

# Reliance on Safe Water and Sanitation Systems for Vulnerable Populations: A Feasible Challenge

Each year the impact of natural disasters increases and associated losses mount. The water and sanitation infrastructure is exposed to increasing levels of risk and with each new disaster more systems are damaged and the losses are more serious. Despite these setbacks, the sector must continue to expand and to provide access to populations that do not yet have water and sanitation service.

The underserved populations are located in marginal urban and rural areas. Often, these locations have the greatest exposure to natural hazards and the systems constructed in these areas are the most vulnerable.

Given that it is difficult to relocate populations from high-risk areas, the systems providing services should incorporate standards that are adequate for existing conditions and hazards. This is of major importance to ensure that investments lead to expected improvements in the health conditions and quality of life of populations that experience the greatest inequities in access to basic services and health. Greater efforts in this area must be made if Millennium Development Goals are to be fulfilled.

Risk management should be oriented not only to protect the water and sanitation infrastructure; it is also necessary to minimize the possible risks to the populations that are meant to benefit that result from poor planning and operation of the systems.

## Minimum standards for levels of operation

It may be impossible or too costly to ensure that water and sanitation systems remain totally unharmed following a natural disaster. The objective of risk management is not to have systems that are infallible in any disaster situation, but continue to provide a minimum level of service.

For populations in emergency situations that do not customarily have water and sanitation systems, humanitarian assistance agencies have defined minimum standards for the provision of water and sanitation. These standards address the quality and quantity of services needed to maintain basic conditions for health and hygiene.



## Basic Indicators for Water during Emergencies and Disasters

### Access to water and available amounts

- Average amount of water for drinking, cooking, and personal and domestic hygiene: 15 liters per person daily.
- Supply of water in health centers: 40-60 liters per patient per day.
- Maximum allowable distance between houses and water collection point: 500 meters.
- Water collection points should be maintained so that adequate amounts of water are consistently available.



UNICEF - El Salvador

### Water quality

- New sources of water that must be used because of an emergency situation should contain no more than 10 fecal coliforms per 100 ml.
- Concentrations of residual chloride in piped water should be 0.2-0.4 milligrams per liter, and turbidity should be less than 5 NTU.
- Total solids dissolved in water should not exceed 1,000 milligrams per liter.

Source: The Sphere Humanitarian Charter and Minimum Standards in Disaster Response.  
Standard 1 on water supply: access to water and available quantities.

Companies that provide services have everything necessary to ensure more than the most basic services, which should be manifest at the time of the emergency. However, providers still do not have operational commitments to the users and local authorities.

The establishment of minimal levels in the provision of services should be done in collaboration with providing companies and the community represented by local authorities. To this end, sectoral authorities and agencies must establish a regulatory framework that allows the space, the need, and the conditions for the work to be carried out.

Once the levels are defined, works for vulnerability reduction should be oriented toward reducing the impact so that these levels can be reached in any scenario of identified risk.

The levels of operation of the services—defined by the service providers and the local authorities—should ensure that during emergencies health facilities and shelters have guaranteed provision of services, which are indispensable for primary health care. In addition, priority should be given to those institutions that form the basis of community development, such as schools.

## **Improving sustainability of existing services—an integral approach to risk reduction**

Vulnerability and risk reduction in existing water and sanitation systems is feasible. In some cases this comes from identification of the risks and knowledge based on lessons learned by the operators in prior events, but it is preferable not to wait for a disaster to take corrective measures. Studies should be promoted that allow identification of hazards without waiting for them to occur, and then service providers can carry out the necessary measures to minimize damage and assure continuity of the services.

Water companies should work in collaboration with local authorities, universities, technical cooperation centers, professional associations, and others to identify and characterize the hazards existing in the area, as well as to identify the weaknesses in infrastructure (physical vulnerability of the compo-

nents), financial capacity (taking into account suspension of payments because of interrupted service, expenses for repair of the systems, increases in production and distribution costs), and operational capacity (technical resources and trained personnel) of the systems and services.

---

## **The Feasibility of Protecting Water Systems in Developing Countries: Retrofitting the Orosi Aqueduct, Costa Rica**

The Institute of Aqueducts and Sewage in Costa Rica reduced the vulnerability of one of the country's major water supply systems, the Orosi Aqueduct, which serves nearly 40% of the population of San José, the country's capital.



The project was undertaken on the basis of risk studies and uses mitigation measures to reduce vulnerability and protect the system. Over a 10-year period, nearly 1.5 million dollars were invested in the project (an amount equivalent to 2.3% of the total cost of the system). It is expected that the reinforcement will prevent losses of some 7.3 million dollars (five times the cost of the project) from direct damage resulting from the effects caused by natural disasters. Added to this are the prevention of indirect damages, such as:

- Loss of human life and property in the community of Orosi;
  - Serious losses in national production;
  - Damage to the institutional image;
  - Possible fines or judgments against the institution and its authorities.
-

As part of risk reduction, reinforcement of infrastructure and protection of the environment where the systems are constructed are necessary to ensure that systems will continue to operate in case of disaster. When this is not possible, service providers should have response plans that are compatible with the local and municipal emergency plans. The objective of these plans is to provide basic levels of water and sanitation to the community and to the key installations for emergency response such as hospitals, health centers, schools, and shelters.

---

## Risk Management in Colombia

In 1999, the Empresas Públicas de Medellín (EPPM—Public Enterprises of Medellín) established as part of its organizational structure the Office of Risk Management within its Strategic Water Unit for aqueducts and sewers, which answers directly to the managers of the company.

Among the activities carried out by the Office of Risk Management, the following should be noted:

- Risk identification and analysis;
  - Application and dissemination of risk management methods;
  - Design, documentation, and implementation of risk reduction projects;
  - Development and execution of emergency and contingency plans.
-

When it is not possible to reduce the vulnerability of the water and sanitation infrastructure it is possible to transfer the risk by insuring the installations, thereby defraying the expenses of system repair. Collaboration with other service providers for emergency response is another important contribution.

### **Conceiving new, safer services**

Including protective measures in the construction of new water and sanitation systems, which ensure sustainability in the presence of environmental risks, must not be limited for economic reasons. In complying with the Millennium Development Goals (MDG), increased access to water and sanitation services is fundamental—not only for the specific water and sanitation target, but to support the entire MDG. This has made increased funding available for inclusion of protective measures, which is justified because of the contribution of these measures toward sustaining the systems.



---

## Tsunami in India, 2004—Providing Services during Reconstruction

Three months after the tsunami that devastated coastal areas of India in December 2004, most initiatives focused on relocation of the affected populations. In some cases, people moved to new settlements, whether out of fear of another tsunami or because of government plans to reduce vulnerability.



In those cases, water supply was centralized, usually through municipal treatment and distribution systems, or the people relied on private or communal sources of water. In other cases people returned to their places of origin and rebuilt their homes.

In both scenarios initial governmental plans for restoring systems included major expenditures for improvement of the water and sanitation systems, particularly in the most densely populated areas. This unprecedented investment creates the opportunity to carry out appropriate and sustainable improvements that reflect the best practices and integrate engineering and public health expertise. However, there is also the chance that these funds will be diverted to other projects based on other political or commercial priorities.

Source: World Health Organization, 2005

---

Advances made half-way through the term set for the MDG shows that more attention needs to be given to peri-urban and rural zones where the technical and economic capacity of the population is more limited than in urban areas.

These people have knowledge that has been forged over the years through their relationship with their own environment and which must be taken into account and put to use when improving water and sanitation services. Local risk management should involve the community and gather its knowledge about existing natural hazards, the places with highest risk, and the extent to which the hazards have affected the community in the past. This knowledge should be combined with available technological options so that components of the system can be located in areas with less risk, or can include preventive measures when necessary.

Both technical personnel and the technology should respond to the challenges that these risk scenarios pose, thereby serving populations that settle in increasingly hazardous areas and where conventional technological options are not always applicable.

The best time to reduce the vulnerability of systems is during the planning and execution of reconstruction and rehabilitation projects when they have been damaged. The damages reveal the vulnerability of each of the components. (In normal situations this must be determined through vulnerability studies carried out by experts, which can be costly.) The resources that can be mobilized for reconstruction should include those needed for preventive measures.

