



Enhancing Health Sector Crisis Preparedness in  
The Event of High Intensity Earthquake in the Kathmandu Valley

# Emergency WASH Preparedness Training Module for Health Facilities



Prepared by  
Environment & Public Health Organization





# Acronyms

AHW	Auxillary Health Workers
ANM	Auxillary Nurse Midwives
DM	Disaster Management
DMC	Disaster Management Committee
ENPHO	Environment and Public Health Organization
E-WASH	Emergency Water Sanitation and Hygiene
FCHVs	Female Community Health Volunteers
V-WASH CC	VDC level Water, Sanitation and Hygiene Coordination Committee
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

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# 1

## Introduction

### 1.1 Rational of Training

If there is a major earthquake and the existing water storage facilities are inadequate to meet the current or expected demands. The existing water supply pipe lines are vulnerable and basic WASH materials are lacking to meet the demand in the event of an earthquake. Preparedness and response capacities of health facilities are insufficient due to the lack of trained professional human resources, lack of coordination and inadequate policies. Issues at Health Sector level include the lack of health personnel preparedness for hazards other than epidemics, lack of awareness and knowledge on DRM, the lack of implementation of the health disaster preparedness and response plans, and no mechanism for networking and resources sharing.

### 1.2 Goal

The goal of the training is to build capacity of maintenance, housekeeping staff, health facilities staffs and relevant stakeholders on emergency WASH. Orient participants on stockpiled emergency water supply, sanitation and hygiene materials items to ensure water and sanitation system function after an earthquake.



## 1.3 Objective

- To provide detail knowledge on WASH in emergency;
- To provide hands-on practical training on Emergency WASH;
- To practice prepared E-WASH plan on field, Simulation of Emergency layout plan (identify gap);

## 1.4 Target audience

Health institution staffs including AHW, ANM, FCHVs , Office assistants, community stakeholders i.e., V-WASH CC, water users groups, DMC members

## 1.5 Expected outcome

- Participants will be able to understand E-WASH plan for their respective health institution;
- Participants will be able to construct emergency toilet;
- Participants will be able to prepare chlorine solution for mass water disinfection;
- Participants will be able to understand their roles during emergency response;

## 1.6 Duration

3 days including two days theoretical session and third day Drill/ Simulation



# Training Course Schedule

Time	Session	Facilitator
Day 1		
08:30am-09:15am	Breakfast+ Registration	
09:15am-10:00am	Introduction + Objective of training	
10:00am-12:45am	Conceptual framework design and discussion of emergency WASH preparation / Disaster terminology+ Disaster Management Cycle	
12:45pm-01:00pm	Session evaluation	
01:00pm-02:00pm	Lunch	
02:00pm-03:30pm	Epidemiological management during Emergency	
03:30pm-03:45pm	Tea break	
03:45pm-04:45pm	Solid/ medical waste management	
04:45pm-05:00pm	Session evaluation and review	
Day 2		
10:30am-10:45am	Registration	
10:45am-11:00am	Review of Day 1	
11:00am-12:45pm	Drinking water quality, treatment and hygiene.	
12:45pm-1:30pm	Lunch	
1:30pm-3:30pm	Practical session + discussion	
3:30pm-3:45pm	Session evaluation+ break	
3:45pm-4:30pm	Sanitation and its importance, toilet type and its use during emergency + Toilet construction (theory+ practical)	



<b>Time</b>	<b>Session</b>	<b>Facilitator</b>
4:30pm-5:00pm	Session Evaluation	
Day 3		
09:30am-9:45 am	Registration / gather	
9:45am-10:15am	Reach at site/field (Changunarayan)	
10:15am-11:15am	Orientation for Simulation	
11:15am-2:00pm	Simulation exercise	
02:00pm-03:00pm	Cleaning and packing of materials	
03:00pm-03:45pm	Break for discussion	
03:45pm-04:30pm	Experience sharing	
04:30pm-05:00pm	Closing	





# Training Course Schedule and Session Objectives

Session title	Duration	Objective
<b>Day 1</b>		
<i>Training opening</i>		
Welcome and introduction	30 minute	<ul style="list-style-type: none"> <li>To create a common base of understanding project background and its importance in Health sector;</li> </ul>
Objective of training	10 minute	<ul style="list-style-type: none"> <li>To set the 3 days training objectives</li> </ul>
Expectation Collection	5 minute	<ul style="list-style-type: none"> <li>To reveal their expectations from 3 days training</li> </ul>
Pre- test	15 minute	<ul style="list-style-type: none"> <li>To get basic understanding of participants on the training content</li> </ul>
<b>Break</b>		
<i>Disaster terminology, Disaster Management Cycle, Sphere standard</i>		
Disaster terminology and Disaster	45 minute	<ul style="list-style-type: none"> <li>To make participants familiar with disaster terminologies;</li> <li>To make participants able to understand disaster, its causes and its consequences;</li> </ul>
Disaster Management Cycle, Sphere Standard	30 minute	<ul style="list-style-type: none"> <li>To introduced Disaster management cycle and identify difference between existing disaster response;</li> <li>To discuss activities related to WASH in each steps of DM cycle.</li> </ul>
<b>Lunch Break</b>		

Session title	Duration	Objective
<i>Epidemiological Management During Emergency</i>		
Epidemiological Management During Emergency	90 minute	<ul style="list-style-type: none"> <li>To make participants able to understand importance of epidemiological management during emergency;</li> <li>To familiarize participants with epidemic surveillance and its process and identify roles during epidemiological management;</li> </ul>
<b>Tea Break</b>		
<i>Solid/ medical waste management</i>		
Solid/ medical waste management	60 minute	<ul style="list-style-type: none"> <li>To introduce participants on medical waste management during emergency;</li> <li>To discuss on effects of medical waste and steps of waste management;</li> <li>To introduce possible methods/ techniques of medical waste management;</li> <li>To discuss on advantage and disadvantage of these waste management techniques;</li> </ul>
<b>Day 2</b>		
<i>Drinking water quality, treatment and hygiene</i>		
Water, water quality and health effects	40 minute	<ul style="list-style-type: none"> <li>To discuss on water sources, cause of water pollution;</li> <li>To introduce different physical, chemical and biological water quality parameters and their effects on health;</li> </ul>
Emergency treatment of drinking water during disaster	40 minute	<ul style="list-style-type: none"> <li>To introduce Water treatment option on mass scale;</li> <li>To discuss on Chlorination and its concentration for different purposes;</li> <li>To aware participants on chlorination facts and points to be considered/ taken care of;</li> </ul>
Hygiene practice during emergency	40 minute	<ul style="list-style-type: none"> <li>To share on Hygiene and personal hygiene practices at health centers; To discuss on the challenges on maintaining hygiene; To identify importance of hygiene at health centers; Introduce participants on preparation of chlorine solution on different concentration;</li> </ul>

Session title	Duration	Objective
<b>Lunch Break</b>		
<i>Practical on drinking water quality, treatment and hygiene</i>		
Practical session	120 minute	<ul style="list-style-type: none"> <li>To provide hands-on training on using water test kit, preparing chlorine solution</li> </ul>
<b>Break</b>		
<i>Sanitation, its importance, type and its use during emergency</i>		
Sanitation, its importance, type and its use during emergency	30 minute	<ul style="list-style-type: none"> <li>To provide basic knowledge on importance of Sanitation;</li> <li>To introduce feco-oral transmission route, water induced disease during disaster, sanitation ladder, relation between sanitation and health and Sphere standards for toilet construction;</li> <li>To introduce options on toilets types for emergency and points to be noted during emergency toilet construction;</li> </ul>
<i>Practical on toilet construction during emergency</i>		
Practical session	30 minute	<ul style="list-style-type: none"> <li>To orient participants on temporary emergency toilet;</li> <li>To provide hands on training on construction of temporary emergency toilet.</li> </ul>
<b>Day 3</b>		
<i>Simulation</i>		
Simulation	300 minute (5 hours)	<ul style="list-style-type: none"> <li>To work practically on field to identify gap on proposed plan</li> </ul>



# 4

## Learning Session: Day 1

### *Welcome and Introduction (30 minutes)*

Organize the welcome session either formally or informally. Proceed for introduction with interesting methodology including team building games.

### *Team Building*

#### **Snowballing**

Distribute A4 paper sheet among all participants, including organizer/facilitator team. Instruct participants to write down following information: name, address, organization, hobbies, most memorable incident and participation on any Disaster / Emergency WASH training before. Request them to form a big circle, ask them to make a ball of the given paper and throw within circle targeting any one participant. Similarly ask participants to recollect any paper ball in front of them and throw among participants. Repeat the process twice or thrice, finally instruct each participant to collect one ball and take seat. Voluntarily ask any one participant (A) to read the content of the collected ball while ask participants (B) to stand while introduction is going on. Similarly, continue the introduction round till last paper ball has been open.

Material required: A4 paper, dot pens/marker

#### **Expectation Collection (5 minutes)**

Provide metacard to each participants and ask individual participant to reveal their expectations from training in a metacard.

Material required: metacard, permanent marker, glue stick/masking tape, chart paper

### **Objective of Training (10 minutes)**

Briefly set the program objectives through presentation including project information and updates.

### **Pre-test (15 minutes)**

Provide printed pre-test forms to all participants, pre and post-test sample questions are attached at annex.

Material required: pre-test print paper.

Tea break: 15 minute

## **4.1 Disaster Terminology, Disaster Management Cycle, Sphere Standard**

### *Disaster Terminology and Disaster:*

#### **Session Objective:**

- Participants will get familiar with disaster terminologies;
- Participants will be able to understand disaster, its causes and its consequences.

**Session Duration :** 45 minutes

#### **Methodology**

- Show a video clips to sensitize the participants and prepare for the upcoming contents
- Initiate with general discussion with term “disaster” and other terms related to disaster,
- Note down the terms at newsprint;
- Furthermore divide participants into groups and provide them terms and their meaning, instruct them to match terms with their meaning (time limit: 10 minutes)



- After completing the task, make presentation including the terms and their meaning. Have open discussion with participants. Make your presentation on Nepali language.

Materials required for this session: Videos, projector, Terminology and meaning print out sheet, presentation slide, masking tape, Glue stick, markers and newsprint

**Hazard:** A rare or extreme natural or man-made trigger event that threatens to adversely affect human life, property or activity to the extent of causing disaster.

**Disaster:** Any event that causes damage, ecological disruption, loss of human life, or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community

**Vulnerability:** The level of disruption and loss a hazard can potentially cause in a community / society. Or people with comparatively low coping capacity during any disaster. There are three elements of vulnerability: Physical and material vulnerability, social and organizational vulnerability, motivational and attitudinal vulnerability.

**Capacity:** Any sources, tools, properties, energy or power that individual, organization, community bears and can be used to tackle, prevent and mitigate any disaster. Or the ability of human beings to mitigate or cope with the combined effect of hazard and vulnerability is called capacity. There are three elements of capacity: Physical and material capacity, social and organizational capacity, motivational and attitudinal capacity.

**Response:** Actions taken during and immediately after the occurrence of an event, to ensure that disaster effects are minimized and people are given immediate relief and support.

**Risk:** The probability or threat of quantifiable damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through proactive action.

**Recovery:** The coordinated process of supporting disaster-affected communities in reconstructing their physical infrastructure and restoration of emotional, social, economic, and physical well-being. There are two stage of recovery i.e., rehabilitation and reconstruction.

### *What is disaster?*

Disaster is the state of emergency where suddenly life of group of people/ community gets into trouble. They have to face with lots of pain and trauma. Basic need like food, cloth and shelter also becomes difficult to supply. There are different effects of disaster like: Human, economic, environmental, geographic, social, physical infrastructure and psychological effects.

Nepal is ranked at 11th disaster prone area in terms of Earthquake, 30th in terms of water induces disaster. Kathmandu Valley is ranked at 1st position in terms of earthquake.

$$\text{Disaster Risk} = \frac{(\text{Hazard}) \times (\text{vulnerability})}{(\text{Capacity})}$$

### *Disaster Management Cycle, Sphere standard*

#### **Session Objective:**

- Participants will be introduced to Disaster management cycle and will be able to identify difference between existing disaster response practice and DM cycle;
- To discuss activities related to WASH in each steps of DM cycle.

**Session Duration :** 30 minutes

#### **Methodology:**

- Divide participants into three/ four groups;
- Provide contents of Disaster Management (DM) Cycle, i.e., Preparedness, Mitigation, Prevention, Rehabilitation, Reconstruction, Search and rescue; written on meta-card to each group;
- Instruct participants to arrange those cards : as activities to be done before and after disaster and present that as steps of disaster management cycle;
- Discuss with participants regarding the activities that should be conducted at each steps of DM cycle with open discussion (facilitator can take this session with or without power point presentation)

Materials required: set of metacard with content of DM Cycle, brown paper, masking tape, markers.

## Disaster Management Cycle

Disaster Management cycle is divided into two levels i.e., activities/steps to be conducted before and after disaster. Activities like prevention, mitigation and preparedness are conducted before hand of disaster and Activities of search and rescue, rehabilitation and reconstruction are conducted after disaster. Key messages: community is first responder after disaster. (Refer Annex 7.2 for Disaster Cycle Points for Preparing DM Cycle)



### Activities to be conducted before disaster:

**Prevention:** It focuses on preventing the human hazard, primarily from potential natural disasters. Preventive measures are taken on both the domestic and international levels, designed to provide permanent protection from disasters.

**Mitigation:** Structural and non-structural measures undertaken to limit the adverse impact of natural, human-generated, or technological hazards.

**Preparedness:** Arrangements to reduce suffering, immediate and long-term avoidable mortality, morbidity and disability in any type of emergency and to build a bridge to development is called preparedness.

### Activities to be conducted after disaster:

**Search and rescue:** The search for and provision of aid to people who are in distress or imminent danger



**Rehabilitation and Reconstruction:** These are two phase of recovery. Recovery is the coordinated process of supporting disaster-affected communities in reconstructing their physical infrastructure and restoration of emotional, social, economic, and physical well-being.

### Session evaluation

Session evaluation can be conducted in each session through presentation or simple quiz relating to the session conducted before as per time limit.

Lunch Break: 45 minutes

## 4.2 Epidemiological Management During Emergency

### Session Objective:

- Participants will be able to understand importance of epidemiological management during emergency;
- Participants will be familiar with epidemic surveillance and its process and identify roles during epidemiological management;

**Session Duration :** 90 minutes

### Methodology:

- Initiate with general discussion about disaster with some facts or images/ charts, data.
- Introduce participants regarding disasters and situation of Nepal during disaster.
- Raise question to participants regarding effects of disaster in public health after negligence in WASH.



- Discuss on importance of epidemiological management.
- Familiarize participants with Outbreak investigation and its objective; Steps of investigation; some facts and data can also be shared at this session.
- Management of epidemics; Surveillance and its process during emergency.

Materials required for this session: Projector, presentation slide, masking tape, markers and newsprint

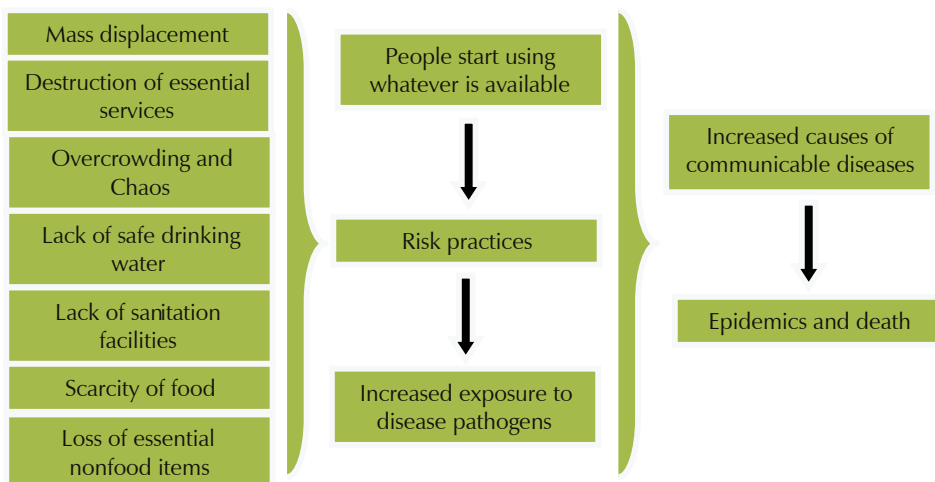
### Example: Jaundice Epidemic in Biratnagar

- The OPD cases of jaundice started reporting from 23<sup>rd</sup> April (Baisakh 10, 2071)
- By the end of 30<sup>th</sup> May 2014 (Jestha 16) there were reported 1991 morbidity cases and the causal mortality (deaths) was 12. (DPHO, Biratnagar)

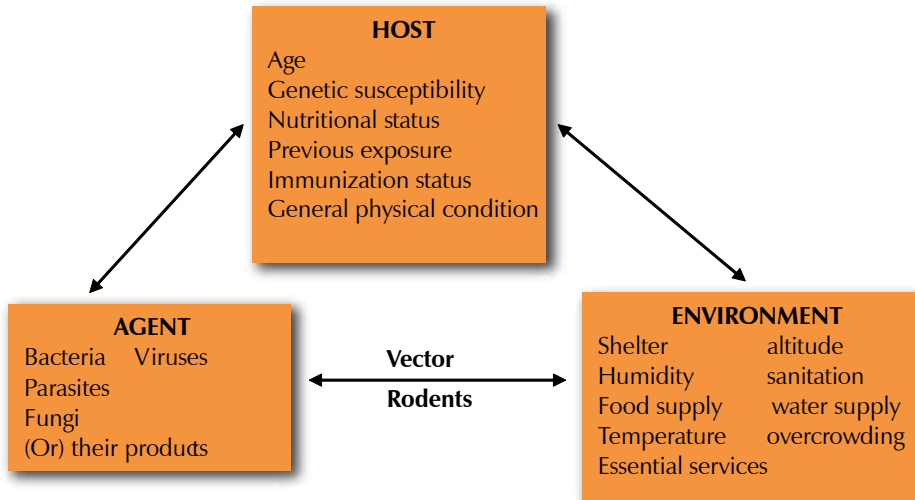
Suspected causes:

1. No proper drainage system
2. Contaminated water
3. Street food festival (April 18-19)
4. Kumbha mela at baraha chhetra ended on April 30
5. Imported raw fruits and vegetables from India.

### What happens in emergencies?



## How Do People Get Infected (Epidemiological Triage)

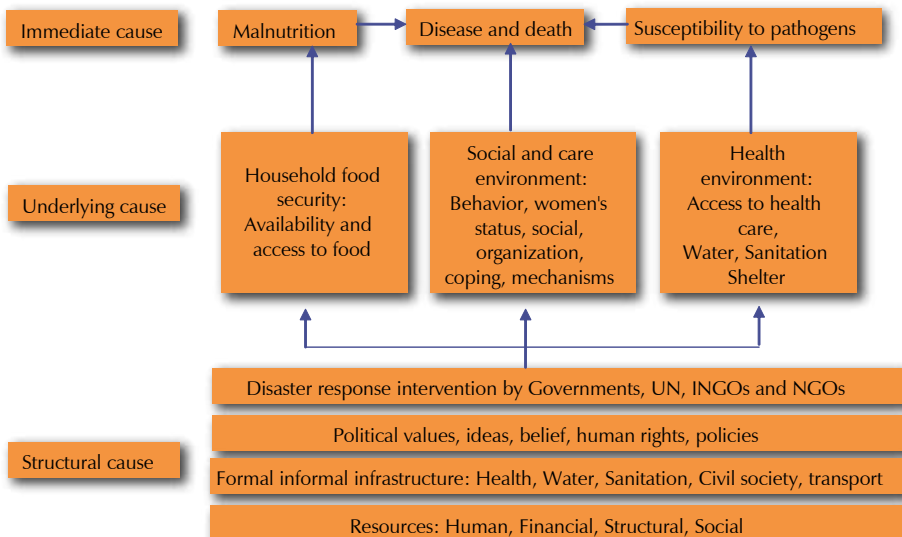


### Causes of epidemics and death

The causes of epidemics and death are categorized into three sub causes:

- Immediate causes
- Underlying causes
- Structural causes

Linkages between these three causes are shown below:



### **Difference between epidemic and endemic**

**Epidemic:** An epidemic occurs when new cases of a certain disease, in a given human population and during a given period, substantially exceed what is expected based on recent experience.

**Endemic:** Endemic in a population when that infection is maintained in the population without the need for external inputs.

### **Effects of Disaster in Public Health after negligence in WASH**

- Environmental Health
- Occupational Health
- Injury and Trauma
- Mental Health / Behavioral Health
- Reproductive Health

### **Outbreak investigation and its objective**

- To control ongoing outbreaks
- To prevent future outbreaks
- To provide statutorily mandated services
- To strengthen surveillance at local level
- To advance knowledge about a disease

### **Steps of an outbreak/epidemiological investigation**

- Confirm existence of an outbreak/epidemic (clinical & laboratory) – confirm diagnosis
- Establish a working case definition for the outbreak
- Identify, count number of cases & determine size of population at risk (to calculate attack rate)
- Look for additional cases & follow up contacts
- Develop and test hypothesis
- Implementation of control measures
- Write a report with recommendations

### **Surveillance**

Surveillance is the ongoing systematic collection, analysis and interpretation of data; and the dissemination of information to those who need to know in order that action may be taken. Surveillance is the monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them.

## 4.3 Solid/ Medical Waste Management

### Session Objective:

To introduce participants on medical waste management during emergency;  
To discuss on effects of medical waste and steps of waste management;  
Introduce possible methods/ techniques of medical waste management;  
Discuss on advantage and disadvantage of waste management techniques;

**Session Duration :** 60 minutes

### Methodology:

- Initiate with discussion on existing medical waste management practices.
- Divide participants onto three groups and provide metacards to each team.
- Instruct team one to write down different types of medical waste as much as they can on metacards; team two to segregate those metacards (different types of waste) and team three to manage them. Let them work as per their idea and practice.
- Present about effects of medical waste.
- Present on steps of waste management: segregation, storage, transportation and disposal.
- Discuss with participants on different possible medical waste management techniques along with their merits and de-merits.
- Have open discussion with participants to get their ideas and views regarding these techniques.

Materials required for this session: projector, presentation slide, masking tape, markers and newsprint.

### *Different types of waste generated from health care institute:*





- Infectious sharps (like syringe, needles, blades, glass and other contaminated materials) or non-infectious sharps (like bandages, gauzes or items soaked in blood)
- Improper handling and disposal of HCW can have direct impacts. Like it could potentially cause risk due to the disposed toxic chemicals or reuse of contaminated syringes if they are accessible to public
- It can also have adverse impacts on human health and environment by polluting air and water bodies

### Steps of waste management:

- Segregation;
- Storage;
- Transportation and
- Disposal

### Some possible waste management techniques:

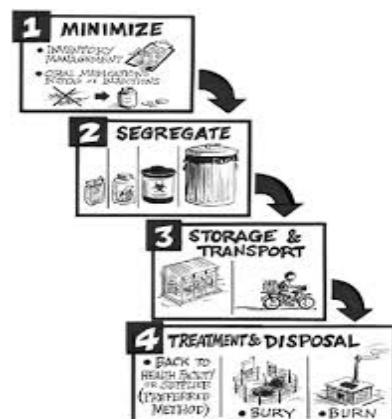
- Pit method;
- Encapsulation;
- Drum incinerator
- Chemical methods

### Pit method:

- To manage infectious non-sharps health care waste
- In this method, infectious non-sharps health care waste are kept in a pit and immediately covered with lime and soil.

### Encapsulation:

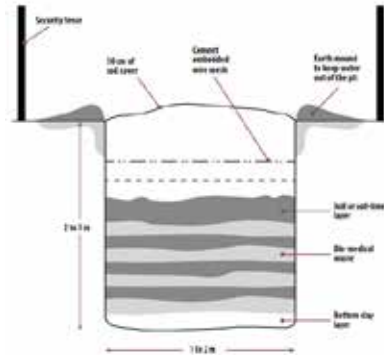
- For the treatment of sharps.
- In this process sharps are placed within high density polyethylene containers or metal drums up to three quarters full.
- An immobilizing material such as plastic foam, sand, cement or clay is added. Once dry, the containers are sealed and disposed of in landfill sites or waste burial pits.



- The following proportions are recommended: 65% pharmaceutical waste, 15% lime, 15% cement, 5% water.

### Incineration (Drum incinerator)

- Waste is completely combusted at high temperatures (over 1000°C) and under controlled air-flow,
- One of the few technologies with which all types of health-care waste can be treated properly and can result in a significant reduction in the volume and weight of the wastes treated.



### Chemical treatment

It is suitable mainly for treating liquid infectious wastes such as blood, urine, faeces or hospital sewage. Typically, a 1% bleach (sodium hypochlorite) solution or a diluted active chlorine solution (0.5%) is used.



# Learning Session: Day 2

## 5.1 Drinking Water Quality, Treatment and Hygiene

*Water, water quality and health effects:*

**Session Objective:**

- To discuss on water sources; cause of water pollution;
- To introduce different physical, chemical and biological water quality parameters and their effects on health;

**Session Duration :** 40 minutes

**Methodology:**

- Start the session with general discussion on water sources, uses and causes of water pollution which will make participants familiar with upcoming topics/ content.
- Enter into water quality session through presentation introducing water quality parameters i.e., physical, chemical and biological parameters with short definition, its guideline values and effects on health.

Materials required for this session: projector, presentation slide, markers

***What is pH:***

pH value is the indicator of the intensity of the acidic or basic nature of water. Water becomes acidic or alkaline properties depending on the type of substance contact with it.



### **Effect of pH:**

- pH value above 8 gives an alkaline taste.
- Below 4 gives a sour taste.
- Water having higher value (above 8) increases scale formation in apparatus and decreases chlorinating efficiency.
- Low pH value (below 6.5) causes corrosion in the distribution system of water supply.
- WHO Standard for pH: 6.5-8.5

### ***Ammonia:***

Ammonia pollution in water is mainly due to the human activities and natural decay. WHO Standard for ammonia is 1.5 mg/L.

### **Health Effect of Ammonia:**

- Higher contamination of ammonia is harmful for fish and other biota and even human being.
- The toxicity of ammonia increase with the increase of pH value. Because at higher pH most of ammonia remains in the gaseous form which is more toxic.
- The decrease in pH decreases its toxicity due to conversion of ammonia in to ammonium ion, which is less toxic than the gaseous form.

### ***Iron:***

Depending upon the geology of the area and other component of the waterway Iron may present in water in varying quantities. WHO Standard for iron is 0.3 mg/L.

### **Health effect of iron:**

- Iron is little concern as a health hazard but a nuisance in excessive quantities.
- Higher iron concentration water:
  - Cause staining of clothes and utensils.
  - Not suitable for processing food, beverage, ice, dyeing, bleaching and many items.
  - Gives a black inky appearance with metallic test in preparation of tea and coffee.
  - May cause vomiting.

### ***Nitrate:***

Nitrate Pollution is due to the oxidation of organic nitrogenous substance. WHO Standard for nitrate is 1.5 mg/L.

**Health effect of nitrate:**

- Continue consumption of more than 50 mg/L may cause Methamoglobinemia (Blue baby Syndrome) may cause death of infant.

**Chloride:**

Chloride pollution in water is mainly due to the human activities like domestic waste, Industrial waste etc.

**Health effect of chloride:**

High chloride can corrode metals and affects the taste of food.

**Phosphorous:**

Phosphorous pollution in water is mainly due to the domestic sewage and decaying vegetable matters. WHO Standard for phosphorous is 500 mg/L.

**Health effect:**

- Phosphorous is not harmful to the organism but its analysis is useful for pollution study.
- Phosphorous as a phosphate is an essential element for life as a nutrient and as a key element in the metabolic process of all living organisms.
- In case of excess phosphate it stimulates or promotes algal bloom
- It may lead to rapid eutrophication especially in lakes, reservoir and ponds.

**Hardness:**

Water hardness is the traditional measure of the capacity of water to react with soap. Water hardness in water is caused by mainly calcium and magnesium cation.

**Health effect:**

- There is no any convincing evidence that water hardness causes adverse health effects in human. But clog supply pipe line.

**Micro-bacterial contamination and diseases:**

Microorganism	Disease causing microorganism	Diseases
Virus	Rotavirus Hepatitis A virus Entrovirus Poliovirus	Diarrhoea Jaundice Meningitis Polio
Bacteria	Escherichia coli salmonella typhi salmonella paratuphi shigella sp. Salmonella sp. vibrio cholerae	Diarrhorea Typhoid Paratyphoid Dysentery Cholera

Microorganism	Disease causing microorganism	Diseases
Protozoa	Giardia Entamoeba hystalytica	Giardia Amoebiosis

## *Emergency treatment of drinking water during disaster:*

### **Session Objective:**

- To present on detail process of water treatment;
- To introduce Water treatment option on mass scale;
- To discuss on Chlorination and its concentration for different purposes;
- To aware participants on chlorination facts and points to be considered/ taken care of;

**Session Duration :** 40 minutes

### **Methodology:**

- Initiate session with open discussion on process of water purification, i.e., straining, sedimentation, filtration, disinfection and continue the session by explaining each process in detail.
- Include definition, types, different methods etc.
- Orient participants on method/steps of preparing chlorine solution, its required concentration.
- Aware participants on facts of chlorination and points to be take care of/ noted.

Materials required for this session: projector, presentation slide, markers.

### ***Straining and aeration:***

- Pouring water through a clean cotton cloth will remove suspended silt and solids.
- The cloth must always be used with the same surface uppermost.
- The cloth may be cleaned using soap and clean water.

Aeration increases the oxygen content of water, removes volatile substances affecting



taste and odor, reduce carbon dioxide content, hydrogen sulfide and methane. Some dissolved minerals precipitate due to oxidation and can be removed by sedimentation and filtration.

### ***Sedimentation:***

Suspended solids and some pathogens will settle to bottom of container. According to the WHO, after 24 hours of storage in a sterile container, up to 50% of bacteria die.

### ***Filtration:***

Process of natural cleansing of water through sand or other porous material is termed as filtration.

### ***Disinfection:***

Storage, sedimentation and filtration of water reduce the contents of harmful bacteria but none of them can guarantee the complete removal of germs. Disinfection is a treatment process that ensures drinking water is free from harmful organisms or pathogens. There are various methods of achieving disinfection at household level: Disinfection by boiling, disinfection by using chlorine, solar disinfection (SODIS) and other water treatment chemicals.

### **How to prepare chlorine solution:**

- Take 40 grams of bleaching powder in a litre of jug/ vessel.
- Add little water to make a paste.
- Add 1 litre of water on the prepared paste;
- Leave the solution for five minute to settle down.
- Pour the clear solution into colorful vessel and store it properly.
- Hence, we can get chlorine solution of 1% concentration.
- Thus prepared chlorine solution can be used as per requirement considering volume of water in a vessel e.g.,  
One glass of 1% chlorine solution can disinfectant 1000 litre of water; 1 litre of 1% chlorine solution can disinfectant 10,000 litre of water;



- It should be left for 30 minutes before drinking.
- After leaving for 30 minute, water should have chlorine concentration of 0.2-0.5 mg/ L as free residual chlorine.

### **Free residual chlorine:**

Chlorinate water should have free residual chlorine of 0.2-0.5 mg/lit. Low concentration of chlorine doesn't kill bacteria and high concentration of chlorine in water disturbs its odor.

### **Some facts about Chlorine**

- Water should be distributed after 30 minutes of chlorination.
- Although hypochlorous acid readily reacts with pathogens in water, correct use is essential for maximum effectiveness and safety.
- The effectiveness of chlorine is controlled by pH, temperature, contact time, and dose.
- Neutral pH (6.5 to 7.5) produces the maximum amount of hypochlorous acid. If the pH of the water is too low (pH < 6.0), chlorine will escape as a gas, decreasing effectiveness and increasing equipment corrosion.
- If chlorine is added to an alkaline water (pH > 8.5), the amount of hypochlorous acid formed will be greatly reduced, and the water will not be disinfected

## *Hygiene practice during emergency*

### **Session Objective:**

- To share on Hygiene and personal hygiene practices at health centers;
- To discuss on the challenges on maintaining hygiene;
- To identify importance of hygiene at health centers;
- Introduce participants on preparation of chlorine solution on different concentration;

**Session Duration :** 40 minutes

### **Methodology:**

- Initiate session with general discussion on importance of maintaining hygiene during emergency.
- Discuss on the challenges that health centers faces maintaining hygiene.
- Present on the hygiene practice at health facility at different points like at entry and exit, at admission point, during hospitalization, at floor etc.
- Discuss on chlorine concentration for different use at health facilities.

Materials required for this session: projector, presentation slide, markers.

- The main objective of water, sanitation and hygiene programs in disasters is to reduce risk factors to prevent and control disease outbreaks.
- Risk:
  - Faeco-oral transmission of disease (can easily spread in overcrowded unsanitary conditions during emergencies).
  - Exposure to disease-bearing vectors.
  - Good hygiene practices & the provision of safe drinking water is important to ensure good health.
  - Awareness on Hygiene
- Construction of infrastructures alone is not enough.
- Awareness of hazards, disease prevention and preparedness to act is important
- Hygiene education to all medical and non-medical staff to keep everyone aware of the rules related to hygiene and the dangers of not adhering to them.
- Prevention is of major concern rather than treatment in awareness programs.
- Effect of disease is not only limited to the patient, but the family and community too.

#### Health Centers and Hygiene:

- Health care facilities play vital role during emergencies
  - Providing essential medical care to the sick
  - Resource centre for prevention
  - Early warning network of communicable disease
  - Its effective functioning depends upon different requirements including safe and sufficient water along with application of correct hygiene practices.

If not,

- Health care facilities could become the epicentre of outbreaks of diseases.
- Inadequate sanitation also means risks of infection to health personnel.

#### Challenges:

- Significant increase no. of patients during emergencies
- Insufficient number of toilets, bathing facilities and handwashing stations to cope with demand
- Short supply of disinfectants, detergents, soaps and cleaning materials.
- Inadequate electricity affecting water provision, sterilization and laundering services.

## Hygiene and Chlorine

- Chlorination is most common method of disinfection in emergency WASH measures.
- Chlorine solution has multiple functions:
  - Safeguarding drinking water from microbes
  - Disinfection at entrances and exits of health care
  - Washing solutions for hands, clothes, utensils, health care equipments
  - Disinfection of working areas
  - Disinfection of infectious waste, excreta, body fluids.

## Hygiene at Health Centres

- At entry/ exit points
  - A footbath or preferably a guard with sprayer employed for spraying and disinfecting feet.
  - Footbaths are trays with cloth or sponge soaked in 0.2 % chlorine solution
- Cloth/ sponge changed twice per day or when the cloth appears dirty.
- The spraying also makes the staff and visitors aware of the contamination they are potentially bringing into the different areas.

## At admission points

- Disinfection of patients and caregivers feet and shoes using 0.2% chlorine solution by sprayer or footbath while entering patient entrance area
- Hand-washing at entrance/exits with a 0.05% chlorine solution.
- Disinfection of the patient's transportation:
  - 0.05% solution for stretchers and beds or
  - 0.2% for vehicles.
- Wash patient and caretaker clothes in a 0.05% solution for 30 minutes, then rinse with clean water and dry under the sun.
- Avoid washing infected clothes close to water sources like rivers streams and or wells.
- Restrict and control movements into and within the wards as much as possible.
- Restrict admission and care to one caretaker per patient.

## Preparation of Chlorine Solution:

	<b>0.05%</b>	<b>0.20%</b>	<b>2%</b>
Tablets (70% active chlorine)	1 table spoon in 20 litres of water	1 table spoon in 5 litres of water	2 table spoons in 1 litre of water

	<b>0.05%</b>	<b>0.20%</b>	<b>2%</b>
Bleach (5%)	14 table spoons in 20 litres of water or 1/4th cup in 20 litres of water	20 table spoons in 5 litres of water	2 cups in 1 litre
Use	Washing hands and clothing (soak for 15 minutes), Skin disinfection	Disinfecting of beds, floors, kitchen utilities of patient etc.	Disinfecting of vomit, stool Disinfecting dead bodies
	Use within 24 hours	Use within 3 days Use gloves	Use gloves

NOTE: 1 cup is 200 mL and 1 teaspoon is 10 mL

<b>Amount of chlorine bleach per gallon of water</b>	<b>Approx. concentration of total chlorine (ppm)</b>
1 Teaspoon	65
1 Tablespoon	200
1 Fluid ounce	400
1/4 cup	800
1/2 cup	1600
2/3 cup	2200
3/4 cup	2400
1 cup	3200

Assuming 5.35% sodium hypochlorite in chlorine bleach

ppm = parts per million

1 Gallon = 3.79 Litres

Lunch break: 45 minute

## 5.2 Practical on Drinking water quality, treatment and hygiene

Session Objective:

- To provide hands-on training on using water test kit, preparing chlorine solution

Session Duration : 120 minutes

Methodology:

- Make participants prepared about upcoming practical session reviewing some points from previous theoretical session.
- Provide participants with all the required materials for practical sessions and introduce the equipment/tools that are being used.



Materials required for this session: bucket, 1 litre mug, alum, bleaching powder, lime, wooden stick, turbidity tube, water test kit.

## 5.3 Sanitation, its importance, type and its use during emergency

Session Objective:

- To provide basic knowledge on importance of Sanitation;
- Introduce feco-oral transmission route; water induced disease during disaster; sanitation ladder;
- Relation between sanitation and health and Sphere standards for toilet construction;
- Introduce options on toilets types for emergency; point to be noted during emergency toilet construction;

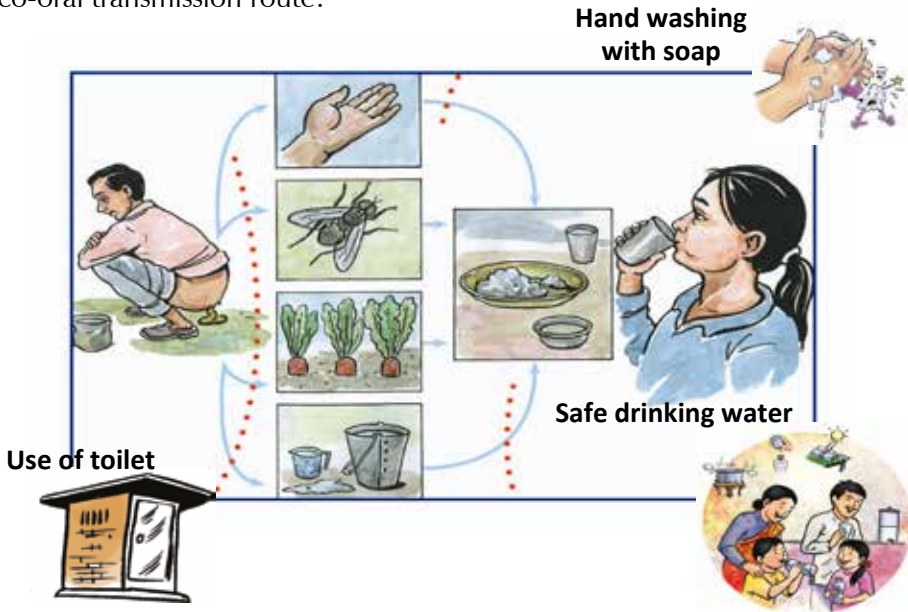
Session Duration : 30 minutes

Methodology:

- Initiate session with basic discussion on sanitation, relation between sanitation and health, water induced disease.
- Make your presentation more pictorial with open discussion making session participatory.
- Make note to some major points for disaster like: access, safety, security, different options for different geographic condition, socially and culturally accepted, easy for operation and maintenance, child friendly, disable friendly, gender friendly.

Materials required for this session: projector, presentation slide, markers.

Feco-oral transmission route:



Techniques of being safe from diarrheal disease



Reduction  
of diarrheal  
disease by  
39% due to  
safe drinking  
water



Reduction  
of diarrheal  
disease by  
32% due to  
use of toilet



Reduction  
of diarrheal  
disease by  
45% due to  
hand washing  
practice

As per Sphere standard, following points should be considered before emergency toilet construction:

- Toilet should be constructed at distance of 30 meter from water station/ source and should be 1.5 meter away from underground water source.
- Toilet constructed should not be in distance more than 50 meter from camp/ shelter.
- Toilet should be constructed in the ratio of 1:20 per person.

## 5.4 Practical on toilet construction during emergency

Session Objective:

- To orient participants on temporary emergency toilet
- To provide hands on training on construction of temporary emergency toilet.

Session Duration : 30 minutes

Methodology:

- Start session with materials required for construction, its background and measurements.
- Introduce formula to delineate pit size among participants.

$$\text{Volume of pit (V)} = (N \times S \times D) / 1000 + 0.5A$$

Where, N= number of people using toilet

S = sludge collection rate (L/person/year)

D= using duration (years)

A= area of pit ( $A = \pi r^2$ ) (m<sup>2</sup>)

Materials required for this session: projector, presentation slide, markers, bamboo, tarpaulin sheet, wire, nail, hammer, easy/ temporary toilet pan, measuring tape, rope and hacksaw.

Note: Before ending day, pre-inform participants regarding field/ simulation area. Ask all to bring at least bottle water, umbrella or raincoat, wear comfortable dress and shoes.



# Learning Session: Day 3

## 6.1 Simulation

### *Step 1: Orientation on Simulation:*

- Brief about the simulation in short with participants to prepare;
- Brief participants regarding prepared response plan.

### *Step 2: Team formation:*

- Divide work for internal team (project team) into: simulation control team, logistic team, overall observer, observer for each team water, sanitation, hygiene and camp.
- Divide participants as per their task team as Management team, Water Team, Sanitation Team and Hygiene Team;
- Ask team member to select their team lead and co-lead for simulation;
- Call team lead and management team for 1st inject, declare disaster state (1<sup>st</sup> notice of Earthquake briefing) and activate disaster plan;
- Hand over VHF set to team lead and co-lead for communication;
- Ask them to prepare response plan as per situation with time limitation (15 minutes);
- Team will prepare their plan for response with action, list of materials.
- Ask team to complete all the process for logistic like: materials demand form, store issue note, material receipt note, purchase requisition.
- After completing the process and taking materials from store, proceed team for field work.

### *Step 3: Field work:*

- Prepare for injects like: asking first report, raise question on the leadership, sending media person, sending health incharge for monitoring.

- Call management team and lead for urgent meeting with control team, provide 2<sup>nd</sup> inject i.e., making scenario worse.
- Disturb team leads and team on their work sending media person and raising question/ issues.
- Make victims ready and send the message of victims approaching to field health camp to make rush in their work.
- As per situation at field, change and create obstacles at the work and note the responses of team.

\*Note: Provide lunch at field as per feasibility.

#### ***Step 4: Hot debriefing:***

We can take two different methods for debriefing:

##### **Method 1:**

- Deactivate disaster state;
- Ask team lead and lead to collect all items that they have issued and submit back to logistic department;
- Gather all the participants including all team, project teams, observers, volunteers at a place;
- Ask all to share their experience;
- Ask them to point out what went well and what went off during simulation;
- Make note of each good and bad points/ points to be improved for recommendation.

##### **Method 2:**

- Deactivate disaster state;
- Visit each station: water station, sanitation station, hygiene station, camp team;
- Ask each team to share their experience of simulation;
- Ask them what went well, what went off, what would have been better if it was done;
- Make a note of all the points as recommendation;
- Ask team lead and lead to collect all items that they have issued and submit back to logistic department.

Materials required for this simulation: name tags, masking tape, marker, chart paper, loose sheet, meta card, minute, paper cutter, scale, alum, bleaching powder, wire, bamboo, layout, plastic sheet/tarpaulin sheet, rope nylon and plastic, mask, measuring tape, first aid box, triage ribbon, VHF radio, printed demand slip, store issue note, material receipt note and other WASH stockpile items.



# Annex

Environment and Public Health Organization  
Enhancing Health Sector Crisis Preparedness in The Event of High Intensity Earthquake in the Kathmandu Valley  
Emergency WASH Preparedness training  
Kathmandu, 2014

## 7.1 Pre-test and Post-test question

१. E-WASH plan को पूरा अर्थ के हो ?

Earthquake WASH plan, Essential WASH plan, Emergency WASH Plan

२. तपाईंको स्वास्थ्य संस्थामा आपतकालीन खानेपानी स्वास्थ्य सरसफाई योजना बन्दै छ, के तपाईंलाई थाहा छ ?

छ

छैन

३. पुनर्लाभ (Recovery) का दुई प्रकार के के हुन् ?

पुनः स्थापना, पुनः निर्माण

पुनः स्थापना, पुनः व्यवस्थापन

४. अल्पीकरणका प्रकारहरू के के हुन् ?(Types of Mitigation)

जनचेतनामुलक अल्पिकरण,

सामाजिक अल्पिकरण

संरचनात्मक अल्पिकरण,

गैर-संरचनात्मक अल्पिकरण

५. विपद् जोखिमको सुत्र भन्नुहोस् । यि चकगबि या म्कबकतभच च्कप

६. विपद् व्यवस्थापन चक्रमा प्रकोप पूर्व गरिने चरणहरू वा कामहरू के के हुन् ?

(क) खोज तथा उद्धार

(ख) राहत

(ग) पुनःनिर्माण तथा पुनःस्थापना

(घ) रोकथाम, न्यूनीकरण र पूर्वतयारी

७. दिसा मुख सम्म पुग्ने ५ माध्यमहरू मध्ये कुन होईन ?

a. Fluid,

b. Fly,

c. Field,

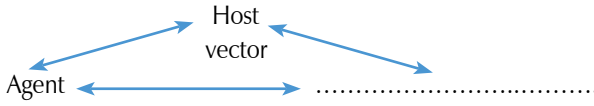
d. Faeces

e. Finger,

f. Food,

८. दिसा मुख सम्म पुग्न नदिन अपनाउन सकिने छेकबारका उपायहरू शौचालयको प्रयोग, सुरक्षित पानी र \_\_\_\_\_ हुन् ?

९. मानिसहरू संक्रमित हुने चक्र पुरा गर्नुहोस् ।



१०. फोहोर ब्यवस्थापमा सम्भावित प्रविधिहरू के के हुन् ?

.....

११. फोहोर ब्यवस्थापका चरणहरू के के हुन् ?

.....

१२. इन्सिनरेटरको प्रयोग गर्दा तापक्रम कति डिग्री सम्म पुगेको हुन्छ ?

२५० डिग्री , ५०० डिग्री , ८०० डिग्री, १००० डिग्री

१३. तपाईंहरूको स्वास्थ्य संस्थामा भण्डारण गरिएको tap stand मा कति ओटा धारा हुन्छ ?

४ ओटा, ५ ओटा, ६ ओटा

१४. रसायनिक विधि अपनाउँदा .... ५ ब्लिचिङ् पाउडर (Sodium hypochlorite), वा diluted active chlorine solution (0.5%) को प्रयोग गरिन्छ ।

०.२ ५ ०.५ ५ १ ५ , २ ५,

१५. फोहोरहरू जम्मा गर्ने कन्टेनरहरू, फोहोर वर्गिकरण गर्ने क्षेत्रभन्दा कम्तिमा कति मिटरको दुरिमा हुनुपर्छ ?

१ मिटर , २ मिटर, ५ मिटर, १० मिटर

१६. उज्ज को स्केल कति देखि कति सम्म हुन्छ ?

pH range 0-14 , pH range 1-14 , pH range 1-14 ,

१७. WHO Guideline अनुसार pH को खबगिभ कति हुनुपर्छ ?

WHO Guideline value 6.5- 7.5 WHO Guideline value 6.5- 8.5

WHO Guideline value 5.5- 7.5

१८. क्लोरिनेशन गरेपछि Free Residual Chlorine को मात्रा कति हुनु पर्छ ?

0.3- 0.6 mg/lit, 0.2- 0.5 mg/lit , 0.5- 0.8 mg/lit

१९. साबुन पानीले हात धुने बानीले कति प्रतिशत कमि ल्याउन सकिन्छ ?

५४५, ५६५, ४५५, ३२५

२०. आपतकालीन अवस्थामा क्लोरिन भोल बनाउँन १ लिटर पानीमा ४० ग्राम ब्लिचिङ् पाउडर रख्या कति ५ को सोलुशन बन्छ?

1 % , 5% , 0.5%, 2 %

## 7.2 Disaster Cycle Points for Preparing DM Cycle

- Disaster
- Search and Rescue
- Before Disaster
- Preparedness
- After Disaster
- Mitigation
- Prevention
- Reconstruction
- Rehabilitation

## 7.3 Disaster Terminology

**प्रकोप** : कुनै खास निश्चित अवधि र निश्चित भौगोलिक क्षेत्र भित्र रहेको क्रियाकलाप, स्वरूप वा प्राकृतिक कारणले हुनसक्ने घटना हो जसले सम्भावित क्षति वा विपद् निम्त्याउन सक्दछ ।

**विपद्** : "त्यस्तो विपत्तिपूर्ण परिस्थिति हो, जुन परिस्थितिमा धेरैजसो जनजीवन अकस्मात अस्त-व्यस्त हुन पुग्दछ । यस्तो परिस्थितिमा मानिसहरूले धेरै दुःख पाउछन् र यसको परिणामस्वरूप सुरक्षा, खाना, आवास, लुगाफाटो, औषधीउपचार तथा सामाजिक सेवा जस्ता मान्छेलाई जीवनमा नभई नहुने अन्य आवश्यकताहरूको पूर्ति गर्नु आवश्यक हुन्छ" ।

सम्भावित प्रकोपको असरबाट हुनसक्ने क्षतिको अवस्था वा प्रकोपको कारणले समुदायको संरचना वा भौगोलिक क्षेत्रलाई पार्नसक्ने सम्भावित क्षति वा अवरुद्ध गर्न सक्ने अवस्था ।

### जोखिम

**संकटासन्नता** : खतरामा भएका र हुनसक्ने जोखिमका तत्वहरू वा जोखिमको अवस्थामा रहेका तत्वहरू भन्ने बुझिन्छ । वा तुलनात्मक सापेक्षित रूपमा कम क्षमता भएको त्यस्तो व्यक्ति वा सामाजिक समूह जोसंग सम्भावित प्रकोपसँग सामना गर्न, रोकथाम गर्न र पुनर्स्थापित हुने समेत कुनै स्रोत साधन र उपाय हुँदैन भने त्यसलाई संकटासन्नता भनिन्छ ।

**क्षमता** : कुनै पनि व्यक्ति, संस्था, समुदाय.....संग भएको स्रोत, साधन, गुण र शक्तिलाई बुझिन्छ, जसले तिनीहरूलाई विपद्संग सामना गर्न, विपद्पूर्व अवस्थामा ल्याउन, विपद्को रोकथाम तथा न्यूनीकरणका लागि मद्दत गर्दछ । वा व्यक्ति, संस्था, समुदाय.....संग भएका



सबल पक्ष जसले तिनीहरूको विपद्सँग सामना गर्ने शक्ति प्रदान गर्दछ । “कुनै काम कारोवारलाई रोक्न वा अड्याउने काम वा प्रत्यत्न” भनी अर्थ्याएको छ । त्यसैले विपद् रोकथामको अर्थ हुन्छ विपद् रोक्न वा अड्याउन गरिने सबै खालका प्रयासहरू ।

**रोकथाम** : सम्भावित प्रकोपको असरबाट हुनसक्ने क्षतिको अवस्था नै जोखिम हो । वा प्रकोपको कारणले समुदायको संरचना वा भौगोलिक क्षेत्रलाई पार्नसक्ने सम्भावित क्षति वा अबरुद्ध गर्नसक्ने अवस्था नै जोखिम हो । जोखिममा रहेका तत्वहरू मानिस, पूर्वाधारहरू, घर र सामुदायिक, संरचनाहरू, जिविकोपार्जन, प्राकृतिक संरचनाहरू आदि

$$= \frac{\text{प्रकोप} \times \text{संकटासन्नता}}{\text{क्षमता}}$$

### विपद् जोखिम

**अल्पीकरण** : कुनै राष्ट्र वा समुदायमा प्राकृतिक वा मानवजन्य प्रकोपको असर कम गर्न अपनाइने सबै प्रकारका उपायहरूलाई नै ..... भनिन्छ ।

**विपद् पूर्वतयारी**: विपद् सम्बन्धमा पूर्वानुमान, रोकथाम र असर न्यूनीकरणका साथै प्रकोप परिहर्नु हुँदा र परिसकेपछि यसबाट उत्पन्न परिस्थितिको सामना गर्नका लागि पहिले नै तयार भएर वस्तु भन्ने बुझिन्छ ।

**प्रतिकार्य** : विपद् पश्चात् तुरन्तै गर्नु पर्ने गतिविधि वा कार्य किनभने विपद्मा परेकाहरू (पीडित) को आधारभूत आवश्यकता तत्कालै पूर्ति गर्नु पर्ने हुन्छ वा विपद्मा परेकाहरूले आधारभूत आवश्यकता तत्कालै पाउनु पर्ने हुन्छ ।

**खोज तथा उद्धार** : भत्किएका संरचनाहरूमा पुरिएकाहरूलाई खोजी गरेर पत्तालागाई उनीहरूको जीवन रक्षाको लागि पुरिएका ठाउँबाट सुरक्षितसाथ सुरक्षित स्थानमा ल्याइने कार्य ।

**राहत** : विपद्को कारणले अकस्मात् जनजीवन अस्तव्यस्त भई मानिसहरूले धेरै दुःख पाउँछन् । त्यसको फलस्वरूप पीडित मानिसहरूलाई सुरक्षा, औषधि उपचार, खाना, लुगाफाटो, आवास तथा सामाजिक सेवा उपलब्ध गराउनु पर्दछ । उल्लिखित चीज र सेवाहरू पीडित पक्षलाई उपलब्ध गराउने काम हा ।

**पुनर्लाभ** : विपद्बाट प्रभावित व्यक्ति, समुदाय वा क्षेत्रलाई विपद् आउनुअघिको भैं सामान्य अवस्थामा ल्याउनका लागि गरिने पुनःस्थापन तथा पुनर्निर्माणजस्ता गतिविधिहरूलाई नै ..... भनिन्छ ।

**पुनर्स्थापना** : खतरा ठाँउबाट सुरक्षित ठाँउमा सार्ने वा वसोवास गराउने ।

**पुनर्निर्माण** : पहिलाकै ठाँउ वा अन्य सुरक्षित ठाँउमा निर्माण गरी वसाल्ने कार्य ।

**विपद् व्यवस्थापन** : विपद्सँग सम्बन्धित सबै पक्षहरू समावेश भएको एउटा सामुहिक अवधारणा हो । यसले विपद्को जोखिम र परिणाम दुबैको व्यवस्थापनलाई सम्बोधन गर्दछ ।

प्रकोप	Hazard
विपद्	Disaster
जोखिम	Risk
सङ्कटासन्नता, सङ्कटासन्न क्षमता	Vulnerability, Vulnerable Capacity
सङ्कटासन्न समूह	Vulnerable group
उत्थानशीलता, उत्थानशील	Resilience /Resilient
प्रतिरोधी, प्रतिरोध	Resistant /Resistance
पूर्वकम्प	Fore Shocks /Pre-shocks
परकम्प	After shocks
प्रबलीकरण	Retrofitting
सबलीकरण	Reinforcing
अल्पीकरण	Mitigation
न्यूनीकरण	Reduction
निर्माण संहिता	Building code
दिगो विकास	Sustainable Development
आपतकाल	Emergency
संरचनात्मक	Structural
गैर-संरचनात्मक	Non-Structural
आवश्यकताको पहिचान	Need Assessments
राहत	Relief
पुनर्लाभ	Recovery
रोकथाम	Prevention
जन चेतना	Public Awareness
तीव्रता	Intensity
सङ्कटासन्नता-क्षमताको विश्लेषण	Vulnerability/ Capacity Analysis
पूर्व-चेतावनी	Early Warnings
जोखिम न्यूनीकरण	Risk Reduction
जोखिम विश्लेषण	Risk Analysis
विपद् जोखिम न्यूनीकरण	Disaster Risk Reduction
पूर्वतयारी	Preparedness
प्रतिकार्य	Response
सामना क्षमता	Coping Capacity
"भटपट भोला"	Earthquake "Go Bag"
घुँडा टेक गुंडुल्क, ओत लाग समात	Duck, Cover and Hold





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