



# Chapter 3

## Damage Assessment and Needs Analysis

After a disaster has struck water supply and sewerage systems, damage assessment is of the greatest importance in obtaining a rapid diagnosis of the remaining functions and operational capacity of the systems, the damage suffered, its causes and required repairs and rehabilitation. Such an assessment will obviously help to locate and quantify the needs that must be met in order to re-establish key services, and to estimate the time needed until they can be back in operation. While the services are being restored, other measures must be taken to distribute water essential for human consumption. Moreover, the resources needed to rehabilitate the affected components and the service must be estimated so they can be allocated as quickly as possible.

Damage assessment, in short, involves the identification and qualitative and quantitative examination of the effects of the event on the affected systems.

### Types of Assessment

Bearing in mind what has been said in previous chapters, two kinds of damage assessment can be performed after a disaster has struck. The first is the preliminary damage assessment, providing the most essential information no later than eight hours after the impact. The second, or general damage assessment, provides a greater degree of detail. Finally, there are specific assessments.

#### Preliminary Assessments

The preliminary assessment must be carried out by operations employees who are well acquainted with the systems. It will be based on the relevant assessment manual included in the Emergency Operations Plans. These manuals are meant to help focus the inspectors' attention on the most relevant aspects of the emergency, and including all affected components. The manuals also help to organize the information by quantifying the damage. In order to gather the largest amount of data in the shortest time possible, it is customary for the operations staff to divide into teams, each of which focuses on a given component or set of components, collects the information, and transmits it to the situation room, either personally or by radio, telephone, fax, or some other medium.

This preliminary assessment is meant to gather the basic information needed by decision-makers to assign priorities based on the resources available in the region and to plan the actions that can restore water supply services to the largest number of users in the shortest time possible.

Assuming that vulnerability analyses were completed prior to a disaster, the

damage assessment can focus first of all on those components that were previously identified as representing the greatest risk for the system.

## General Assessments

The second, or general, assessment, provides a more detailed account of the damage suffered by the systems, and it must be completed no later than 72 hours after the onset of the disaster. On the one hand, this assessment helps to make the necessary adjustments to the actions initially undertaken; on the other, it makes it possible to identify those needs that cannot be met by the company's own resources. Unlike the preliminary assessment, the general assessment is usually carried out by a team of specialists which may include external consultants.

## Specific Assessments

There is an additional type of assessment, known as the specific assessment, which is undertaken in those cases where the initial assessors have identified situations that must be evaluated by specialists. An example would be the need to carry out a structural analysis of a treatment plant or a dam.

The specific assessment also includes those evaluations made by experts who are participating representatives of the national government or international agencies.

The instruction manuals included in the Emergency Operations Plans must specify how soon the various types of assessments are needed. Should the Plans not be ready at the time of the emergency, the highest ranking authority in the situation room must make this determination.

# Techniques for Data Gathering

## Information Gathering

- *On-the-Ground Assessments*

Information gathering through on-the-ground assessments is normally carried out—if conditions allow—by staff members who know the affected system and are in its vicinity at the time of impact. This is probably the best way to collect information since the system can be assessed stage by stage, determining at each stage the condition of its components. As noted earlier, attention must be paid to the difficulty of access to each of the key points and the time required to reach them.

Bearing in mind the area covered by the system and the difficulty of access to affected components, this type of assessment should give priority to the

inspection of those components previously identified as high-risk. After verifying that personnel are available to carry out the inspection, they must be provided with a checklist to rapidly identify the various types of damage.

If, after disaster has struck, not enough employees are available to carry out all the inspections needed, priorities must be assigned based on experience and the characteristics of the event. For instance, if the volume and quality of the water flowing into the treatment plants has not varied significantly—bearing in mind the time it takes for the water to travel from its source to the plant—assessment of these components may be postponed until later, mobilizing the staff instead to sites that have suffered greater damage.

This does not preclude the need for examination of the entire system. For instance, the conditions of water catchment areas may be affected hours or days after the initial impact, and this must be monitored.

- ***Reconnaissance Flights***

The second way to gather information is through low-level reconnaissance flights. Flights are used when access by road to the relevant parts of the system is difficult or impossible. It is required above all when dealing with very large water catchment areas, since it makes it possible to identify not only the damage suffered but also potential damage as a result of unstable soil or the accumulation of dammed-up water. The likelihood of landslides or mudslides can affect not only the water supply system but also homes and infrastructure—above all, they can put human lives at risk.

- ***Interviews and Other Techniques***

Interviews are seldom used in assessing damage to water supply and sewerage systems, but they can be helpful. They consist in talking to witnesses or victims of the emergency or disaster. Those interviewed can provide valuable information especially about areas that are not accessible and where there is likely damage to local water supply and sewerage systems.

Other sophisticated techniques include aerial photography, satellite imaging, and remote sensor systems. These can provide important information about the magnitude and extent of the damage and other changes wrought by the disaster.

## **Instruction Manuals and Assessment Forms**

Instruction manuals for damage assessment are part of the Emergency Operations Plan. They must be prepared in advance and cover each of the potential hazards in the areas where water supply and sewerage systems are located.

The purpose of the instruction manuals is to ensure that each of the system components, particularly those that are most vulnerable, are inspected, paying special attention to the most vulnerable features.

For each component, the best format must be chosen for the orderly and comprehensive collection of information on the condition of the structures (for example, the specific types of damage, potential problems that may arise in the short term, performance, percentage of the systems or components that have been affected, or the remaining system capacity expressed in volume). As already noted, personnel carrying out the assessment must be familiar with the system components and with the assessment process.

The information collected in the field must be processed in a thorough and orderly way so as to assist the decision-making process. Table 8 presents a simple damage assessment form. Annex 2 includes forms from *Guidelines for Assisting Caribbean Governments in the Event of a Disaster* (PAHO/WHO and CPC, Barbados, 1999).

When thinking of wastewater and sewage systems, it is easy to underestimate the impact of the disaster, since much of the damage may be hidden in the course of the preliminary assessments, only becoming apparent once all the systems are working at full pressure.

**Table 8.**  
**Sample Form for Damage Assessment – Operations Manual**

Event: Earthquake  
 Action: Immediate actions  
 Activity: Completion of the damage assessment form  
 In charge: Engineer or technician carrying out the assessment

Date: ...../...../..... Time:..... (1)

Damaged components: (2).....  
 .....

Description of damage: (3).....  
 .....

Location of the damaged component: (4): .....  
 .....

Loss of water: (5)  
 Loss of flow or volume ..... Unit of measure (m<sup>3</sup>/s, l/s, other).....  
 Considerable: .....  
 Medium:.....  
 Little:.....  
 Other (please specify):.....

Potential danger (please specify): (6).....  
 .....

Needs: (7) .....  
 .....

Estimated time required for rehabilitation (in days): (8) .....

Recommendation: (9) Put out of service YES ( ) NO ( )

Comments (10).....  
 .....

Completed by : .....

**Table 8 (continued).**  
**Instructions for Filling Out the Damage Assessment Form—**  
**Operations Manual**

- (1) Write down the date and time the assessment was carried out.
- (2) Identify and describe the damaged component.
- (3) Briefly describe the damage to the component, whether direct or indirect.
- (4) Specify the precise location of the component.
- (5) Estimate, if possible, the lost flow (volume) of water.
- (6) Specify if there is any danger of the component collapsing or causing further damage.
- (7) Estimate the human, material, and logistical resources needed to repair the damaged component.
- (8) Estimate (in days) the time required to rehabilitate the component.
- (9) If the component should remain out of service, indicate the likely number of days; if not, specify the measures needed to keep it in operation.
- (10) Write down any information not included in the rest of the form, such as the state of the access routes, alternative routes of access, etc.

*Note: Please include any additional information required, or a sketch or diagram of the damage, on the reverse of this form.*

## Information Analysis

The first step in information analysis is to compare the information collected previously about the system with the information gathered from the field inspections, in order to define the situation of the affected area. The information collected on the impact of the event will assist in carrying out the needs assessment.

The damage assessment should not be seen as the final assessment. Changing circumstances and the actions undertaken will generate new situations, which will require follow-up. Those components identified as high-risk call for greater control and continuing surveillance.

After needs have been assessed, it is necessary to identify the locally available resources. If these are insufficient, additional resources must be allocated, whether at the regional, provincial, national, or international level.

Needs must be classified and ranked in order of priority. The following is a list of potential needs for water supply and sewerage system companies:

- Human resources (professionals, technicians, labor);
- Equipment for the system, such as pumps;
- Supplies for the treatment of drinking water;
- Construction teams needed to rehabilitate the services;
- Water trucks needed for water distribution;
- Tanks needed for distribution points (hospitals, shelters, etc.);
- Pipes for urgent repairs and special accessories;
- Vector control;
- Excreta and waste management;
- Latrines;
- Provision of drinking water (in bags, plastic containers, etc.);
- Communication systems.

If the assessments have taken into account, in a clear and orderly fashion, both immediate needs and those related to the rehabilitation phase, it will be possible to set priorities when organizing urgent external aid, whether provincial, national or international.

In parallel, the impact must be quantified based on the losses reported. The impact may be subdivided into different kinds, such as damage to the water supply and sewerage system infrastructure, impact on the environment (preferably in terms of the time needed to reestablish certain environmental conditions such as recovery of the water catchment area), and socioeconomic impact as a result of the destabilization of organizational structures.



## Decision-making

One of the first actions that company or agency employees should take is verifying that their loved ones are safe, the same as anyone else in similar circumstances. This should reassure the employees and allow them to carry out their tasks. In the case of staff in charge of damage and needs assessment who may have been personally affected by the disaster, it is essential for them to remain in control of their emotions and retain their objectivity in analyzing and observing the situation.

After the first damage assessment has been completed, and the preliminary needs assessment made, the decision making process should begin. The following aspects should be considered:

- The actual situation of the water supply and sewerage systems;
- The availability of local resources for emergency response;
- The need for support from other local companies and institutions;
- The identification of problems in the vicinity that may indirectly impact the systems;
- Priority problems to be addressed involving the service itself;
- The provision of drinking water in small quantities to the affected population in the first hours after the impact. If the water is unsafe, the population must be informed of this fact and of the measures they need to take;
- Verify the condition of the wastewater systems, ensuring that there is no contamination of water for human consumption by wastewater or sewage;
- The organization of work teams (professionals, technicians, and repair teams) so that excessive working hours and other stresses do not compromise the work required in the coming days and weeks;
- The design of the provisional or final works needed, paying special attention to disaster mitigation measures in order to prevent the same kind of damage from occurring in the future.

## Producing Reports

All the activities carried out as outlined above must be recorded. It is recommended that a minimum of three reports be produced.

The first should be a preliminary report based on the information gathered in the eight hours immediately following the impact of the emergency or disaster. This report must be addressed to the company's highest authorities, who must in turn decide who else should receive the information and by which means it will be disseminated.

The second is a general report, identifying the needs involved in the first response to the emergency and the critical points of the system needing rehabili-

tation and reconstruction. It should be produced no later than 72 hours after the impact of the event.

The third report should be the final one. It must describe the response to the disaster, the damage and needs assessment. The contents of the previous reports should be included, reflecting the most up-to-date and precise knowledge of the situation. The experiences of the damage and needs assessment teams may be included if relevant. Finally, the report should contain recommendations to improve the Emergency Operations Plans and the performance of the Central Emergency Committee and the Emergency Operations Committees, including key measures to be implemented as part of the reconstruction effort.

This final report may also incorporate information presented in any of the specific assessment reports. They should be produced during the first eight days after the impact of the disaster, and will assist in the following:

- Making requests for cooperation and collaboration in the rehabilitation process;
- Carrying out a detailed analysis of the damage and the condition of the specific components or functions involved;
- Incorporating mitigation measures needed during the reconstruction process;
- Evaluating the Emergency Plan and the Emergency Operations Plans.