan American Health Organization (PAHO), 1987.

Appendix 2

Public Advisory on the Criteria for Vessels for Water Storage

Vessels for storing water should be:

- Clean
- Covered
- Above ground level
- Unlikely to taint water

And most importantly, vessel should not have previously contained hazardous materials such as pesticides, PCB's, etc.

Water should be taken from storage vessels in such a manner that hands, cups etc. do not contaminate the whole container. Buckets used in wells should be kept in a sanitary condition

Ideally 20L water/person per day should be stored (4-5 Gal.)-Includes drinking water allowance of 4 litres. This allocation should be increased in hot conditions or where heavy work is being done.

Bottled water should also be used where available.

Appendix 3

Public Advisory on Small-Scale Disinfection

- Water for drinking, cooking, making ice and bathing should be boiled for three (3) minutes
- Household bleach (4-6% Cl) can also be used to purify water – ½ Teaspoon/Gal., allow to stand for 30 mins. (0.5ml/Gal.)
- Chlorine tablets should be distributed if available-This should be accompanied by an education campaign to inform the public on the proper use of the tablets.

Appendix 4

Flood Field Kit Checklist

Items	Tick
<ul style="list-style-type: none">• Flashlight and spare batteries• Felt tip marking pens• Steel toe rubber boots• Water cooler or thermos (drinking water)• First aid kit• Protective gloves (nitrile/pvc)• Construction helmet• Full suit overalls• Safety glasses• Clip board and writing material• Clean towels for personal use• Small backpack• List of emergency contact telephone numbers• Maps of local area• Tape measure• Collection vials and labels• Mosquito larvae dipper• Squeeze bulb syringe (for transferring larvae)• Respirators with canisters• Disposable masks• Sealing tape and string• Camera• Thermometer• Residual chlorine and pH testing equipment• Water sampling bottles (microbiological and chemical)• Inspection forms	

Appendix 5

HACCP Methods for Food Sanitation

	HACCP Principle	Food Sanitation Application Guideline
1	Identification of Hazards	Potential chemical, biological and physical hazards to food as a result of flooding should be identified and control measures for these possibilities should also be identified.
2	Identification of Critical Control Points	Points along the system between production (where applicable) and consumption where potential hazards as a result of flooding can be controlled/eliminated should be identified.
3	Establishment of preventative measures with critical limits for each control point.	For food preparation and for refrigeration of stored food for example, minimum temperature limits should be set. Another example would be the setting of a duration of exposure to a minimum temperature for the reheating of food.
4	Establishment of procedures to monitor critical control points	Establish clear lines of responsibility for handling and preparation of food by specific persons and guidelines for the methodologies to be followed e.g. duration of cooking for particular foods, and how this would be monitored.
5	Establishment of corrective actions to be taken when monitoring shows that a critical limit has not been met.	Develop clear response plan for the actions to be taken if for example, food has been identified as improperly processed because the minimum temperature was not met.
6	Establishment of procedures to verify that the system is working properly.	Regular checks and inspection should be made to ensure that time and temperature gauges are functioning optimally.
7	Establishment of effective record-keeping to document the HACCP system.	Records should be kept of the potential hazards and their control points as well as the monitoring of safety and corrective actions taken.

Appendix 6

List of Food Safety Practices That May be Employed for Food That Has Come into Contact with Floodwater

1. Ensure that utensils used for food preparation are clean and safe. In the event that they have made contact with floodwater:
 - a. Wash all items in strong detergent solution, brush clean and rinse in hot water.
 - b. Glass, porcelain, china and plastic should be immersed in a hot, 10% chlorine bleach solution.
 - c. Silverware and metal pot and pans should be boiled for 10 minutes. Utensils should be air-dried.
 - d. Soft, porous plastic and wooden items, inundated by floodwater should be discarded.
 - e. Storage areas such as cupboards that have been exposed to floodwater should be sanitized with bleach solution before dishes are restored to them.
2. The following food items should be discarded if they have come into contact with floodwater:
 - a. Fresh produce, meat, poultry, fish, eggs,
 - b. Food in open containers and packages,
 - c. Submerged, unopened glass jars that have cardboard lid liners, or
 - d. Home canned jars with broken seals,
 - e. All food in cardboard boxes, paper, foil, cellophane or cloth,
 - f. All food in canisters e.g. spices and staples such as sugar, and cans that are dented, leaking, bulging or rusting
3. Food in cans and glass jars can be used if these storage vessels are first sanitized by:
 - a. Marking the contents with indelible ink then removing labels,
 - b. Washing and scrubbing vessels with a brush in strong detergent solution,
 - c. Then immersing for 10 minutes in solution made of 2 teaspoons of chlorine bleach per gallon of water at room temperature.Cans or jars should then be air-dried before opening
4. Citrus fruit should be washed and sanitized in a light bleach solution (as described in above), and peeled before consumption.

5. Peas, beans, tomatoes, peppers etc., should be washed, then soaked in weak bleach solution (as described above), then cooked thoroughly prior to consumption.
6. Mature root crops e.g. carrots and potatoes may be consumed after they have been sanitized, peeled and cooked.
7. Leafy greens such as lettuce, spinach, cabbage and soft berries must be discarded due to difficulty with removal of silt.
8. Raw fruits and vegetables should not be consumed, even if they have been sanitized.
9. Discard the following frozen or refrigerated items if they have been warmed above 40 degrees F for more than 2 hours: meats, seafood, milk, soft cheeses, eggs, and prepared food.
10. Discard food items that have grown mould, have an unusual odor or an unusual appearance.
11. Refreeze food that is wholly or partially frozen.
12. Uncooked meat, fish or poultry that has been completely thawed may be refrozen if there is no off odor.
13. Thawed but cold juices, baked goods and dairy items may be refrozen.
14. Frozen vegetables that have been thawed to the point that ice crystals have melted, should not be refrozen, but cooked and consumed if there is no off odor.
15. Combination dishes e.g. stews, should be discarded.
16. Where possible, use simple field kits to determine food safety such as phosphate determination kits.
17. Food should be cooked thoroughly to temperatures of at least 70 degrees C, particularly animal products. For spot checks at food preparation establishments, a thermometer should be handy.
18. As far as possible it should be ensured that food is served as soon as it is prepared, while the food is still hot, before bacterial proliferation that will occur at room temperature.
19. Ensure that food that is not consumed right away (stored for more than four or five hours) is either kept hot (at or above 60 degrees C) or cold (at or below 10 degrees C).
20. Large quantities of warm food should not be stored in the refrigerator given the possibility that the core would not reach temperatures below 10 degrees C and that can lead to bacterial proliferation.

21. If food is to be reheated, it should be ensured that all parts of the food should reach temperatures of at least 70 degrees C.
22. To eliminate the possibility of cross contamination, raw and cooked foods should never come into contact with each other. Utensils used with raw food should also not be used with cooked food before washing thoroughly. Hands should be thoroughly washed as well after handling raw food and before handling cooked food.
23. It should also be ensured that food handlers wash their hands frequently during food preparation, after every interruption and before handling different types of foods.
24. Food handles with wounds on their hands should have it bandaged securely.
25. Ensure that the food preparation area is free of animals such as pet cats, dogs, birds etc.

Ensure that all spills and crumbs are immediately cleaned up because they can harbor microorganisms. Surfaces should be cleaned frequently, including floors. Cloths used to clean surfaces should be changed frequently and boiled. Those used on the floors should be washed as well.



Part II

Environmental Health Rapid Needs Assessment for Floods in the Caribbean



Introduction

An Environmental Health Rapid Needs Assessment (EHRnA) is conducted to determine immediate resource needs of an affected area. The EHRnA is designed to provide a snapshot of the potential need for resources, so that decisions can be quickly made about how much and what resources should be activated. An EHRnA is undertaken, by a small team whose objective is, to provide information that will determine critical resource requirements to support emergency response activities.

Environmental Health Rapid Needs Assessment tools are the basic operational data gathering instruments used by the EHRnA team to collect information in an uncomplicated but precise manner. The structure and design of the assessment forms must reflect this.

The EHRnA tools are used within an operational plan. This plan must include:

- Linkages and relationships with the national health sector disaster management plan and the national disaster response agency.
- Primary and secondary target assessment areas
- Assessment of priorities
- Fastest method available for undertaking the assessment (e.g. air, ground)
- Identification of assessors
- Team roster
- Reporting timeframes
- Communications procedures
- Safety and security procedures
- Emergency action procedures
- Dispute resolution procedures

EHRnA TEAM OPERATIONAL PLAN TEMPLATE

Incident:	Flood conditions – give quantitative and qualitative details where possible. Include estimates of flood period, recovery period, aquatic vegetation development etc.
Location:	Give coordinates, dimensions of affected area. Ensure that there is an estimate of the affected population – Description of Land use (housing, agricultural, etc)
Date:	Self-explanatory
Team:	Indicate members and areas of expertise
Objectives:	Determine primary and secondary targets after full consultation and agreement with national disaster response agency.
Strategies:	Designate lead assessors
Clearly identify assignments of the assessors	<ul style="list-style-type: none"> • Note method of transportation • Record reporting times • Include safety and security concerns • Document any unusual circumstances or instructions

EHRnA Team Reporting

Three reports are required for any EHRnA team. These are:

1. Assessment forms
2. Consolidated report
3. Final report

EHRnA Assessment Forms

The assessment form is the principal tool used to collect and relay information to decision makers who in turn will put into operation the mobilization of adequate resources to address the immediate needs of the affected area (s). It is vital therefore, that information in the assessment forms is complete and concise. Templates of these forms are included in this document.

EHRnA Consolidated Report

The EHRnA team leader and the coordinator of the National Health Sector have responsi-

bility for taking the information from the various assessor forms and collating the findings into a Consolidated Report. The Consolidated Report should provide an overview of the impacted area resource immediate needs and the issues faced by the flood-affected areas and must be directed to the appropriate body that will immediately mobilize resources as recommended. It is important that the reports be forthcoming within 24 hours of the occurrence.

EHRnA TEAM CONSOLIDATED REPORT TEMPLATE

Report Number:

Event:

Date, time and Location:

Reporting Period:

Overview:

Describe the area affected by the flood, indicating the boundaries of the most severely affected areas.

Situation Assessment:

This is a narrative that outlines the most critical issues, as determined by team leader and the National Disaster Response Agency designee. Some emphasis should also be placed on other imminent hazards that could exacerbate the situation and cause additional response requirements.

Key areas to be reported on include: Population affected, general health situation, basic health needs, (water, food).

Recommendations:

The recommendations are extracted from the Assessment Forms. The focus must be placed on the most critical issues identified during the assessment phase, clearly identifying the resources required.

Annexes:

Any additional information that would enhance the content of the report should be attached. The individual Forms should also be attached to this report.

Verification:

Team leader and the National Disaster Response Agency designee must sign the document.

Final Report

Each EHRnA Team deployed after the flood event must submit a final Report within the time frame specified by the Team Leader. The Team Leader compiles this report, which is used to assess how effectively and efficiently the assessment operation was undertaken. The report should seek to identify impeding factors to the deployment and suggest corrective measures for the future.

EHRnA TERMINAL REPORT TEMPLATE

Event:

Date:

Introduction: The following Final Report is that of the EH Rapid Needs Assessment team that conducted an initial EH assessment following:

Issue: A one sentence statement

Background: Give a brief description of the issue, context, disaster response and list of challenges – Public Health problems

Recommendations: Detail recommendations in relation to challenges outlined, specifically the issues outlined below.

1. The activation process
2. The mobilization process
3. On-site operations
4. Reassignment and/or demobilization
5. Post-mission activities
6. Organisational effectiveness
7. An assessment of the EHRnA tools used
8. An assessment of policies and procedures

The Team Leader must sign the document

The EHRnA Team

An EHRnA team should be deployed immediately during flood event, as long as conditions permit (e.g. an approaching tropical storm) and immediately after the occurrence of a flooding episode. The team should be comprised of small groups of competent experts.

Each team may be comprised of three sections. Specifically, these are (1) a management unit, (2) an assessment unit and (3) a support unit.

Management Unit

The Management Unit supervises and coordinates the assessment and support units and bears responsibility for the coordination of the EHRnA. The unit comprises:

- A team leader, the chief officer responsible for environmental health
- A member of the National Health Disaster Management Coordination Unit
- The Environmental Health Officer with responsibility for the flooded region.

The team leader has overall responsibility for EHRnA operations and provides the linkages to the national health emergency response agency.

The Environmental Health Officer is responsible for providing local knowledge of the flooded area.

Assessment Unit

The Assessment Unit should include experts that can be drawn from a cross section of the society. These are the individuals that actually perform the EHRnA.

In each case the designated expert within the unit must determine or estimate the resources required to ensure the maintenance of acceptable environmental health standards.

The Assessment Team could be comprised of up to six persons:

- ***A water and sanitation expert***

The water and sanitation expert assesses the distribution status and safety of the potable water supply where appropriate he/she will take water samples. In addition he/she is required to assess the status of excreta and solid waste disposal systems, as well as the number, type and capacity for disposal of dead animals and cadavers. He/she must clearly identify and estimate the immediate needs.

- ***A food safety and hygiene expert***

The food safety and hygiene expert assesses the state of food supplies, availability, safety and distribution within the flood-affected region. In addition they are responsible for assessing the requirements for personal domestic hygiene and survival within the flood-affected zone. They must clearly identify and estimate the immediate needs of this sector and where necessary take samples for laboratory analysis.

- ***A vector and rodent control expert***

An infectious disease professional or entomologist if possible holds responsibility for assessing the resource requirements for vector and rodent control in the immediate and near

future. They must clearly identify and estimate the immediate needs.

- ***A hazardous materials expert***

The hazardous materials expert assesses hazardous materials sites and facilities and their potential for impacting the public in the flooded area. This expert identifies the type of hazard, the contamination threat and the areas under threat. They must clearly identify and estimate the immediate needs.

- ***Logistician***

The logistician determines the immediate requirements for the provision of food, shelter, water and sanitary needs for displaced members of the affected population. In addition they assess the amount of relief and emergency first aid along with volunteer capacity. Logicians must also assess needs related to clean-up operations.

- ***A public health doctor, medical/epidemiological expert***

The medical expert assesses all relevant health care infrastructure and primary care systems, emergency medical services along with any special medical requirements. They must be able to set up ASAP epidemiological surveillance system for affected populations.

Support Unit

The support unit provides both logistical and administrative support to the assessment unit.

Forms

Environmental Health Rapid Needs Assessment: Drinking Water Quality and Quantity

Water Quality and Quantity		Type/Cause of Flood		Reporting Unit		Form	
Flood # (for area this year):		Operations Period:		Date/Time Prepared:		Prepared by:	
Location:		No. of Households			Est. Size of Pop		
Type of Area:		<input type="checkbox"/> Urban		<input type="checkbox"/> Sub-urban		<input type="checkbox"/> Rural	
		<input type="checkbox"/> Sub-urban		<input type="checkbox"/> Rural		<input type="checkbox"/> Industrial	
Observation Operation							
Agency/Organization: _____							
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview							
GPS Location: _____							
Debris Removal							
Are areas where you need emergency access covered by debris? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Is there local capacity to remove debris? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Have all emergency routes been identified? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Estimated quantity of debris to be removed: _____							
Drinking Water Quality and Quantity							
Is distribution system operational? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Has water been contaminated? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Will potable water be required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Is alternative water supply available? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Is chlorine available for disinfection? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Are field kits available for water testing? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
How much potable water will be needed? (20L/person/day) _____							
Are tankers/trucks available to transport water? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Potable Water Systems							
<input type="checkbox"/> Wells <input type="checkbox"/> Springs <input type="checkbox"/> Reservoirs <input type="checkbox"/> Cisterns <input type="checkbox"/> Desalination Plant							
<input type="checkbox"/> Water Treatment Plant <input type="checkbox"/> Other (Please specify) _____							
Number of facilities affected (specify types): _____							
Name of Facility: _____							
Location: _____							
Extent of damage: <input type="checkbox"/> Most destroyed <input type="checkbox"/> Major damage							
<input type="checkbox"/> Minor damage <input type="checkbox"/> In use							
Risk of downstream impacts: <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low							
Time to return to service: _____ Hours _____ Days _____ Weeks							
Is commercial power available at facility? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Is generator power available at facility? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown							
Service area of facility: _____							
Service population of facility: _____							
Response Actions							

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low							
Team Leader _____ Date _____ Time _____						Distribution: _____	

Environmental Health Rapid Needs Assessment: Vectors and Vermin

Vectors and Vermin	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area: <input type="checkbox"/> Urban	<input type="checkbox"/> Sub-urban	<input type="checkbox"/> Rural	<input type="checkbox"/> Industrial
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Vectors Status			
Are rodent populations obviously present in the affected area? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown			
If yes, give details of most prevalent locations and estimate numbers: _____ _____			
Estimate the number and type of bait stations required to control rodent populations: _____ _____			
Are flies, mosquitoes and other insect pests present in large enough numbers to cause concern?			
Flies	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unsure
Mosquitoes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unsure
Other insect pests	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unsure
Identify "other insect pests": _____			
Recommend control measures for these insect pests, and provide details such as quantities of substances to be used where applicable and necessary equipment: _____ _____ _____			
Removal of Potential Vector Habitat			
Is there significant water settlement in areas adjacent to or close to areas of human habitation?			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure			
If yes, indicate : Est. size of area: _____ Longitude: _____ Latitude: _____			
If yes, can contingency action be taken to remove water? Outline required action(s) below, giving estimated resources required. _____ _____ _____			
Are there exposed piles of refuse, dead animals or putrescible material? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure			
If yes, estimate the amount of debris to be removed, and indicate below the resources required for such: _____ _____ _____			
Response Actions			
_____ _____ _____			
Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:

Environmental Health Rapid Needs Assessment: Food Safety

Food Safety	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area: <input type="checkbox"/> Urban	<input type="checkbox"/> Sub-urban	<input type="checkbox"/> Rural	<input type="checkbox"/> Industrial
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Food Handling Establishments			
No. storage sites <input type="checkbox"/> No. preparation sites <input type="checkbox"/> Other processing site <input type="checkbox"/>			
Has there been flood damage to any of the facilities? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown			
If yes, describe the extent of the damage: _____			

Can operations continue? <input type="checkbox"/> Yes <input type="checkbox"/> No Is power available? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Requirements to optimize/resume operations? _____			

Est. quantities of food by weight:			
requiring processing/heating <input type="checkbox"/>		requiring refrigeration <input type="checkbox"/>	
ready to serve cold <input type="checkbox"/>		lost due to poor storage/power failure <input type="checkbox"/>	
lost due to contamination <input type="checkbox"/>		at risk if no remedial action is taken <input type="checkbox"/>	
Are quantities sufficient for the number of persons requiring food assistance?			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure			
Estimate food requirements if necessary: _____			

Operations			
In records of food operations monitoring, have any critical points been identified?		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Can remedial action be taken in the short term?		Yes <input type="checkbox"/>	No <input type="checkbox"/>
What would be required to achieve this? _____			
Risk from Sewage/excreta			
Is there a sewerage system?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, has the system been damaged?		<input type="checkbox"/> Yes	<input type="checkbox"/> No Unknown <input type="checkbox"/>
Est. no. of houses with septic tanks <input type="checkbox"/>	How many damaged? <input type="checkbox"/>		
Est. no. of houses with pit latrines <input type="checkbox"/>	How many damaged? <input type="checkbox"/>		
Risk from Industrial Activity			
Is there industrial activity in the area?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, describe location and possible types contamination: _____			

Environmental Health Rapid Needs Assessment: Food Safety (cont.)

Equipment/Supplies			
Are field kits available for analysis of floodwater?	<input type="checkbox"/> Yes	No <input type="checkbox"/>	Unknown <input type="checkbox"/>
If no, what is required? _____			

Have food supplies encountered floodwater?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input type="checkbox"/>
If yes, is there equipment to ascertain contamination in the food?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
If no, indicate resources required: _____			

Are there adequate supplies of cleaning products and apparatus?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
If no, list requirements: _____			

Drinking Water Quality and Quantity			
Is there risk of microbiological contamination of drinking water?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Is there risk of chemical contamination in drinking water?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Is sufficient water stored (20L/person/day)	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Response Actions			

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:

Environmental Health Rapid Needs Assessment: Sanitation and Hygiene

Sanitation and Hygiene	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area: <input type="checkbox"/> Urban	<input type="checkbox"/> Sub-urban	<input type="checkbox"/> Rural	<input type="checkbox"/> Industrial
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Water Supply Management			
Is regular water supply present? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Has the water been tested for: Residual Chlorine <input type="checkbox"/> Turbidity <input type="checkbox"/> Microbiological Quality <input type="checkbox"/>			
Indicate values:	Chlorine	Turbidity	MicroB
Do values indicate acceptable quality? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If no, suggest disinfection method: _____			
If there is no regular supply, how is water supplied? truck <input type="checkbox"/> tanker <input type="checkbox"/> Other <input type="checkbox"/>			
Is a field test kit available for water testing? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Water has been tested for: Residual Chlorine <input type="checkbox"/> Turbidity <input type="checkbox"/> Microbiological Quality <input type="checkbox"/>			
Indicate values:	Chlorine	Turbidity	MicroB
Do values indicate acceptable quality? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If no, suggest disinfection method: _____			
Are shelters being used/occupied? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Have the water containers been examined? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is volume adequate to supply 20 L/person/day? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is the storage container clean? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is the storage container free from cracks? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is the storage container covered at all times? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Has disinfection responsibility been assigned to a specific person? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Response Actions			

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:

Environmental Health Rapid Needs Assessment: Sanitation and Hygiene

Excreta Disposal and Personal Hygiene	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area: <input type="checkbox"/> Urban <input type="checkbox"/> Sub-urban <input type="checkbox"/> Rural <input type="checkbox"/> Industrial			
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Excreta Disposal and Personal Hygiene			
Is there a sewerage/excreta disposal system? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If yes, has the system been damaged? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown			
Est. no. of houses with septic tanks? How many damaged?			
Est. no. of houses with pit latrines? How many damaged?			
Have existing toilets been repaired where necessary? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Have exposed pit toilets been treated? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Have damaged septic tanks been rehabilitated? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Have chemical toilets been used where required? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are basic sanitation services available? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If no, what type of latrine is recommended for construction?			
<input type="checkbox"/> Individual <input type="checkbox"/> Collective <input type="checkbox"/> Portable			
For construction of latrines, have the following been considered:			
<input type="checkbox"/> Soil conditions <input type="checkbox"/> Topographical conditions <input type="checkbox"/> Proximity to coastal environment			
<input type="checkbox"/> User access <input type="checkbox"/> Presence of surface or groundwater			
Are the ground conditions suitable for latrine construction? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If no, are latrines with removable tanks recommended? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are facilities available for the transport of the excreta to a suitable site for burial? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are the no. of latrines suitable for the no. of persons at the shelter?			
(1 latrine per 25 women; 1 latrine & 1 urinal per 35 men) <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are basic handwashing facilities provided? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are these facilities easily accessible or located within close proximity to latrines? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are handwashing facilities adequate for the number of people? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Have provisions been made for washing, cleaning and bathing? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is water available in adequate quantities? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are the shelters overcrowded? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Response Actions			

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:

Environmental Health Rapid Needs Assessment: Sanitation and Hygiene

Solid Waste Management	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area:	<input type="checkbox"/> Urban	<input type="checkbox"/> Sub-urban	<input type="checkbox"/> Rural <input type="checkbox"/> Industrial
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Solid Waste Management			
Access routes been restored?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Debris has been cleared from roadways etc.?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Waste collection services are available?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
A public advisory been issued to provide guidance for waste handling?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Shelters been assessed for requirements for waste collection and disposal?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are solid waste containers well placed in the shelter e.g. on a wooden platform?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is garbage adequately stored in containers temporarily until the service resumes?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are all solid waste containers fitted with covers?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are the containers of suitable size?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are the numbers of solid waste containers adequate?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have arrangements been made for the removal and disposal of carcasses?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
An inspection been carried out to determine the presence of hazardous materials?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have arrangements been made for refuse collection from the shelter/households?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
If collection & disposal services not available, has temporary site been identified?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Response Actions			

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:

Environmental Health Rapid Needs Assessment For Floods in the Caribbean

Environmental Health Rapid Needs Assessment: Chemical Hazards

Chemical Hazards	Type/Cause of Flood	Reporting Unit	Form
Flood # (for area this year):	Operations Period:	Date/Time Prepared:	Prepared by:
Location:	No. of Households	Est. Size of Pop	
Type of Area:	<input type="checkbox"/> Urban	<input type="checkbox"/> Sub-urban	<input type="checkbox"/> Rural <input type="checkbox"/> Industrial
Observation Operation			
Agency/Organization: _____			
Survey Method: <input type="checkbox"/> Aerial <input type="checkbox"/> Ground Survey <input type="checkbox"/> Interview			
GPS Location: _____			
Release Information Source			
<input type="checkbox"/> Highway <input type="checkbox"/> Air Transport <input type="checkbox"/> Railway <input type="checkbox"/> Pipeline <input type="checkbox"/> Fixed Facility <input type="checkbox"/> Offshore <input type="checkbox"/> Underground Storage Tank <input type="checkbox"/> Above Ground Storage Tank <input type="checkbox"/> Unknown			
Name of Fixed Facility: _____			
Other: _____			
Material Type: (indicate type of container chemical is contained in e.g. plastic, metal drum etc.)			
	Type of substance	Type of Container	State of Container
Hazardous Substance			
Oil			
Unknown			
Other			
Estimated Quantity: (categories determined by criteria developed nationally)			
<input type="checkbox"/> Catastrophic <input type="checkbox"/> Major <input type="checkbox"/> Minor <input type="checkbox"/> Unknown			
Media Affected:			
<input type="checkbox"/> Air <input type="checkbox"/> Land <input type="checkbox"/> Water <input type="checkbox"/> Unknown			
Type of water body (e.g. sea, freshwater lagoon etc.): _____			
Responders Present:			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If yes, whom?			
Release contained:			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If yes, how?			
Response Actions			
* is container leaking _____			
* call authorities in charge _____			
* decontamination needs _____			

Priority: <input type="checkbox"/> High <input type="checkbox"/> Low			
Team Leader	Date	Time	Distribution:



Acronyms

CEHI	Caribbean Environmental Health Institute
CP	Contingency Plan
CPT	Contingency Planning Team
EH	Environmental Health
FPA	Flood Prone Areas
FRU	Field Reporting Units
HACCP	Hazard Analysis of Critical Control Points
NDMC	National Disaster Management Committee
PAHO	Pan American Health Organization