1st Edition

TRAINER'S GUIDE

TECHNICAL COMPETENCY UNIT

ADM.TEC 028.1

Provide Technical Guidance on Core Public Health Engineering Concepts

ASCEND

ASEAN Standards and Certification for Experts in Disaster Management

ASEAN Standards and Certification for Experts in Disaster Management

PROVIDE TECHNICAL GUIDANCE ON CORE PUBLIC HEALTH ENGINEERING CONCEPTS

ADM.TEC.028.1

Trainer's Guide

ONE ASEAN
ONE RESPONSE

Project Sponsors:

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam. The ASEAN Secretariat is based in Jakarta, Indonesia.

The "ASEAN Standards and Certification for Experts in Disaster Management (ASCEND)" is under Priority Programme 5: Global Leadership of the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme 2021-2025 that envisions ASEAN as a global leader in disaster management.

The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) implements the ASCEND project in collaboration with the Korean National Fire Agency (KNFA) and support from the ASEAN Secretariat and the Republic of Korea.

The publication of this document is part of the "ASEAN Standards and Certification for Experts in Disaster Management (ASCEND) Toolboxes Development for Five (5) Professions" project.

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The ASCEND Programme and Toolbox Development:

Overview

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1.1 The ASCEND Programme

Southeast Asian governments, through the ASEAN Committee on Disaster Management (ACDM), continue to invest in strengthening disaster management systems for a more secure and resilient region. However, the compounding of risks and increasing uncertainty of disasters in our new climate reality threaten to set back the socioeconomic development gains of ASEAN societies. Widespread and recurring disaster damages and losses can overwhelm national capacities and worsen regional transboundary effects.

The Declaration on One ASEAN One Response (OAOR) at the 2016 ASEAN Summit in Vientiane, Lao PDR, reaffirms ASEAN's vision to move towards faster and more integrated collective responses to disasters inside and outside the region. However, ASEAN's past experiences of responding to large-scale disasters showed that realising the OAOR can be challenging. Various responders from different countries, institutions, organisations, and companies seek to contribute to the overall response. Their goodwill is appreciated, and several provide much-needed assistance. But ASEAN and affected Member States sometimes found it challenging to determine what knowledge and skills responders have and how they can effectively contribute to national and regional efforts.

Learnings from past experiences and shared commitment to realising the OAOR vision increased the need to develop regionally recognised Competency Standards and a certification process for disaster management professionals. The increased support led to initiatives that eventually created the ASEAN Standards and Certification for Experts in Disaster Management (ASCEND) Programme. ASCEND is now part of Priority 5: Global Leadership of the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme 2021-2025, a programme that envisions ASEAN as a global leader in disaster management.

1.2 The objectives of ASCEND

- To enhance the capacity of the ASEAN countries in the implementation of ASCEND.
- To establish regionally recognised Competency Standards and assessment processes covering five professions in disaster management.

- To improve the capacity of the AHA Centre to serve as the ASCEND Secretariat.
- To promote understanding of the ASCEND Framework among the ASEAN Member States (AMS) and other ASEAN sectors in preparation for the inclusion of ASCEND into the ASEAN Mutual Recognition Arrangement (MRA).

1.3 Advantages and benefits of an ASCEND certification

For ASEAN

The ASCEND certification can assist Member States in ensuring that competent disaster management professionals handle emergency assistance and disaster relief across the region. It also supports mutual recognition of disaster management competencies to facilitate acceptance of external aid and faster response.

For AHA Centre

ASEAN, a rapidly developing and hazard-prone region, will need more competent disaster management professionals. The ASCEND certification can narrow current knowledge and skills gaps. It can also enable stronger cooperation and interoperability between disaster managers in their home countries and across regions.

For disaster management professionals

Disaster management professionals can use their ASCEND certification to promote themselves professionally and serve as evidence of their experience and qualifications. It can also make it easier for organisations to determine the ability of certificate holders to perform critical work functions of specific occupations in the disaster management sector.

These ASCEND toolbox documents support the ASEAN Member States in identifying, building the capacity of, and mobilising competent disaster managers across Southeast Asia that are highly capable of contributing to reducing disaster risks and disaster losses in the region through timely and effective response.

1.4 The ASCEND Toolbox

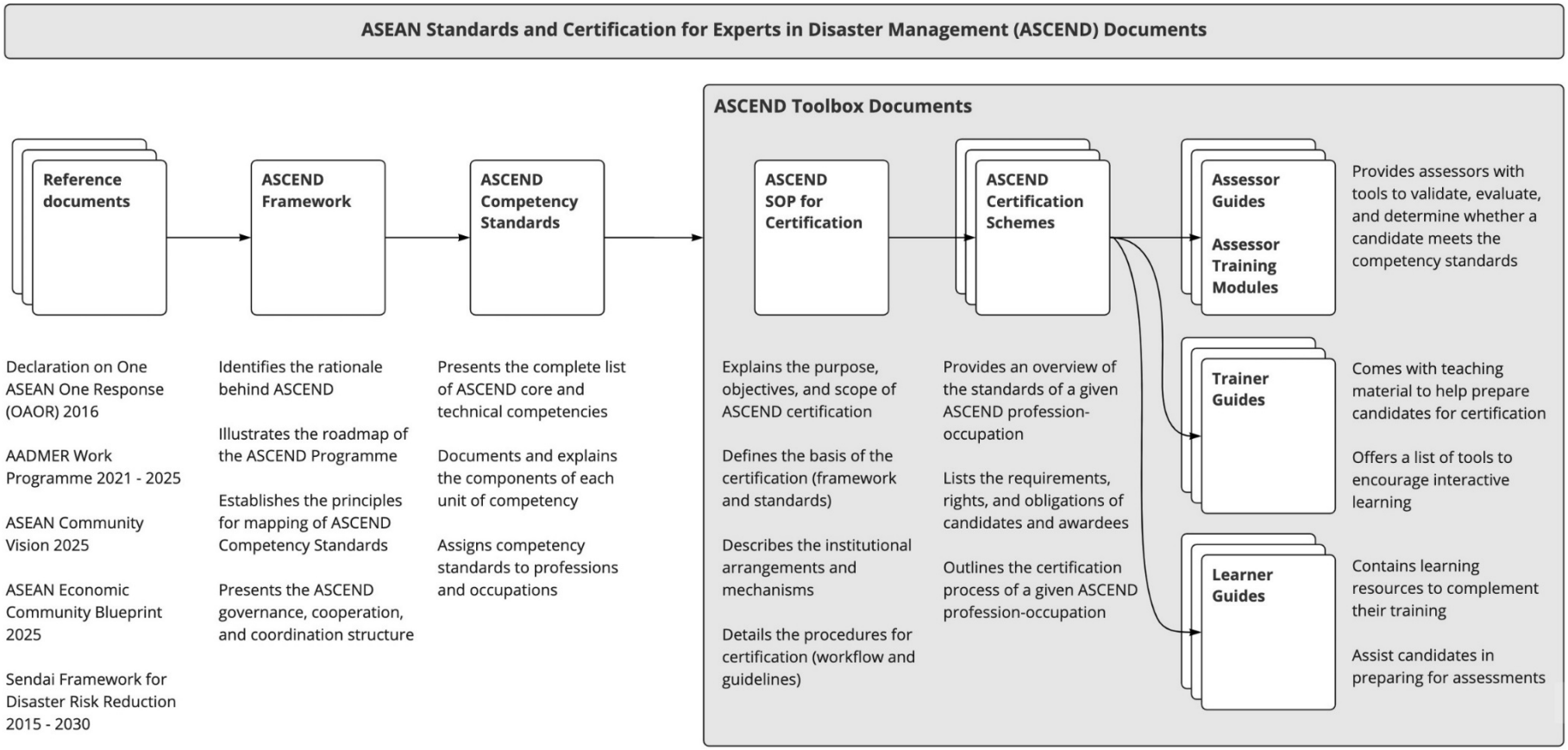
A set of technical requirements must exist before it is possible to implement the ASCEND programme in participating ASEAN Member States. The first requirement is the ASCEND Competency Standards that contains forty-three (43) regionally recognised core and technical competencies in selected disaster management professions. The Competency Standards outline the work elements and performance criteria that guide for certification of disaster management professionals across the region.

Another requirement is the development of an ASCEND Toolbox for five professions. These professions are Rapid Assessment, Humanitarian Logistics, Information Management, Water, Sanitation and Hygiene (WASH), and Shelter Management. The ASCEND Toolbox consists of an SOP, Certification Schemes, Assessor Guides, Trainer Guides, and Learner Guides. The ASCEND Competency Standards, approved by the ASEAN Committee on Disaster Management, is the primary basis of the Toolbox documents.

The SOP defines the basis of ASCEND, describes the institutional arrangements and mechanisms, and details the certification procedures. Certification Schemes presents an overview of the standards of each profession-occupation and certification requirements, the rights and obligations of candidates and certificate holders, and general guidelines on the certification process. Assessor Guides provides assessors with tools to validate, evaluate, and determine whether a candidate meets the Competency Standards. Trainer Guides come with PowerPoint slides and presenter notes to help trainers prepare candidates for certification. It also offers a list of tools that trainers may use to encourage interactive learning. Learner Guides assist candidates preparing for ASCEND certification in their chosen disaster management profession and occupation. It contains learning resources and complementary readings that can help prepare them to undergo the required assessment.

The ASCEND Toolbox documents can assist the ASEAN Member States to identify, build the capacity of, and mobilise competent disaster managers across Southeast Asia to help reduce disaster risks and disaster losses in the region through timely and effective response.

Figure 1: Overview of ASCEND Toolbox Documents



Competency-based Training (CBT):

Introduction for Trainers

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Important: *Training is not a mandatory activity of the ASCEND certification process. Applicants or prospective candidates are expected to prepare themselves before the assessment by self-studying the Learner Guides provided to them when accepted for ASCEND certification.*

In case Authorised/Licensed National Certification Institutions decide to conduct training on material related to ASCEND, their trainers can use the contents of this guide to develop their courses or programmes. Candidates seeking certification may also use the "PowerPoint slides and presenter notes" section of this guide for self-study.

Competency-based learning and assessment

Competency is the characteristic and ability to use or apply knowledge and skills-sets to perform critical job functions in a defined work setting.

Table 1: Competency areas and descriptions

Competency area	Description
Experience	Refers to the qualifications of the candidate that make them eligible to pursue certification. It includes the candidate's formal education, work experience, professional training, and job-relevant life experiences.
Knowledge	Refers to what the candidate needs to know to make informed decisions on how to perform the work effectively.
Skills	Refers to the ability of the candidate to apply knowledge to complete occupational tasks and produce work outcomes or results at the standard required.
Attitudes	Refers to associated beliefs, feelings, motivations, and values that influence a candidate to make decisions and act according to occupational standards and the professional work setting.

Competency-based methods help ensure that the ASCEND certification process is relevant, valid, acceptable, flexible, and traceable – in alignment with the ASEAN Guiding Principles.

The relevance principle confirms that the ASCEND certification reflects the current professional needs in the disaster management sector. The validity principle relates to the consistency and equitability of the assessment process. The acceptability principle is about aligning the ASCEND certification to other disaster management professional standards and good practices. The flexibility principle refers to the responsiveness of the ASCEND certification to changes or differences in disaster management work settings and job requirements. The traceability principle ensures that evidence is sufficient to grant the ASCEND certification.

Competency-based training (CBT) is a teaching strategy that aims to develop the candidate's knowledge, skills, and attitudes to become qualified and competent to perform in a particular occupation. CBT builds on the candidate's experience and uses different modes of instruction to assist them in meeting the standards and performance criteria defined in a unit of competency.

What do trainers do?

A trainer is someone who structures and facilitates the training of candidates to develop or increase their ability to communicate or demonstrate that they are competent in a specific unit of competency.

The role of trainers is to:

- interpret the scope and adapt the ASCEND competency standards to fit the context of where the training is taking place,
- adjust the training method and delivery of material to cater to learner diversity and needs, and
- assist candidates in preparing for competency-based assessments with the learning resources available.

Using the trainer's guide

The material in this trainer guide is designed to assist trainers in conducting learner-centric activities that recognise prior experience, maximise engagement, teach for understanding, and build on learner strengths. The guide provides suggestions on how to prepare training sessions that enhance candidate participation and minimise disruptions during the session. It also offers a list of equipment and tools that trainers may use to encourage interactive learning and supplement traditional methods like lectures, case discussions, demonstrations, group exercises, simulation games, role-playing, and independent research. Finally, it includes a copy of PowerPoint presentation slides and presenter notes to guide trainers on what key messages to highlight during sessions.

Remarks: *Trainers also need to consider the diverse backgrounds (e.g., cultural, linguistic, social) and needs of candidates when planning and delivering the training. Trainers may have to adapt their training style to suit student preferences, use alternative activities for different levels of ability, and provide opportunities for various forms of participation.*

ASCEND Competency Standards

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3.1 Competency standards

Competency standards are a set of industry-accepted benchmarks that defines the experience, knowledge, skills, and attitudes professionals need to perform well in an occupation. It also reflects the requirements of work settings and considers the developments in the disaster management profession.

3.2 ASCEND Competency Standards

The ASCEND Competency Standards identifies the key features of work in selected disaster management professions, and performance standards professionals need to meet to be deemed competent. It also provides the list of the forty-three (43) core and technical competencies that serve as the basis for defining the regionally recognised disaster management qualifications across the ASEAN Member States. The five (5) professions covered by the ASCEND Competency Standards include Rapid Assessment, Humanitarian Logistics, Information Management, WASH, and Shelter Management. Under these professions are five (5) categories of occupations: Manager, Coordinator, Officer, Promoter, and Engineer. Overall, there are fifteen (15) profession-occupation combinations (e.g., humanitarian logistics manager, information management coordinator, WASH promoter).

Each ASCEND Competency Standard has its dedicated Toolbox documents: an SOP, Certification Scheme, Assessor Guide, Trainer Guide, and Learner Guide. One SOP applies to all profession-occupation combinations covered by the ASCEND certification. The Certification Schemes, one for each of the profession-occupation combinations. Both these documents align with the AQRF Level Descriptors, Section 4: Guiding Principles and Protocols for Quality Assurance of the AGP, and ASEAN Disaster Management Occupations Map. The Certification Schemes also outline the ASCEND competencies under selected professions and occupations, eligibility criteria, basic requirements and rights of candidates, and obligations of certification holders. Assessor Guides describe the components of particular competency standards and offer tools to determine the candidate's qualifications. Trainer and Learner Guides expound on a given competency standard's elements and performance criteria for learning and assessment preparation purposes.

The ASCEND Competency Standards and its derivative Toolbox documents will be reviewed and updated every five (5) years to ensure it reflects changes

in the disaster management profession and remains relevant. The Toolbox documents may also serve as a reference for ASEAN Member States' seeking to develop and implement national-level competency-based certification processes based on their respective capacities and needs. Table 2 describes its main components.

Table 2: Components of the ASCEND Competency Standards

Component	Description
Unit title	Describes the critical work function to be performed in an occupation.
Unit number	A coding system to organise the units of competency. It also indicates the types of competency standards. • ADM.**COR**.000.0 are core competencies. These are general professional knowledge and skills related to international humanitarian principles and disaster management standards, including ASEAN mechanisms and procedures. • ADM.**TEC**.000.0 are technical competencies. These are specific knowledge and skills needed to perform effectively in work areas under their chosen disaster management profession and occupation.
Unit description	Provides information about the critical work function covered by the unit.
Elements	Presents the occupational tasks required to perform the critical work function in the unit.
Performance criteria	Lists the expected outcomes or results from the occupational tasks to perform and the standard required.
Unit variables	Advises on how to interpret the scope and context of this unit of competence.
Assessment guide	Outlines the evidence to gather and evaluate to determine whether the candidate is competent in the unit.
Linkages to other units	Explains the connection of the competency standard to other units of competency.

Critical aspects of assessment	Lists the types of evidence or demonstrated abilities assessors need to observe to determine the candidate's competency.
Context of assessment	Notes the settings or situations in which candidates need to demonstrate their ability during ASCEND assessments.
Resource implications	Identifies the resources needed to conduct the assessment.
Assessment methods	Describes the different assessment methods to be used for assessing the competency of candidates in the specific unit.
Key competencies	Presents the specific knowledge, skills, and attitudes related to the unit of competency that assessors need to evaluate to confirm whether the candidate for certification is qualified and competent.

3.3 Unit of Competency

Unit title : **Provide Technical Guidance on Core Public Health Engineering Concepts**
Unit number : ADM.TEC.028.1

Unit description : This units deals with the skills and knowledge required to implement a project in issues related to public health engineering during emergencies, including building, operating and maintaining water and sanitation system and services.

ELEMENT AND PERFORMANCE CRITERIA	UNIT VARIABLE AND ASSESSMENT GUIDE

Element 1.
Provide technical guidance on water supply

1.1 Identify and analyse standards related to water supply in emergency
1.2 Conduct water supply needs assessment and prioritisation in emergency situation
1.3 Identify and analyse different elements and relevance of measures for water supply in emergencies
1.4 Identify key aspects on operation and maintenance of water supply system and facilities for continued health benefits
1.5 Identify learning and good practices on water supply measures

Unit Variables

This unit variables provide advice to interpret the scope and context of this unit of competence. It relates to the unit as a whole and facilitates holistic assessment.

This unit applies to leading and managing a project dealing with a wide range of issues related to public health and may include:

Based on Sphere (2011), WASH programme intervention in the area of water supply should aim for sufficient clean and safe water to be available and accessible to meet basic needs. This may include intervention to ensure:

- Access and water quantity;
- Water quality; and
- Water facilities

Safe disposal of human excreta is crucial to reduce transmission of diseases through direct and indirect routes, where interventions may include: 1) Creating an environment free from human faeces, and 2) Provision of appropriate and adequate toilet facilities (Sphere, 2011).

Sphere (2011) defined solid waste management as the process of handling and disposal of organic and hazardous solid waste which, if unattended appropriately, can pose public health risks to the affected population and

in different types of emergencies

Element 2.

Provide technical guidance on excreta disposal

2.1 Identify and analyse standards related to safe sanitation on health risks in an emergency.

2.2 Conduct sanitation needs assessment and prioritisation in emergency situation.

2.3 Identify and analyse different elements and relevance of measures for excreta disposal in emergencies.

2.4 Identify key aspects on operation and maintenance of sanitation system and facilities for continued health benefits.

2.5 Identify learning and good practices on sanitation measures in different types of emergencies

Element 3.

Provide technical guidance on solid waste management and drainage

3.1 Identify and analyse standards related to proper solid waste management and drainage facilities on

can have a negative impact on the environment. Measures may include collection and disposal of solid waste.

Assessment Guide

The following skills and knowledge must be assessed as part of this unit:

- Knowledge of standards related to water supply, safe excreta disposal, solid waste management, and drainage
- Ability to conduct various types of need assessments related to water supply, safe excreta disposal, solid waste management, and drainage
- Understanding the range of appropriate WASH in emergencies intervention available to address public health needs
- Understanding a wide-range selection of operation and maintenance of WASH facilities in emergency setting

Linkages to other Units

This unit is a core unit for a **WASH manager** and must be delivered with other technical competencies of **WASH Manager.**

Critical Aspects of Assessment

Evidence of the following is essential:

Demonstrated ability to implement an effective WASH intervention during emergencies, specifically to address issues related to water supply, safe excreta disposal, solid waste management, and drainage, including:

- Relevant humanitarian standards at national, regional, and international level
- Need assessment
- Implementation
- Operation and maintenance
- Documentation of learning and good practices

Context of Assessment

This unit may be assessed on/off the job:

health risks in an emergency

3.2 Conduct solid waste management and drainage needs assessment and prioritisation in emergency situation

3.3 Identify and analyse different elements and relevance of measures for solid waste management and drainage in emergencies

3.4 Identify key aspects on operation and maintenance of solid waste management and drainage system and facilities for continued health benefits

3.5 Identify learning and good practices on solid waste management and drainage facilities in different types of emergencies

- Assessment should include practical demonstration to design a complex and large-scale project on WASH in emergency setting either in the workplace or through a simulation activity, supported by a range of methods to assess underpinning knowledge
- Assessment must relate to the individual's work area of responsibility.

Resource Implications

Training and assessment to include access to a real or simulated workplace; and access to workplace standards, procedures, policies, guidelines, tools and equipment.

Assessment Methods

The following methods may be used to assess competency for this unit:

- Case studies
- Observing of practical performance by candidate
- Oral and written questions
- Portfolio evidence
- Problem solving
- Role plays
- Third party reports completed by a supervisor
- Project and assignment work

Key Competencies in this Unit

Level 0 = irrelevant, not to be assessed
Level 1 = competence to undertake tasks effectively
Level 2 = competence to manage tasks
Level 3 = competence to use concepts for evaluating

Key Competencies	Level	Examples
Collecting, organising, and analysing information	2	Identifying the most appropriate WASH measures
Communicating ideas and information	2	Conduct WASH need assessment

Planning and organising activities	**0**	n/a
Working with others and in teams	**0**	n/a
Using mathematical ideas and techniques	**3**	Calculating WASH needs
Solving problems	**3**	Identifying the most appropriate WASH measures
Using technology	**2**	Using technology to support WASH activities

Preparing for Training Sessions:

Equipment, Material, and Tools

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4.1 Onsite training

Please refer to the checklist and table below when conducting onsite training.

Checklist Tick box (✓) when completed	**Training resource requirements** Equipment and material
☐	Secure a computer (desktop or laptop) installed with the latest Windows Operating Systems and Microsoft Office Apps (Word, PowerPoint, Excel).
☐	Gain access to a stable internet connection and printer, if needed.
☐	Reserve a conducive training facility with a dedicated workspace (large desk and chair with back support), projector, and black/whiteboards.
☐	Obtain a copy of the Trainee Guide, including PowerPoint (PPT) presentation and presenter notes. Test if the PPT presentation is working before sessions.
☐	Request a list of confirmed attendees (candidates) and their contact details.
☐	Send training invitations to all confirmed attendees through email. It includes a brief overview of the training, date, schedule, training venue, information about the trainer, email support, and a copy of the Trainee Manual (PDF version).
☐	Print out copies of the Trainee Manual, if needed.

4.2 Online training

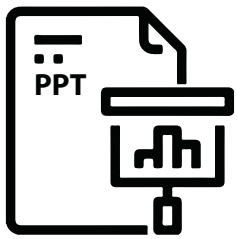
Please refer to the checklist and table below when conducting online training (remote).

Checklist Tick box (✓) when completed	Training resource requirements Equipment and material
☐	Secure a computer (desktop or laptop) installed with the latest Windows Operating Systems and Microsoft Office Apps (Word, PowerPoint, Excel).
☐	Gain access to a stable internet connection.
☐	Purchase a licensed video conferencing account, if needed (e.g., Zoom Meetings, Webex).
☐	Reserve a dedicated workspace (large desk and chair with back support).
☐	Obtain a copy of the Trainee Guide, including PowerPoint (PPT) presentation and presenter notes. Test if the PPT presentation is working before sessions.
☐	Request a list of confirmed attendees (candidates) and their contact details.
☐	Send training invitations to all confirmed attendees through email. It includes a brief overview of the training, date, schedule, Zoom log-in details, information about the trainer, email support, and a copy of the Trainee Manual (PDF version).

The list below recommends apps and tools that trainers may find useful when planning and delivering the training. Trainers need to register and create their accounts before they can use the apps and tools.

Apps and tools	Description
Zoom	Zoom is a software program that provides a multi-user platform for video and audio conferencing. It has built-in collaboration and presenter tools

	useful in planning and delivering online training sessions like calendar integration, group chat, screen sharing, breakout rooms, and whiteboard functions. https://zoom.us/
For collaboration, group exercises, lectures, and demonstrations.	
Lucidspark	Lucidspark is a virtual whiteboard where training attendees can come together to create, develop, and present their ideas. It can be used for brainstorming, group presentations, and organizing notes. https://lucidspark.com/
Ziteboard	Ziteboard is a collaboration software ideal for discussing topics visually and online real-time tutoring. It works seamlessly on different devices (laptops, tablets, and mobile devices) and web browsers (Apple Safari and Google Chrome). https://ziteboard.com/
For activities that test student understanding (quizzes) and decision-making (simulation games)	
Kahoot	Kahoot is a game-based learning platform that allows users to generate multiple-choice quizzes for distance education. Users can create a learning game on any topic in any language, and they can host a live game and share it with users. https://kahoot.com/
Quiz It! Live	Quiz It! Live is an app similar to Kahoot that allows users to create and host live quizzes for groups. It also comes with automated timing, scoring, and marking. https://www.quizit.net/
For gathering feedback, ideas, or responses	
Google Forms	Google Forms is a survey administration software for collecting and organising different kinds of information. Responses are automatically gathered and neatly presented in charts, sheets, and more. https://www.google.com/forms/about/
Survey Monkey	Survey Monkey is the world's most popular free online survey tool. Similar to Google Forms, users can create, send, and edit questionnaires. https://www.surveymonkey.com/



PowerPoint Slides and Presenter Notes

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5.1 Instructions for using PowerPoint presenter

The PowerPoint **Presenter View** allows you to view your presentation together with the presenter notes on your computer's monitor, while attendees view the note-free presentation on another monitor. It allows you to move the slides, control the pace of the presentation, see the elapsed time of your presentation, and use a tool to draw on point or highlight parts of the presentation.

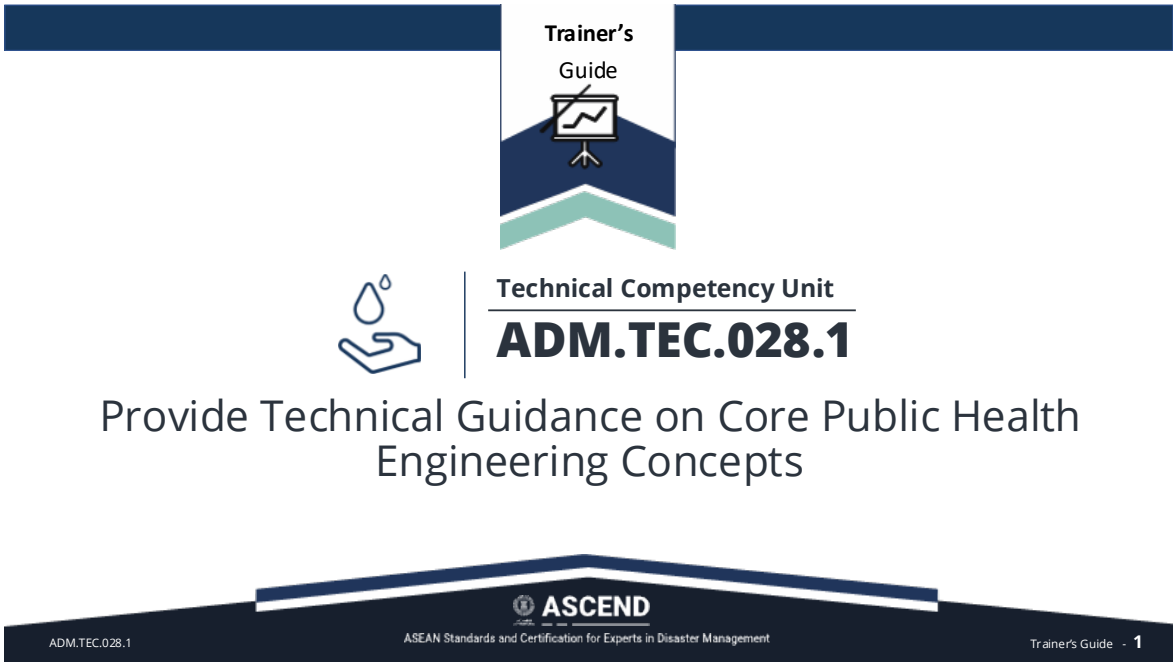
Connect your computer (desktop or laptop) to a projector. Double click on the PowerPoint presentation to open the file. In PowerPoint, click on the **Slide Show** tab and select the **Use Presenter View** checkbox. Choose which monitor to display Presenter View **ON**. Finally, select **From Beginning** or press f5.

For more information, visit the Microsoft PowerPoint help & learning website: https://support.microsoft.com/en-us/powerpoint

A video tutorial is available here: https://support.microsoft.com/en-us/office/use-presenter-view-in-powerpoint-fe7638e4-76fb-4349-8d81-5eb6679f49d7

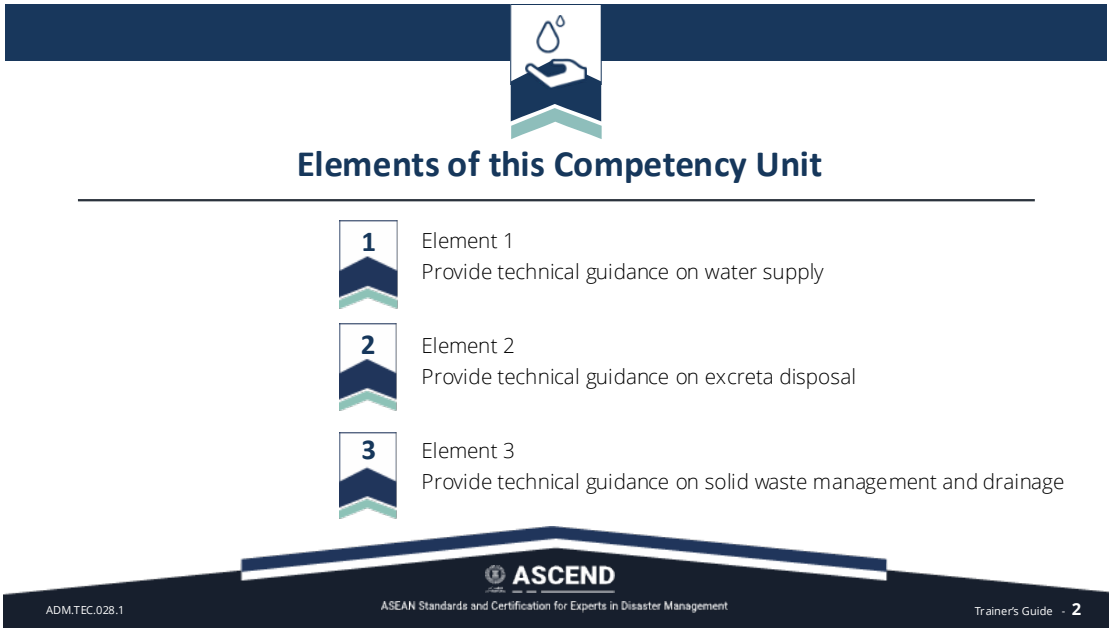
5.2 PowerPoint slides and presenter notes

Image 1: *Slide 1*



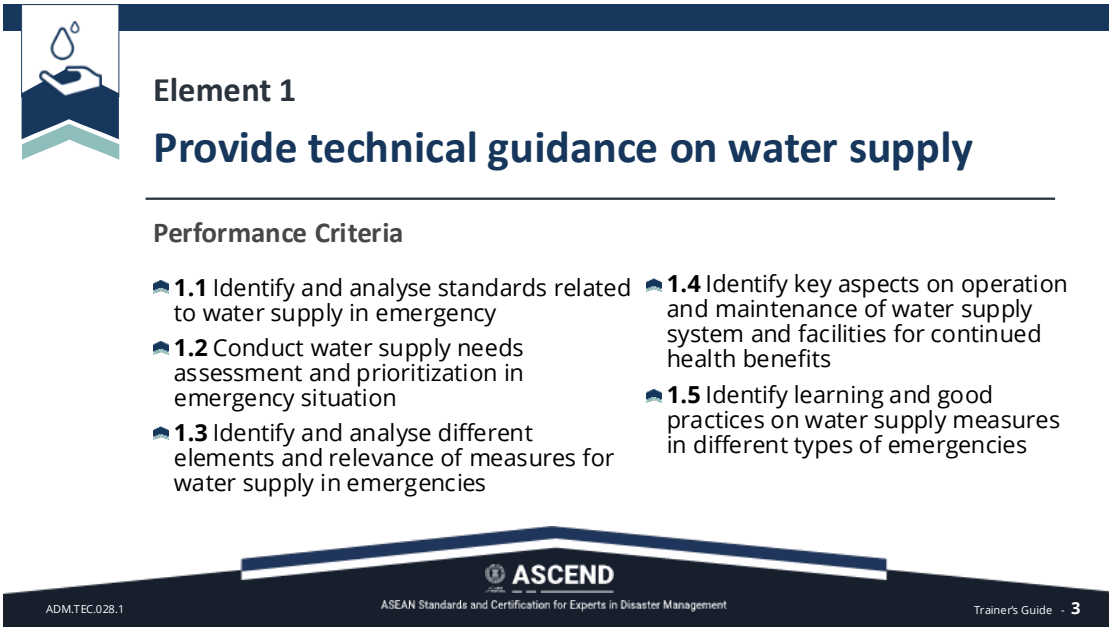
Slide No.	**1**
Trainer Notes	Trainer welcomes students to class.

Image 2: *Slide 2*



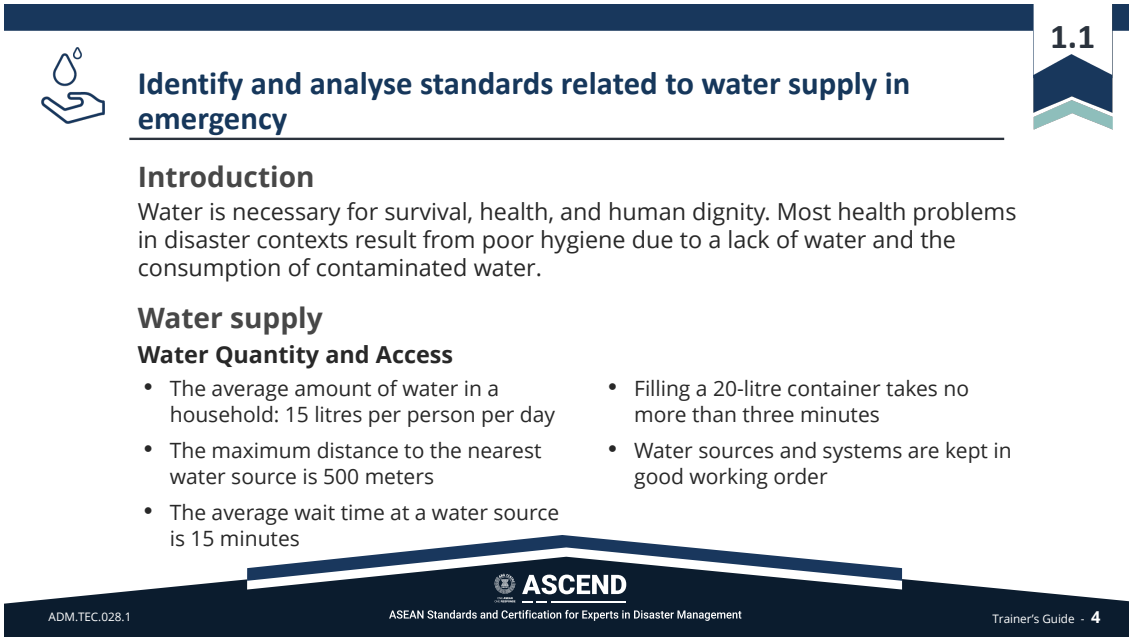
Slide No.	**2**
Trainer Notes	Trainer advises participants this Unit comprises three Elements, as listed on the slide explaining: • Each Element comprises a number of Performance Criteria which will be identified throughout the class and explained in detail • Participants can obtain more detail from their Learner's Guide • At times the course presents advice and information about various protocols. Still, where their workplace requirements differ from what is presented, workplace practices, standards, policies, and procedures must be observed. .

Image 3: Slide 3



Slide No.	**3**
Trainer Notes	Trainer identifies the Performance Criteria for this Element for participants, as listed on the slide.

Image 4: Slide 4



Slide No. **4**

Trainer Notes

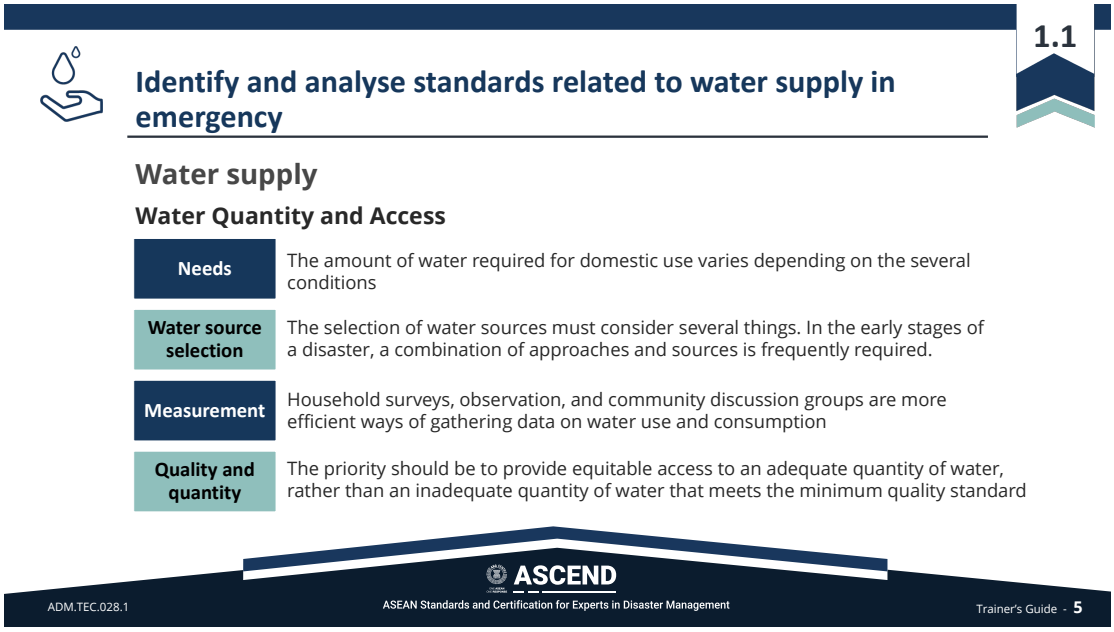
Water-supply issues arise at every phase of a disaster. Water is necessary for survival, health, and human dignity. In extreme situations, there may not be enough water to meet basic needs, and in these cases, providing safe drinking water is critical. Most health problems in disaster contexts result from poor hygiene due to a lack of water and the consumption of contaminated water.

Water should be readily available. It must be located close enough to people's homes for them to collect it easily, and there must be enough water points to allow everyone access

Key Indicators of **Water Quantity and Access:**

- In any household, the average amount of water used for drinking, cooking, and personal hygiene is at least 15 litres per person per day.
- The maximum distance between any two households and the nearest water source is 500 meters.
- The average wait time at a water source is 15 minutes.
- Filling a 20-litre container takes no more than three minutes.
- Water sources and systems are kept in good working order so that adequate amounts of water are available consistently or regularly.

Image 5: Slide 5



Slide No. 5

Trainer Notes

Needs

The amount of water required for domestic use varies depending on the climate, available sanitation facilities, people's normal habits, religious and cultural practices, the food they cook, the clothes they wear, and so on. The closer the water source is to the dwelling the more water is consumed. A simplified table of basic survival water needs can be found in The Sphere Handbook (2018)

Water source selection

Several things that must be considered:

- The availability and sustainability of a sufficient quantity of water; whether water treatment is required,
- the feasibility of this; the availability of the time, technology, or funding required to develop a source;
- the proximity of the source to the affected population; and
- the presence of any social, political, or legal matters related to the source must be considered.

Measurement

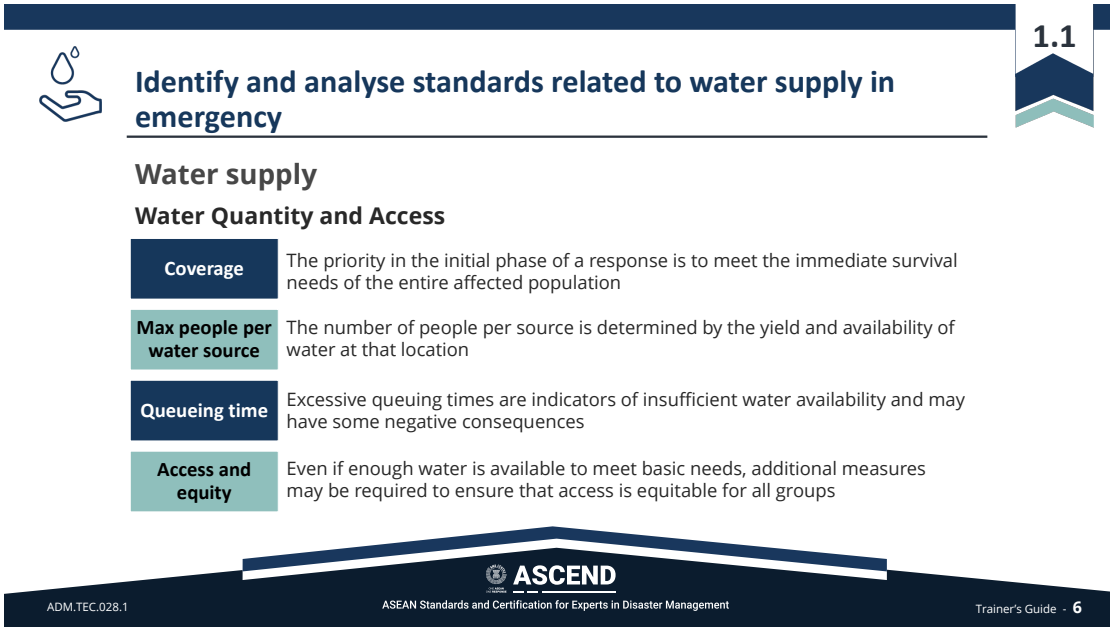
Measuring only the volume of water pumped into the reticulation system or the length of time a hand-pump is in use will not provide an accurate indication of individual consumption. Household surveys, observation, and community discussion groups are more efficient ways of gathering data on water use and consumption.

Quality and quantity

Until both minimum quantity and quality standards are met, the priority should be to provide equitable access to an adequate quantity of water, even if it is of intermediate quality, rather than an inadequate quantity of water that meets the minimum quality standard. It should be remembered that people

living with HIV/AIDS require more water for drinking and personal hygiene. Care should be taken to ensure that the water needs of livestock and crops are met, especially in drought-stricken areas where lives and livelihoods are at stake.

Image 6: Slide 6



Slide No. 6

Trainer Notes

Coverage

The priority in the initial phase of a response is to meet the immediate survival needs of the entire affected population. People affected by an emergency are more vulnerable to disease, so the indicators should be met even if they are higher than the norms of the affected or host population. In such cases, it is recommended that agencies plan programs to improve the host population's water and sanitation facilities as well, in order to avoid provoking animosity.

Maximum numbers of people per water source

The number of people per source is determined by the yield and availability of water at that location. Taps, for example, frequently function only at certain times of day, and hand-pumps and wells may not provide constant water if the recharge rate is low.

The guideline can assume that the water point is only accessible for about eight hours per day; if access is greater than this, people can collect more than the minimum requirement of 15 litres per day. These targets should be used with caution, as meeting them does not guarantee a minimum amount of water or equitable access.

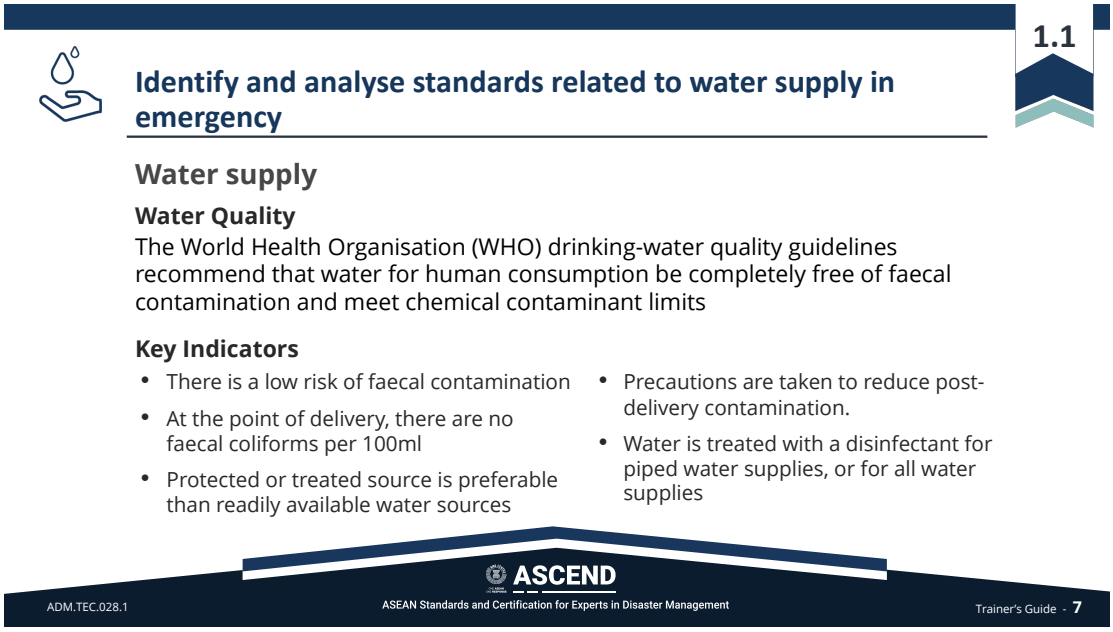
Queueing time

Excessive queuing times are indicators of insufficient water availability (either due to a lack of water points or insufficient water point yields). Excessive queuing times may have the following negative consequences: 1) decreased per capita water consumption; 2) increased consumption from unprotected surface sources; and 3) reduced time for water collectors to attend to other essential survival tasks.

Access and equity

Water points should be placed in areas where everyone, regardless of gender or ethnicity, can access them. Some hand-pumps and water carrying containers may need to be designed or adapted for use by HIV/AIDS patients, the elderly, PWDs and children. In urban areas, it may be necessary to supply water to individual buildings in order to keep toilets operational. Water rationing or pumping should be planned in consultation with users in situations where water is rationed or pumped at specific times. Timetables that are convenient and safe for women and others responsible for collecting water should be established, and all users should be fully informed of when and where water is available.

Image 7: *Slide 7*



Slide No. **7**

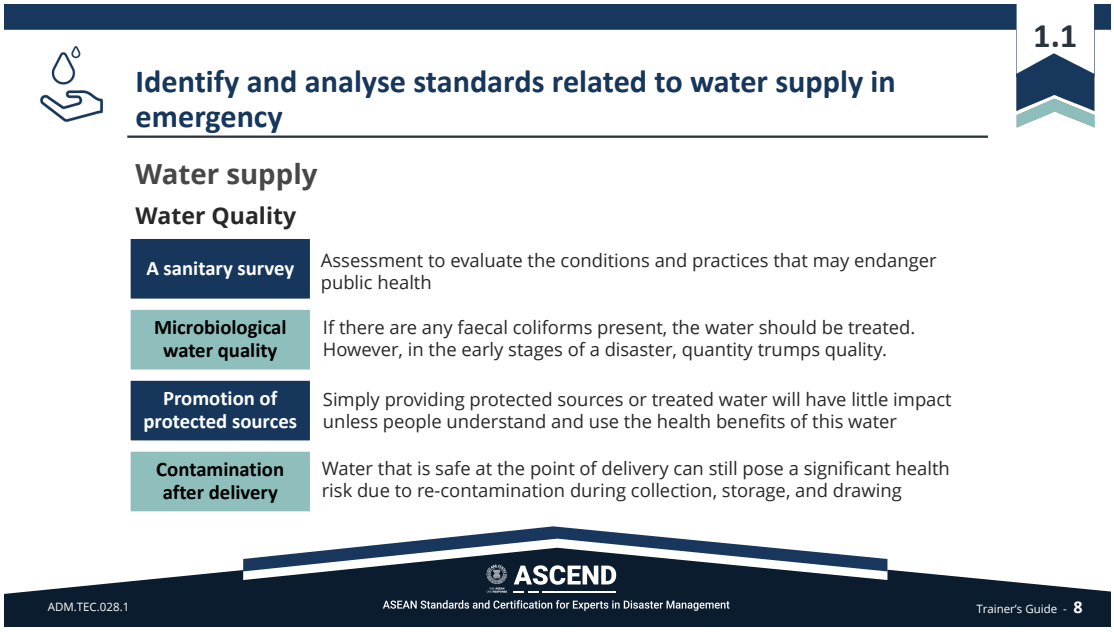
Trainer Notes

In most emergency situations, faecal contamination, rather than chemical contamination, poses the greatest short-term risk to public health. Water quality becomes more important in areas with a high population density and/or where there is a risk of water-related and excreta-related epidemic disease. Chemical water quality may be of primary concern in disasters such as those caused by industrial accidents. The chemical composition of water may have long-term effects on health, which should be considered.

Key Indicators of **Water Quality:**

- A sanitary survey reveals that there is a low risk of faecal contamination.
- At the point of delivery, there are no faecal coliforms per 100ml.
- People prefer to drink water from a protected or treated source over other readily available water sources.
- Precautions are taken to reduce post-delivery contamination.
- Water is treated with a disinfectant for piped water supplies, or for all water supplies when there is a risk or presence of a diarrhoea epidemic, so that there is free chlorine residual at the tap of 0.5mg per litre and turbidity is less than 5 NTU.
- Short-term use of water contaminated by chemicals (including carry-over of treatment chemicals) or radiological sources has no negative health effects, and assessment shows no significant probability of such an effect

Image 8: Slide 8



Slide No. 8

Trainer Notes

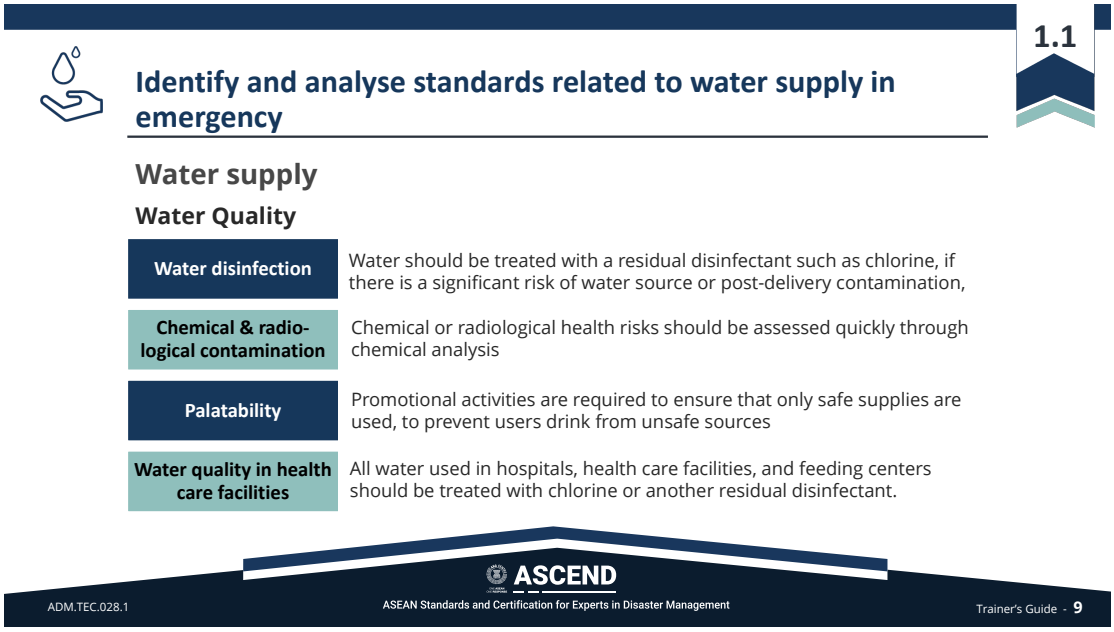
A sanitary survey
The assessment should include potential sources of water contamination at the source, in transport, and at home, as well as defecation practices, drainage, and solid waste management. Community mapping is an especially effective method of identifying public health risks and involving the community in finding ways to reduce these risks.

Microbiological water quality: faecal coliform bacteria (>99 per cent of which are E. coli) are an indicator of the level of human/animal waste contamination in water, as well as the presence of potentially harmful pathogens.

Promotion of protected sources
People may prefer to drink from unprotected sources, such as rivers, lakes, and unprotected wells, for a variety of reasons, including taste, proximity, and social convenience. In such cases, technicians, hygiene promoters, and community mobilisers must understand the rationale for these preferences in order to incorporate them into promotional messages and discussions.

Contamination after delivery
Improved collection and storage practices, distribution of clean and appropriate collection and storage containers, treatment with a residual disinfectant, or treatment at the point of use are all steps that can be taken to reduce such risk. Water should be sampled at the point of use on a regular basis to assess the extent of any post-delivery contamination.

Image 9: Slide 9



Slide No. 9

Trainer Notes

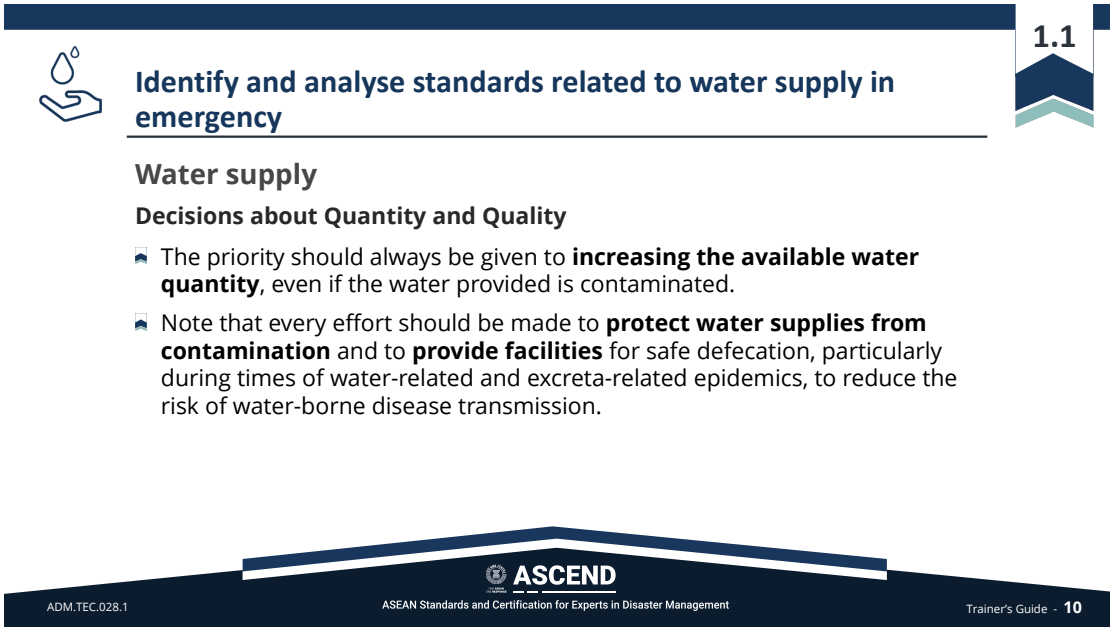
Water disinfection
Conditions in the community, such as population density, excreta disposal arrangements, hygiene practices, and the prevalence of diarrheal disease, will determine this risk. The risk assessment should also include qualitative community data on factors such as taste and palatability perceptions. Any large or concentrated population's piped water supply should be treated with a residual disinfectant, and in the event of a diarrhoea epidemic, all drinking water supplies should be treated, either before distribution or in the home. Turbidity must be less than 5 NTU for water to be properly disinfected.

Chemical and radiological contamination
The decision should then be made by balancing the short-term public health risks and benefits. A decision on whether to use potentially contaminated water for long-term supplies should be based on a more thorough professional assessment and analysis of the health implications.

Palatability
Although taste is not a direct health problem in and of itself (e.g., slightly saline water), if the safe water supply does not taste good, users may drink from unsafe sources, putting their health at risk. This could also be a risk if chlorinated water is used, in which case promotional activities are required to ensure that only safe supplies are used.

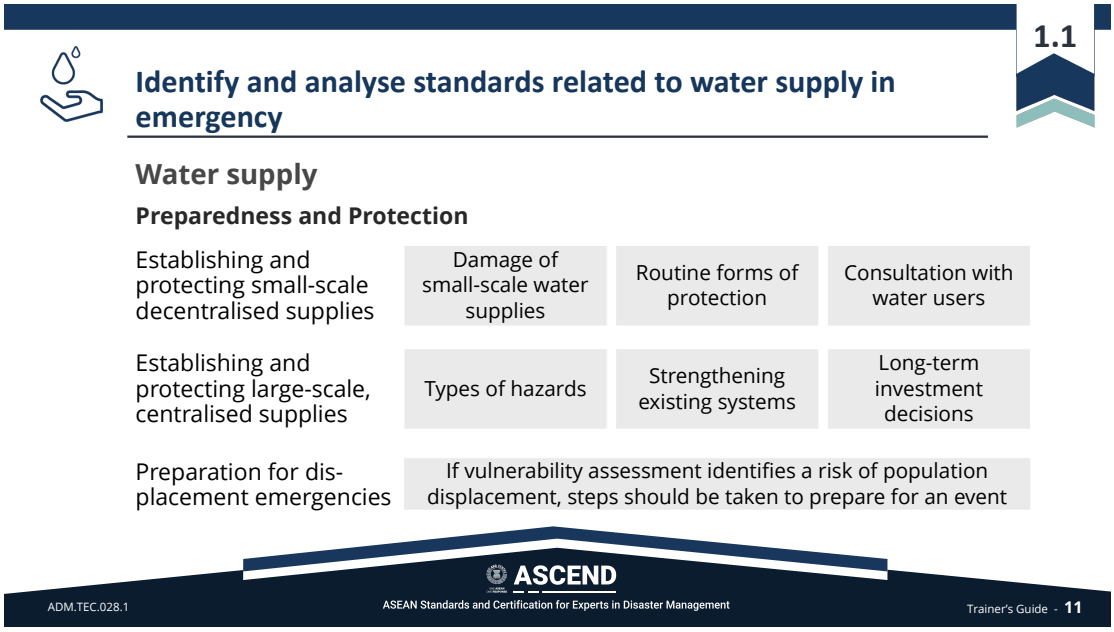
Water quality in health care facilities:
When water is likely to be rationed due to a supply interruption, sufficient water storage should be available at the centre to ensure an uninterrupted supply at normal levels of utilisation.

Image 10: Slide 10



Slide No.	**10**
Trainer Notes	When time and resources are limited and the choice between increasing water quantity or improving water quality must be made, priority should always be given to increasing the quantity of water available, even if the water provided is contaminated. In an emergency, water containing up to 100 faecal coliforms per 100 ml may be provided for a very short time until treatment systems are in place. In many emergencies, the most important routes for the transmission of water- and excreta-related disease are linked to hygiene issues caused by a lack of water, rather than contaminated water supplies. It should be emphasised, however, that at this stage, every effort should be made to protect water supplies from contamination and to provide facilities for safe defecation, particularly during times of water-related and excreta-related epidemics to reduce the risk of water-borne disease transmission

Image 11: Slide 11



Slide No. 11

Trainer Notes

Establishing and protecting small-scale decentralised supplies

1. *Kinds of damage to small-scale water supplies*: Wind damage to roof catchment systems is common during tropical storms. During floods, unlined canals can be washed away or broken, cutting off water supplies. In a drought, they may also dry up sooner. A landslide could destroy hillside springs. During unusual flash flooding, wells near rivers can become contaminated and filled with sand. During earthquakes, landslides, or civil strife, all piped systems are prone to failure and disruption. During wars, dug wells are especially vulnerable because bodies or toxic materials can be dumped in wells.
2. *Routine forms of protection*: Those responsible for providing or improving water supplies during "normal" times must be aware of the specific hazards to which water sources may be exposed. This hazard mapping should be as important as other factors in water supply system planning, such as water quality and taste, distance to users, and capital and recurring costs.
3. *Need for consultation with water users*: Wherever there is a hazard, or the possibility of a water supply disruption, primary healthcare workers or other development personnel should discuss alternative drinking-water sources with the people affected.

Establishing and protecting large-scale, centralised supplies

1. *Types of hazards*: In emergency and disaster preparedness, the location of sources and the design of water-supply systems are critical. Hazards to catchments, reservoirs, pumping and treatment

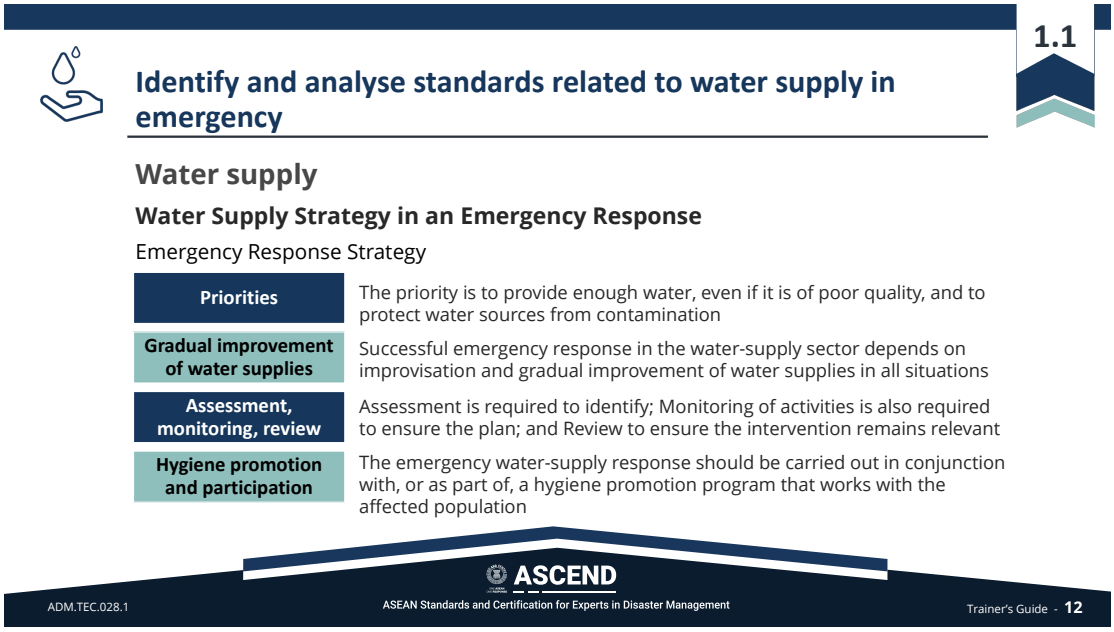
plants, as well as the distribution system must all be considered in designing a contingency planning to protect water-supply systems.

2. *Strengthening existing systems*: Weak points in distribution systems should be reinforced, as should locations where pipes cross earthquake faults. Flood-prone facilities can be raised or protected with levees or bunds. If necessary, backup generators can be provided, as well as a stock of pre-positioned replacement pumps and pipes for emergency repairs. Standardisation of pumps, pipes, and fittings, among other things, is critical
3. *Long-term investment decisions*: Long-term design and investment decisions must account for the possibility of disaster. Water-transmission mains and distribution networks should be routed with the possibility of damage from natural causes such as earthquakes and landslides.

Preparation for displacement emergencies

When the vulnerability assessment identifies a risk of population displacement, steps should be taken to prepare for such an event by considering the likelihood of displacement, the likely number of displaced people, displacement routes, and likely destinations. It may be difficult to move staff and equipment along congested roads during a mass population movement. Therefore, it is critical to establish a local response capacity early on

Image 12: Slide 12



Slide No. **12**

Trainer Notes

Priorities

A minimum of 15 litres/person/day should be provided as soon as possible in the immediate post-impact period. Treated water may need to be limited to 7 litres/day/person. Water quality can be improved over several days or weeks.

Gradual improvement of water supplies

Successful emergency response in the water-supply sector depends on improvisation and gradual improvement of water supplies in all situations, progressing from basic services during the emergency and recovery phases to more sustainable services in the long term when installations should be more robust and less vulnerable to disasters. These enhancements are usually incremental. Emergency measures are designed and implemented in a way that allows them to be expanded later. However, sometimes this may not be possible. Temporary measures, such as the use of lightweight petrol pumps and flexible tanks that require complete replacement after weeks or months may be required.

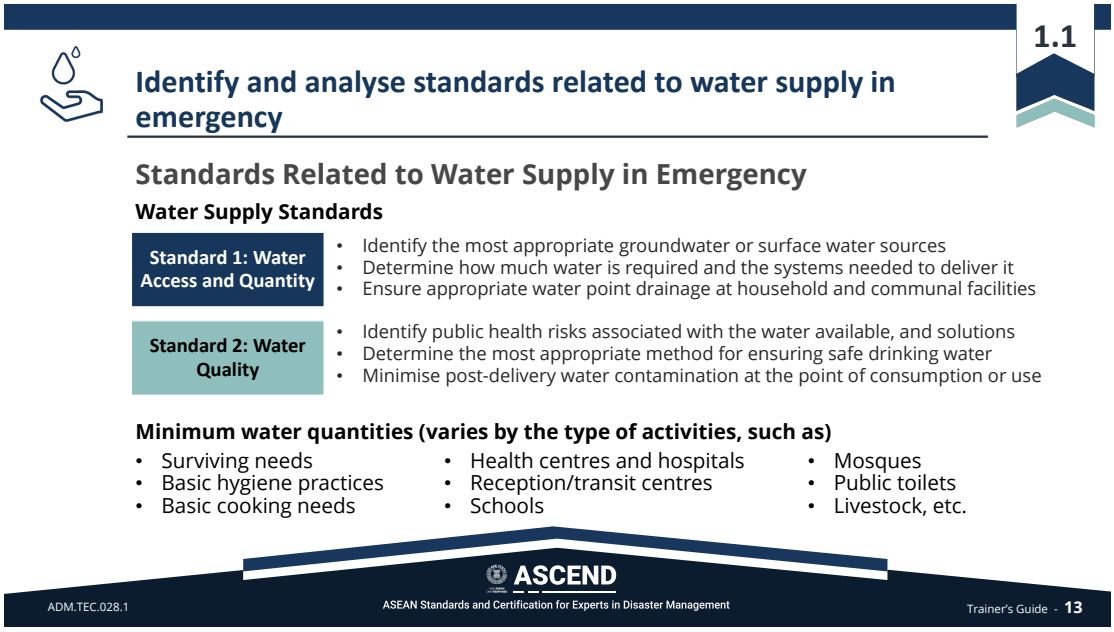
Assessment, monitoring, and review

Assessment is required to identify needs, damage, and resources to respond appropriately and effectively. Monitoring of activities is also required to ensure that water supply activities are carried out as planned. The focus is on looking at indications of problems and unmet needs. Periodic reviews of the situation and response are required to ensure that the intervention remains relevant to the needs and resources of the disaster-affected communities.

Hygiene promotion and participation

The overall aim is to reduce risk, increase resilience, and lessen the impact of disasters on health. Interventions should ensure that water systems are designed and maintained to meet the needs of all parties involved, including women, children, the elderly, PWDs. Opportunities for participation in assessment, monitoring, and review, as well as program design and implementation, should be sought.

Image 13: Slide 13



Slide No. 13

Trainer Notes

Key Actions for Water Supply Standards:

Water Supply Standard 1: *Water Access and Quantity*

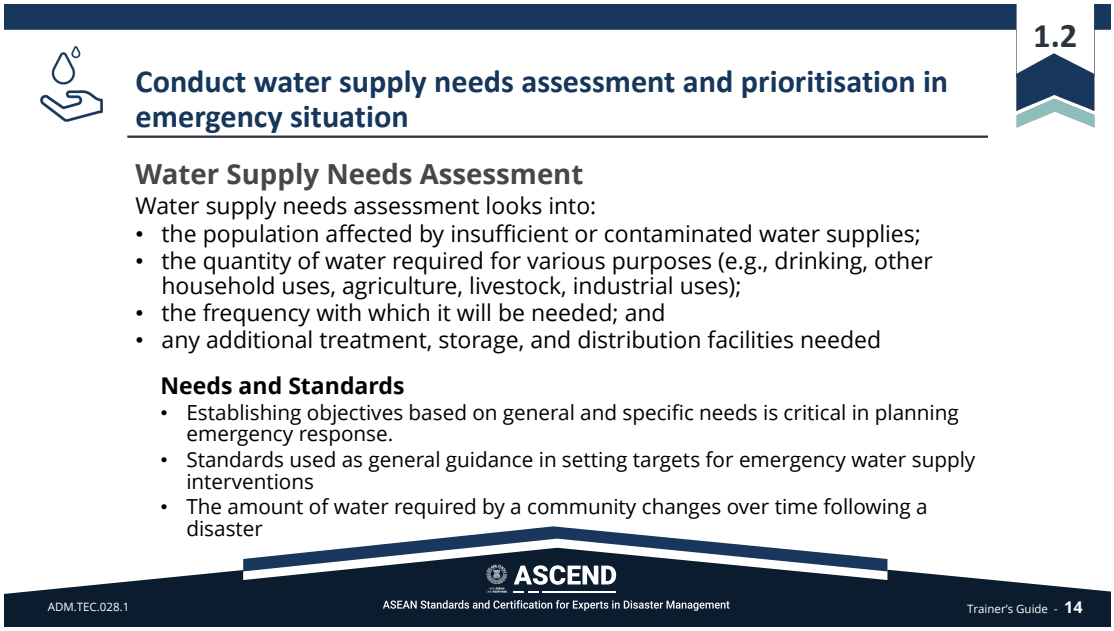
- Identify the most appropriate groundwater or surface water sources, taking account of potential environmental impacts.
- Determine how much water is required and the systems needed to deliver it.
- Ensure appropriate water point drainage at household and communal washing, bathing and cooking areas, and handwashing facilities.

Water Supply Standard 2: *Water Quality*

- Identify public health risks associated with the water available and the most appropriate way to reduce them.
- Determine the most appropriate method for ensuring safe drinking water at the point of consumption or use.
- Minimise post-delivery water contamination at the point of consumption or use.

Read more in Sphere Handbook about the Minimum water quantities: survival figures and quantifying water needs

Image 14: Slide 14



Slide No. **14**

Trainer Notes

In the Learner Guide you can find the Figure 2, and 3 from WHO's Environmental Health in Emergencies and Disasters (2002) that show the needs and resources assessment.

Need and Standards:

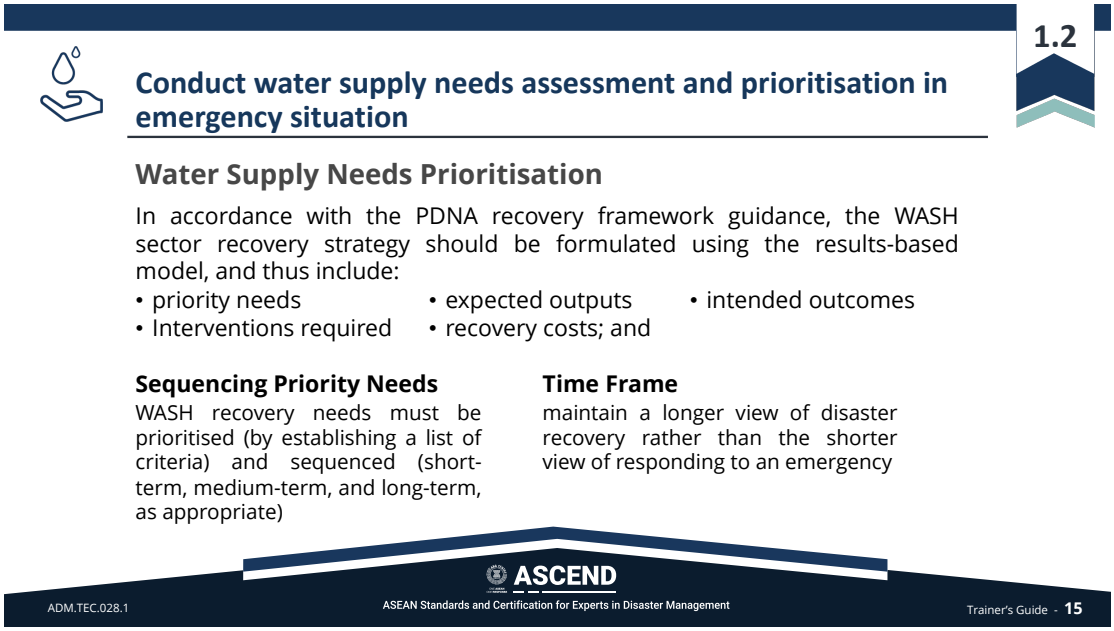
In most cases, water requirements are much higher, as shown below:

- for the general population: 15–20 litres per day per person
- for operating water-borne sewerage systems: 20–40 litres per day per person
- in mass feeding centres: 20–30 litres per day per person
- in field hospitals and first-aid stations: 40–60 litres per day per person
- in mosques: 5 litres per visitor
- for livestock accompanying displaced persons: 30 litres per day per cow or camel, and 15 litres per day per goat or another small animal.

The Sphere Project has identified widely accepted standards for emergency water supply. In addition to the 3–5 litres per person per day required for drinking and cooking, an adequate supply of water is required to control the spread of water-washed diseases, even if the water supply fails to meet WHO drinking-water quality guidelines or national standards.

There are several questions that can be used to Assess Needs adopted from The Sphere Handbook, 2018 and UNHCR, 2015

Image 15: Slide 15



Slide No. 15

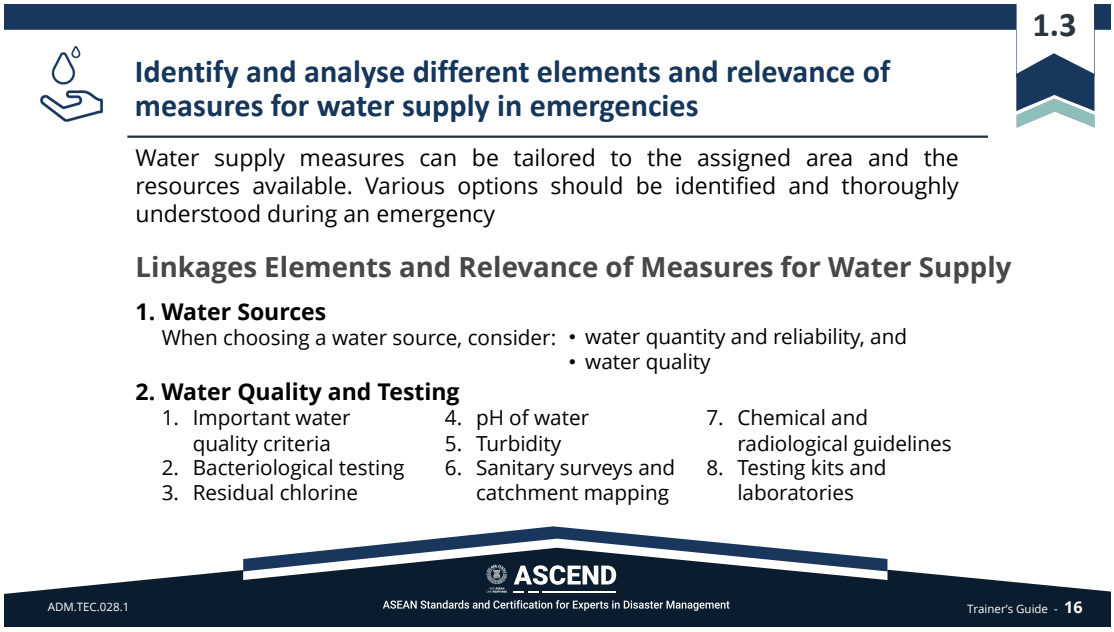
Trainer Notes

It is critical to confirm that an effective consultation process took place and that there was actual collaboration and partnership with key institutional players during the stakeholder engagement process in identifying the components that contribute to the development of the WASH Recovery Plan.

Sequencing Priority Needs
WASH recovery needs must be prioritised and sequenced (short-term, medium-term, and long-term, as appropriate). Criteria for prioritisation may be developed by the sector WASH Team (or previously by the PDNA Team). Priority should be given to critical needs expressed by the affected population and government, as well as vulnerable population groups, geographical areas most affected by conflict, and conflict prevention or peace-building objectives, where applicable.

Time Frame: Short-, Medium-, and Long-Term Recovery
Initial goals are simple restoration of services for survival and health, which are typically addressed by humanitarian actions at the PDNA stage. Long-term goals will include improved health-care services, nutritional security, and improved livelihoods, all of which will feed into a recovery strategy.

Image 16: Slide 16



Slide No. **16**

Trainer Notes

Examples of water sources:

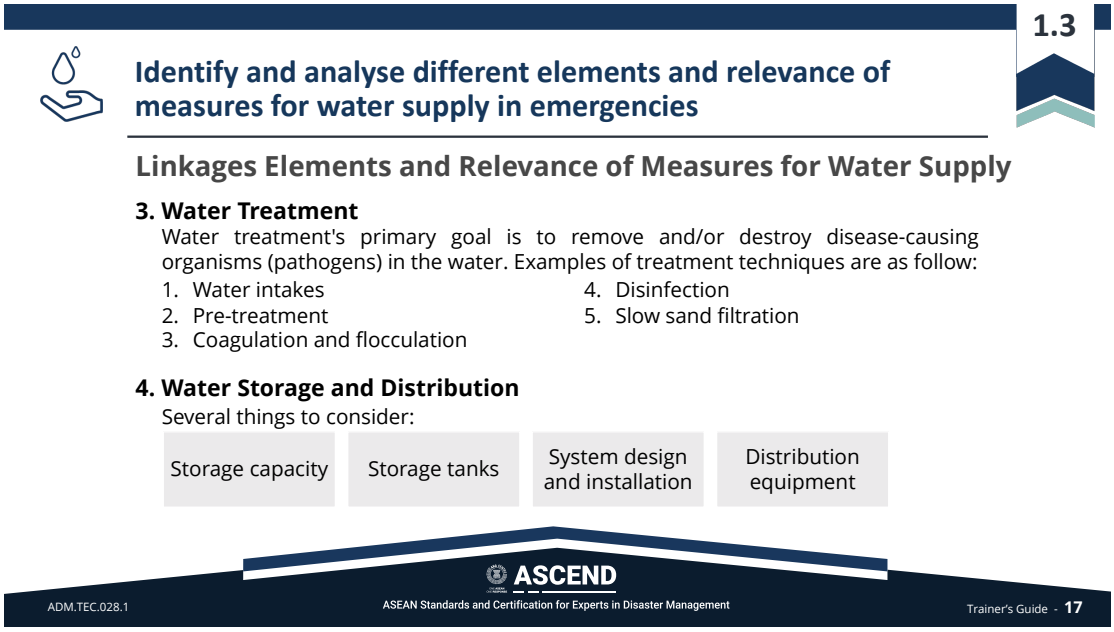
- Surface waters: Surface water is immediately available for use. However, surface water is of questionable and variable quality — it should always be assumed to be contaminated — and the quantity available can also vary greatly.
- Ground water: Groundwater cannot be directly seen or measured. It usually takes too long to assess, reach, and develop for it to be useful in the early stages of most emergencies. On the other hand, it is usually of very high biological quality and requires no treatment other than chlorination.

Water Quality and Testing

1. **Important water quality criteria:** In most emergencies, the transmission of faecal pathogens is the greatest water-borne risk to health due to inadequate sanitation, hygiene, and water source protection. Whatever the source and type of contamination, determining acceptable water quality in an emergency requires balancing short- and long-term health risks and benefits.
2. **Bacteriological testing:** The basic idea behind bacteriological testing is to find a "faecal indicator" organism that is always excreted by warm-blooded animals, both healthy and unhealthy, and use the degree of its presence to determine the level of faecal contamination.
3. **Residual chlorine:** Chlorine content should be tested in the field using a colour comparator in the 0.2–1mg/l range. The sense of taste does not provide a reliable indication of chlorine concentration.

4. **pH:** The pH of the water must be known because more alkaline water necessitates a longer contact time for adequate disinfection (0.4–0.5mg/l at pH 6–8, rising to 0.6mg/litre at pH 8–9, and may be ineffective above pH 9).
5. **Turbidity:** also known as cloudiness, is measured to determine the type and level of treatment required. Turbidity has a negative impact on disinfection efficiency.
6. **Sanitary surveys and catchment mapping:** A sanitary survey can be used to assess the likelihood of faecal contamination of water sources. This is frequently more valuable than bacteriological testing alone, because a sanitary survey shows what needs to be done to protect the water source, and because faecal contamination varies.
7. **Chemical and radiological guidelines:** Water from sources thought to pose a significant risk of chemical or radiological contamination should be avoided, even if only temporarily.
8. **Testing kits and laboratories:** Water pH (acidity/alkalinity), free residual chlorine, faecal coliform bacteria count, turbidity, and filterability can all be determined using portable testing kits.

Image 17: Slide 17



Slide No. 17

Trainer Notes

Examples of treatment techniques:

1. **Water intakes:** The intake or point at which water is taken from a lake or river can be designed, located, and built to ensure that the best quality water is abstracted for treatment.
2. **Pre-treatment:** Before proceeding to the subsequent treatment processes described below, the raw water may be passed through a pre-treatment or roughing filter to remove some of the suspended solids. This makes the subsequent treatments faster, more effective, and less expensive.
3. **Coagulation and flocculation:** The goal is to reduce turbidity to less than 5 NTU so that chlorination can take place.
4. **Disinfection:** There are a variety of disinfection methods available, including boiling, ultraviolet light treatment, and a variety of chemical methods. Chlorination is the most commonly used method for emergency work because it has several advantages:
5. **Slow sand filtration:** To remove nearly all pathogens, slow sand filtration relies on the biological activity produced at the surface of a sand layer underwater. Slow sand filters can work in a variety of temperatures. They are very simple to operate and maintain once they are set up. They do not require any chemical inputs.

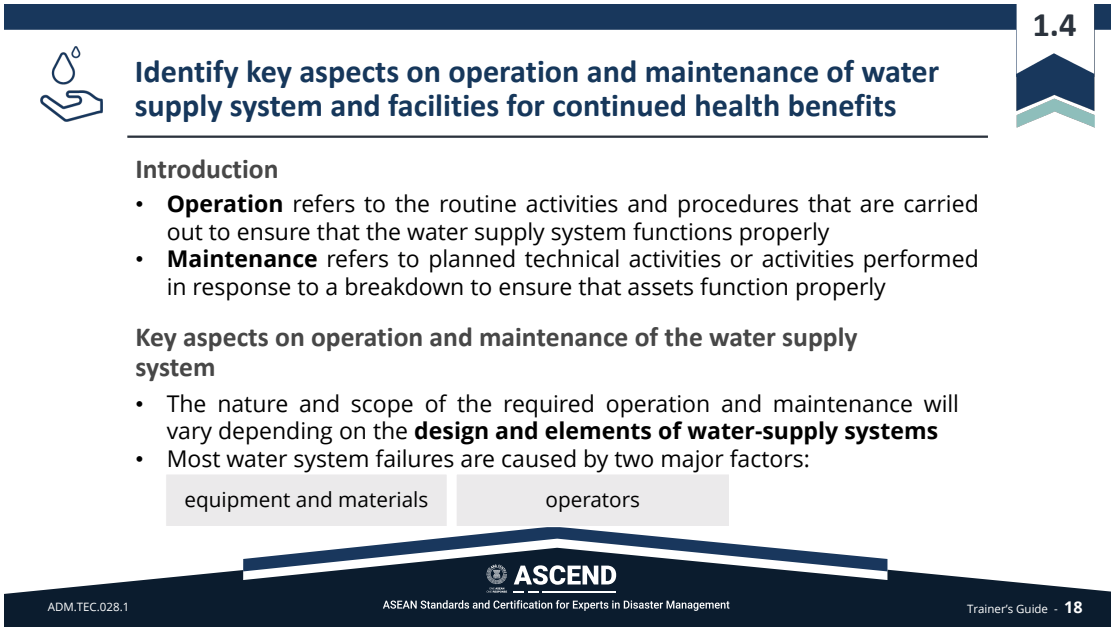
Water Storage and Distribution

1. **Storage capacity:** Water storage is required for the treatment processes, controlling water distribution, providing a stock of water in the camps, and routine maintenance such as cleaning tanks. . Allow enough space when installing storage and treatment tanks to

allow for future tank additions if necessary. The storage capacity should be increased if the supply is unreliable.

2. **Storage tanks:** There are numerous types of storage tanks available, such as: Flexible bladder or pillow tanks; onion tanks; Large tanks; On-site tanks; Earth dams; and Temporary tanks
3. **System design and installation:** After the water has been treated, it must be placed within easy reach of users, or else they will not be able to collect enough of it. A water source should be located within 500 meters of each shelter. The location of water points will be determined primarily by topographical and engineering constraints but should also consider the advice of users.
4. **Distribution equipment:** It is critical that emergency distribution equipment is quick and simple to use and fitted with standard water fittings. It should also be robust and compatible with equipment from other agencies

Image 18: Slide 18



Slide No. **18**

Trainer Notes

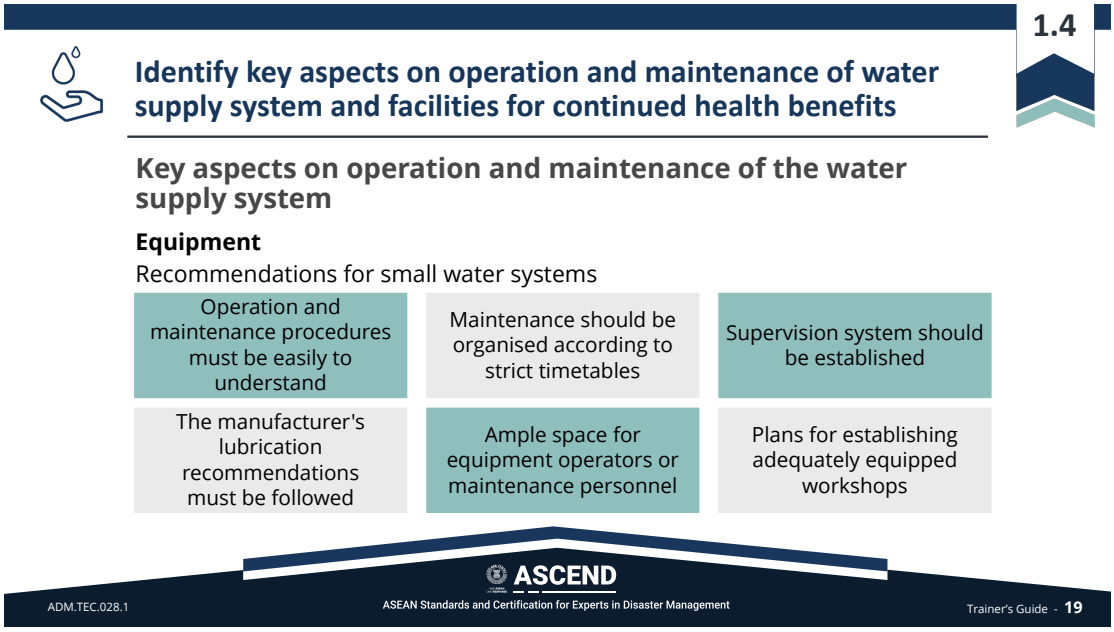
Depending on the circumstances, field work may include:

- well, spring, or drainage basin inspection and maintenance
- dam and reservoir maintenance
- pump and engine operation and maintenance
- treatment operation
- distribution system maintenance
- service connections to system
- meter repairs and maintenance
- operation in emergencies
- detection and elimination of cross-connections.

Most water system failures are caused by two major factors:

- equipment and materials used in conditions for which they were not designed; and
- operators who, due to either ignorance or disinterest, fail to recognise the signs that precede or portend breakdowns and failures.

Image 19: Slide 19



Slide No. **19**

Trainer Notes

The following recommendations are made for small water systems:

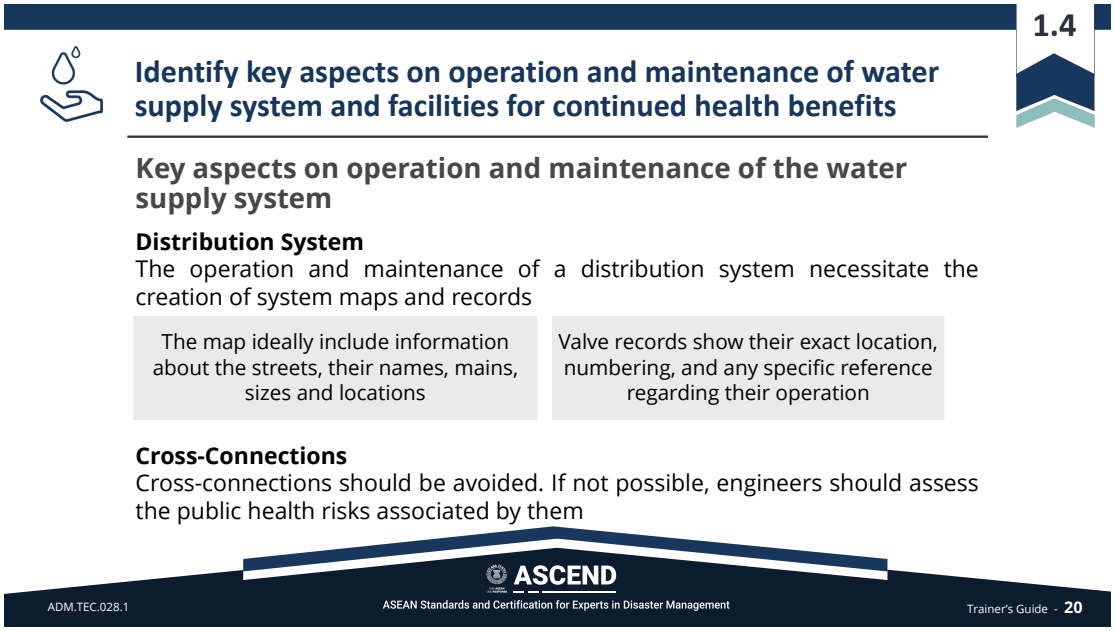
- Recommendations for operation and maintenance procedures should be strictly followed. They should be written in a way that the operators can easily understand. This is especially important when it comes to pumping equipment.
- Maintenance should be organised according to strict timetables. This includes tasks like greasing, oiling, inspections, adjustments, and minor repairs.
- A supervision system should be established to ensure that procedures and schedules are followed.
- The manufacturer's lubrication recommendations for a specific piece of equipment must be followed.
- Ample space must be made available for equipment operators or maintenance personnel to work and store tools, spare parts, oil, grease, and other supplies.
- It is necessary to make plans for establishing adequately equipped workshops.

The following major field equipment will be useful depending on the scope of the water system:

- Dump truck(s) for transporting pipes no larger than 25 cm (10 in.)
- A pavement breaker, and an air compressor as well as air hammers
- Ditch pumps (at least two of them) with 3.6-m (12-ft) hoses to keep trenches dry while working
- Electric generators with two floodlights and extension cords for night-time emergency work

- A small crane capable of turning 180 degrees and handling up to 2.5 metric tons (3 tons), with pneumatic tires and a ball-bearing swivel safety hook. A crane is not required for handling pipes with diameters less than 15 cm (6 in.). But it is useful for handling, turning, and lowering pipes with larger diameters.

Image 20: Slide 20



Slide No.	**20**

Trainer Notes

System maps:
The map will ideally include information about the streets, their names, mains, sizes and locations. It should also identify the valves and hydrants, reservoirs and elevated tanks, and supply sources. The same map can be divided into sections and bound for ease of handling in the field.
Valve records:
These systems can take the form of separate large-scale drawings, each for a single valve, then stored in a loose-leaf binder for easy reference. These records are useful when valve boxes and cones have been hidden or "lost" because of street repairs or construction.

Cross-Connections
There are numerous opportunities for direct cross-connections between public water supplies and private cisterns and wells in small community water systems. Cross-connections should be avoided. Special requests from industries or neighbouring public water systems, for example, for connections of their water pipes with the town's distribution system, should be carefully reviewed by competent public health or water engineers acting on behalf of or attached to the controlling health administration.

Image 21: Slide 21

Slide No. 21

Trainer Notes

- Provisions should be made to ensure that people who have lost possessions and possibly livelihoods can continue to have access to water, even if they cannot afford to buy it.
- Water distribution networks should be repaired as soon as possible after the emergency, and normal water supplies should be restored. Normal municipal water supplies should be made available as soon as possible. More expensive temporary water supplies should not be used for any longer than is necessary.
- Accurate maps of water supply system facilities should be kept on hand to familiarise local and international staff with water distribution systems and other WASH facilities. This is especially important in a city setting.
- A list of people with relevant specialist skills should be kept on hand to be called on in the event of a disaster. Repairing or reinstalling pumping equipment, for example, is a top priority. This necessitates the use of skilled electro-mechanical engineers.
- After an emergency, wells and boreholes should be rehabilitated and returned to service as soon as possible.
- Temporary facilities should be safe and meet the same standards as permanent facilities.
-

Two examples to demonstrate the importance of adopting safe practices are:

- Heavy bladder tanks used as water reservoirs should be supported on structures capable of bearing the considerable weight of the tanks when filled with water.
- Temporary water distribution pipes should not be placed in or near drainage channels because they will likely be damaged or allow contamination to enter the pipe.

Image 22: Slide 22

Slide No. **22**

Trainer Notes

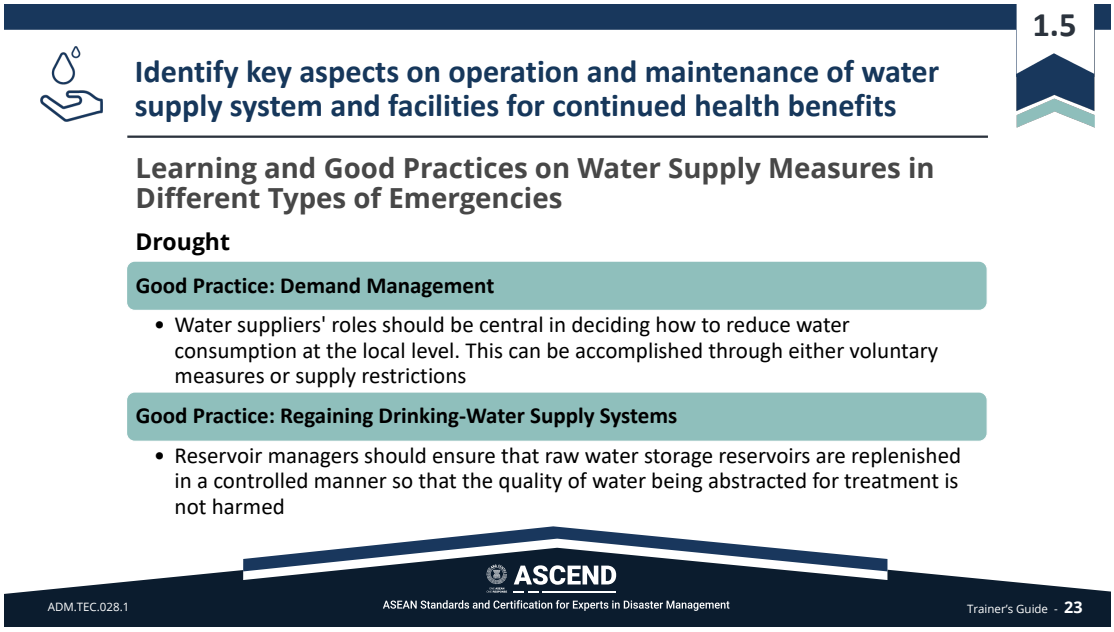
Good Practice: Water Supply Tanks Disinfection

Alternative water supply tanks should be disinfected for 24 hours with a chlorine solution (for example, 14 per cent sodium hypochlorite solution), rinsed (with safe, potable water), and refilled with a safe water supply. After about 30 minutes, a sample of the tank contents should be taken to ensure that it is safe to supply to consumers

Good Practice: Regaining Drinking-Water Supply Systems

When restoring drinking-water supplies following a flood, it is critical that water suppliers collaborate closely with community leaders and local health professionals'/health departments, particularly regarding any precautionary measures that must be taken prior to consumption of supplied water (e.g., boiling it before use). As a general rule, water suppliers should prioritise the use of groundwater/well water where it is well protected (i.e., where it comes from a confined or well-protected aquifer) over water taken from rivers or lakes (surface water). Before restarting, flooded treatment plants and distribution network disinfection necessitate a number of planned actions that must be implemented and tailored for centralised, decentralised, and community-based production utilities

Image 23: Slide 23



Slide No. **23**

Trainer Notes

Good Practice: Demand Management

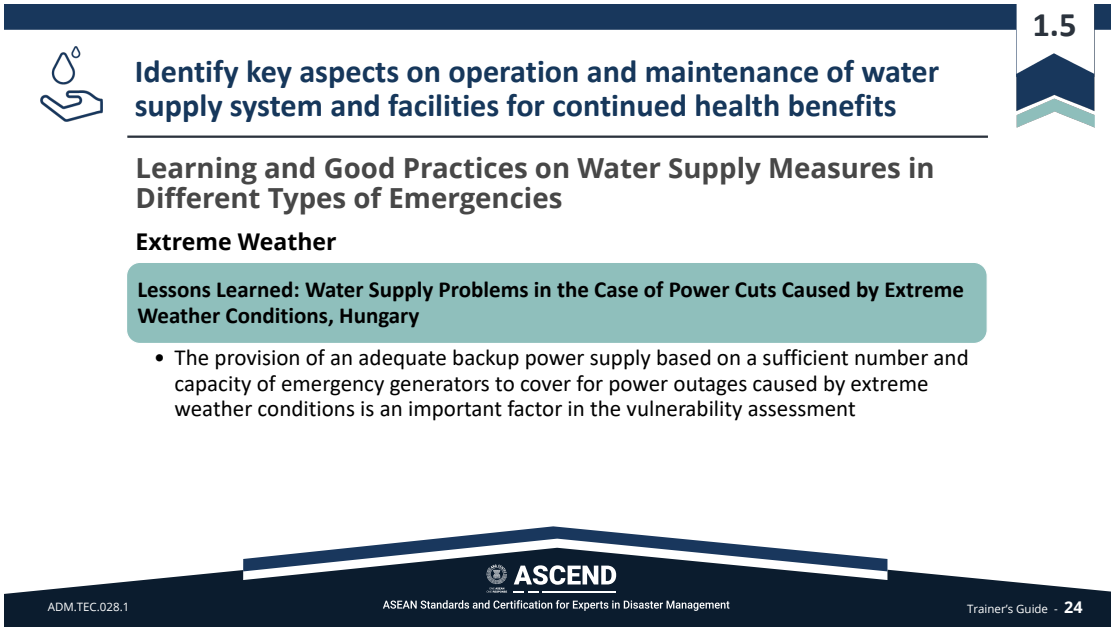
Demand management is one method for addressing the issue of water scarcity. Technological solutions have their own limitations and technical advancements are frequently insufficient on their own. It is also necessary to change people's perspectives and behaviour patterns, as well as municipal policies, for water resources to be used and managed more efficiently.

During times of scarcity, demand may rise as consumers with consistent consumption patterns (e.g., some industrial users) continue to use water, while others (e.g., farmers using irrigation or households) increase their consumption in an attempt to maintain their way of life in non-drought conditions. Given the associated weather conditions, consumers may increase their outdoor activities and associated water uses (for example, for swimming pools or to irrigate crops).

Good Practice: Regaining Drinking-Water Supply Systems

Suppliers should also consider the impact on the aquatic system downstream of the reservoir and the needs of other downstream abstractors. However, the safety and security of drinking-water supplies should always take precedence. Suppliers should also be aware that changes during a drought period may cause some deterioration in raw water quality several months or years later.

Image 24: Slide 24



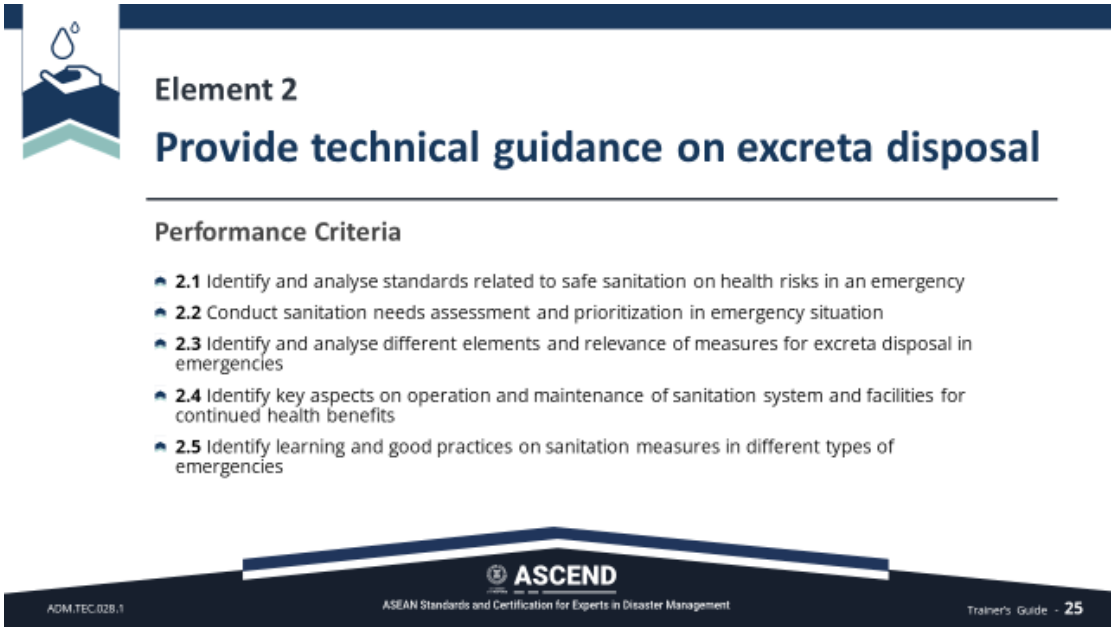
Slide No. 24

Trainer Notes

- Water tankers had to be used in several settlements to ensure adequate water supply, which proved difficult in the snowy conditions. The measure remained effective until negative bacteriology resulted in water samples taken after water pressure stabilisation confirmed the restoration of the water supply.

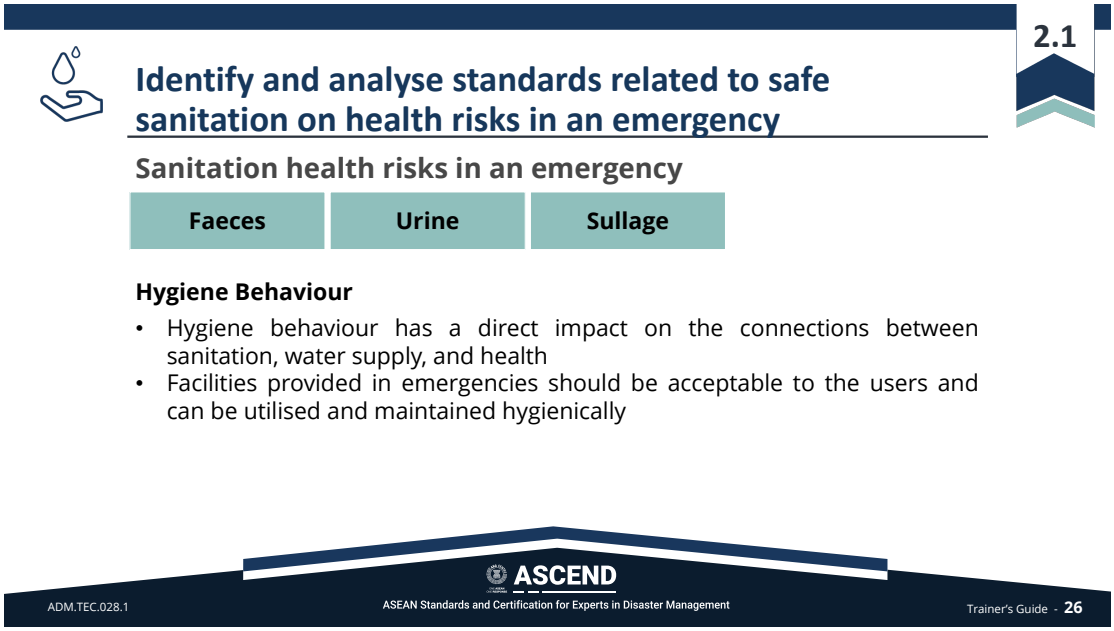
- Both water supply and wastewater treatment are critical for public health, as their absence can pose a significant health risk. An essential factor in the vulnerability assessment is providing an adequate backup power supply based on a sufficient number and capacity of emergency generators to cover for power outages caused by extreme weather conditions

Image 25: Slide 25



Slide No.	**25**
Trainer Notes	Trainer identifies for participants the Performance Criteria for this Element, as listed on the slide.

Image 26: Slide 26



Slide No.	**26**

Trainer Notes

Sanitation health risks in an emergency

Feces: Viruses, bacteria, and parasites' eggs or larvae that come from human feces could cause a range of diseases. This is how diseases like diarrhea, cholera, and typhoid spread and major causes of illness and mortality in disasters and emergencies.

Urine: Unless in areas where the urinary form of schistosomiasis is present, urine is usually harmless.

Sullage: Sullage is the wastewater from kitchens, bathrooms, and laundries. It could contain pathogens, mainly when it fills in poorly drained places and causes pools of organically polluted water.

Image 27: Slide 27

Slide No. 27

Trainer Notes

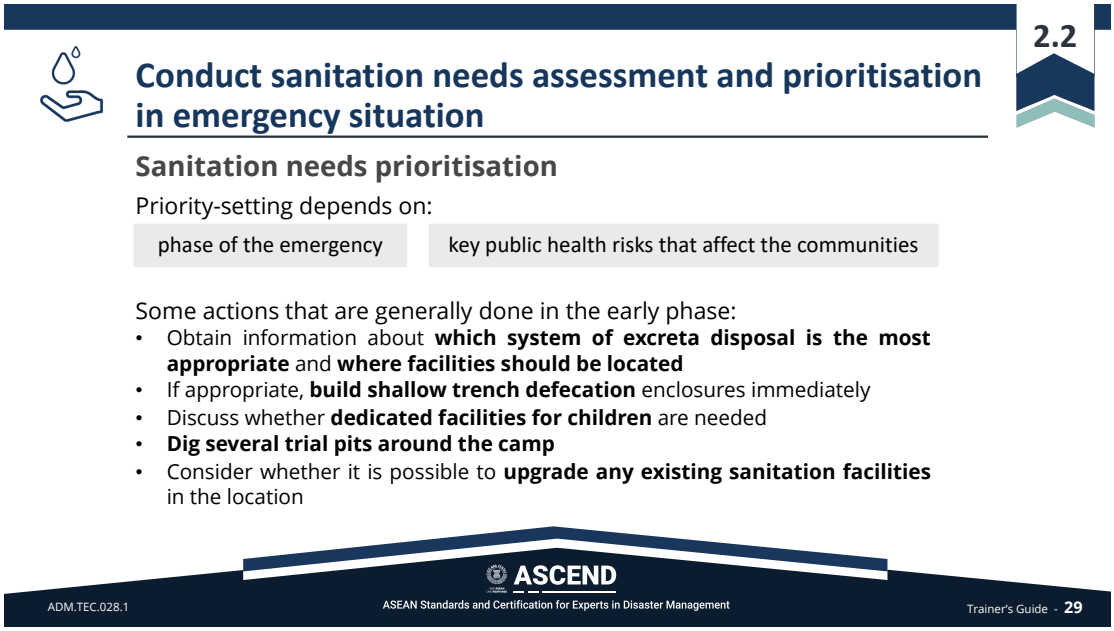
Standards related to safe sanitation in an emergency is addressed in the Sphere standard. Sanitation-related standards for excreta management are divided into three elements. Please look up the **Sphere Standard** for detailed descriptions of the standards.

.

Image 28: *Slide 28*

Slide No.	**28**
Trainer Notes	**Urban situations with existing facilities:** In the suburban areas where onsite sanitation is typical, the assessment should identify the number of households without functioning toilets, the current adjustments by the affected families for excreta disposal (including the use of neighbour's toilets), and requirements for immediate and post-emergency actions **Displacement emergencies** The assessment process should be different in displacement emergencies because the affected people are likely to find themselves in unfamiliar situations. There is a significant loss of social cohesion.

Image 29: *Slide 29*

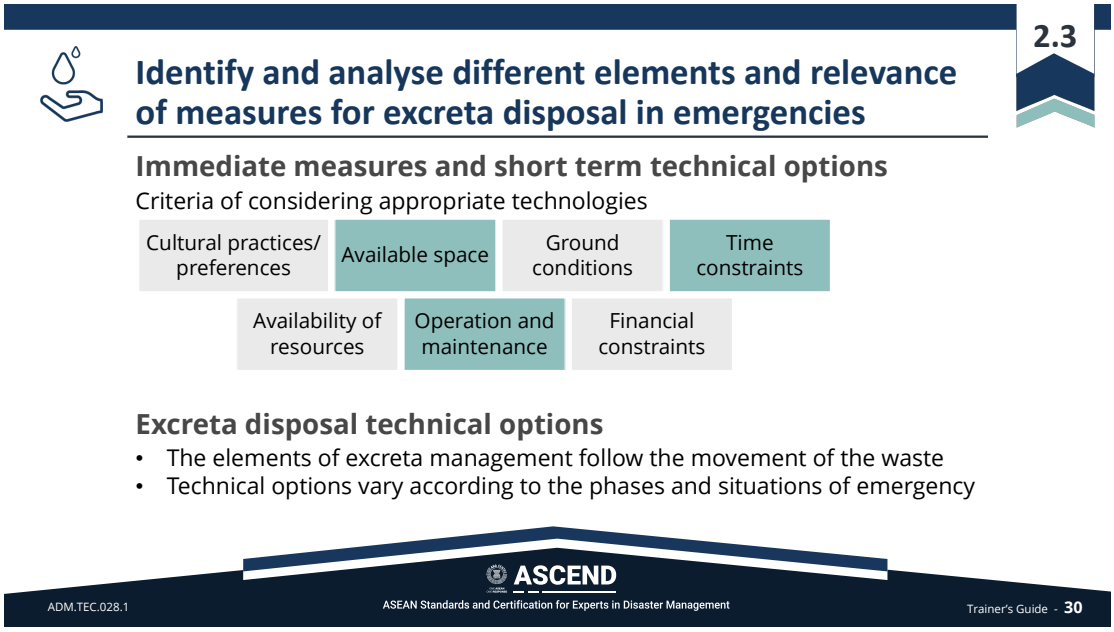


Slide No. 29

Trainer Notes

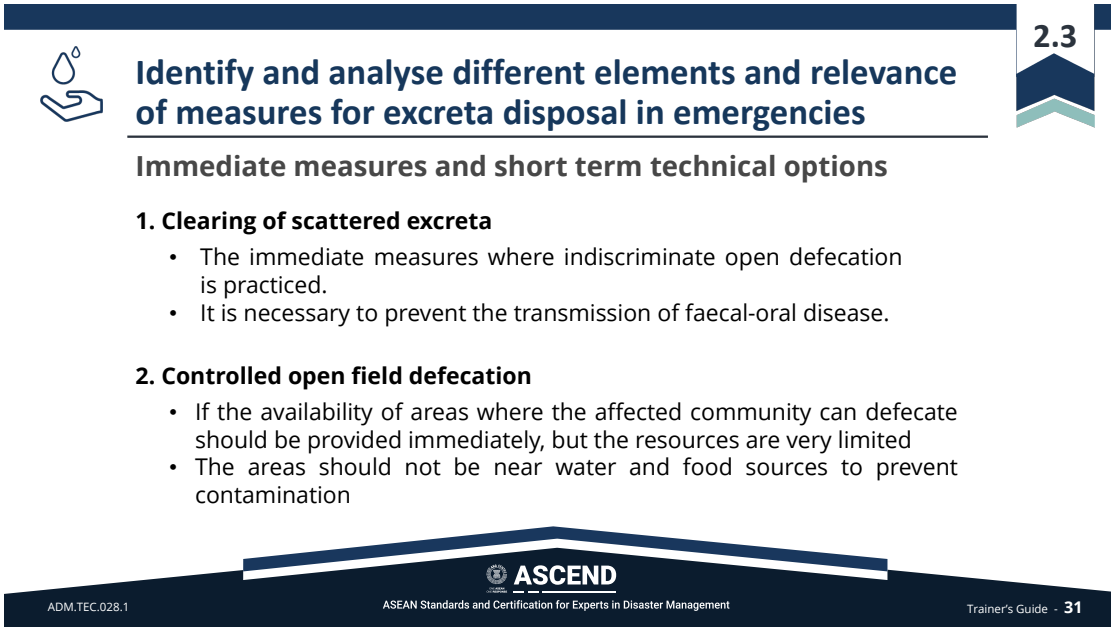
- A tension might occur at the beginning of facilities construction to meet urgent needs in high-risk situations.
- The process of consultation and stakeholder engagement is necessary to assess the sanitation priority needs and preferences. Needs and priorities will be context-specific

Image 30: Slide 30



Slide No.	**30**
Trainer Notes	The considerations for choosing excreta disposal management technology include the current situation, technical, environmental, social and governmental issues. Selecting appropriate interventions must also involve the affected communities and stakeholders

Image 31: Slide 31



Slide No. **31**

Trainer Notes

Clearing of scattered excreta

- The immediate measures where indiscriminate open defecation is practised is to clear scattered faeces and provide designated defecation sites.
- The scattered excreta can be coated with lime and sent to a safe disposal site such as a pit.
- The people who are responsible for doing the job must wear protective wear and use the appropriate tool.

Controlled open field defecation

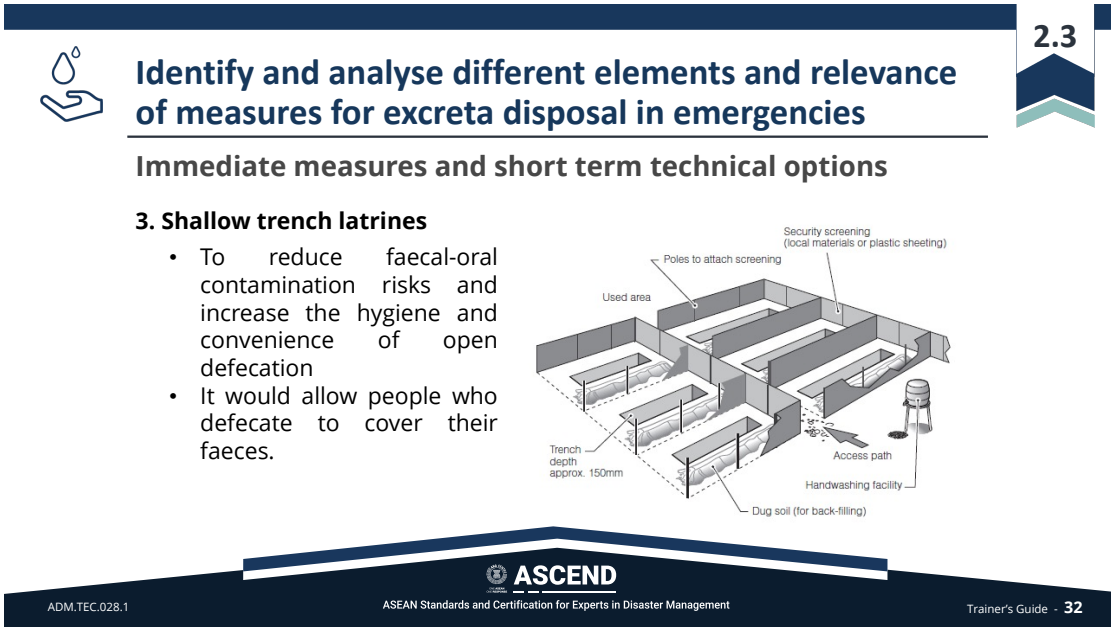
Advantages:

- Rapid to implement
- Minimal resources required
- Minimises indiscriminate open defecation

Constraints:

- Lack of privacy
- Considerable space is required
- Difficult to manage
- Potential for cross-contamination of users
- Better suited to hot dry climates

Image 32: Slide 32



Slide No.	**32**

Trainer Notes

Shallow trench latrines

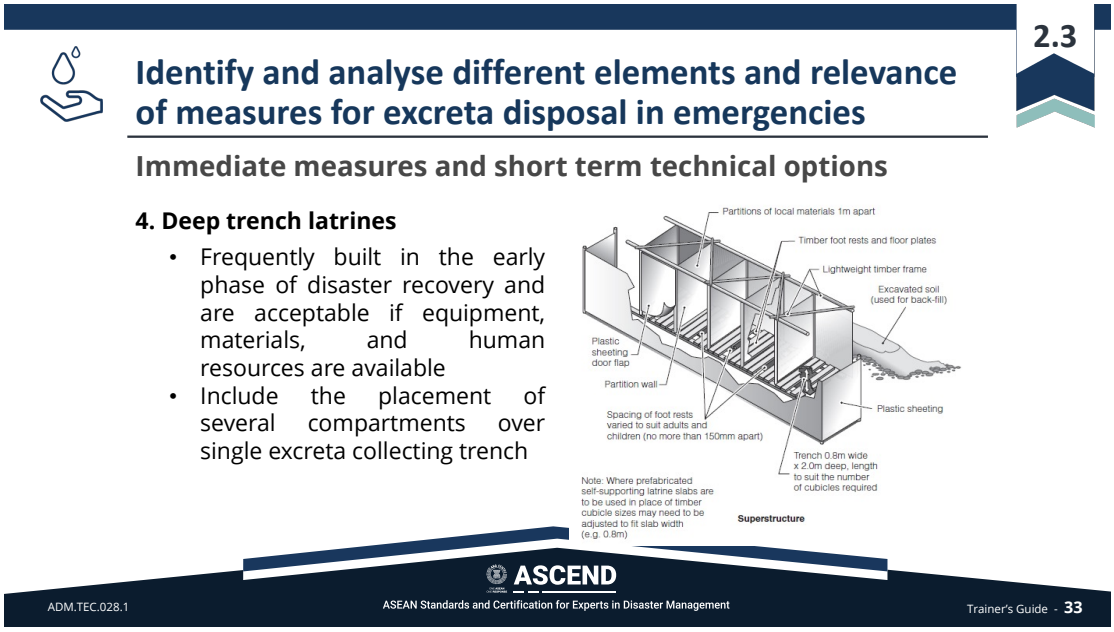
Advantages:

- Rapid to implement (one worker can dig 50 m of trench per day)
- Faeces can be covered easily with soil

Constraints:

- Limited privacy
- Short life-span
- Considerable space required

Image 33: Slide 33



Slide No.	**33**

Trainer Notes

Deep trench latrines

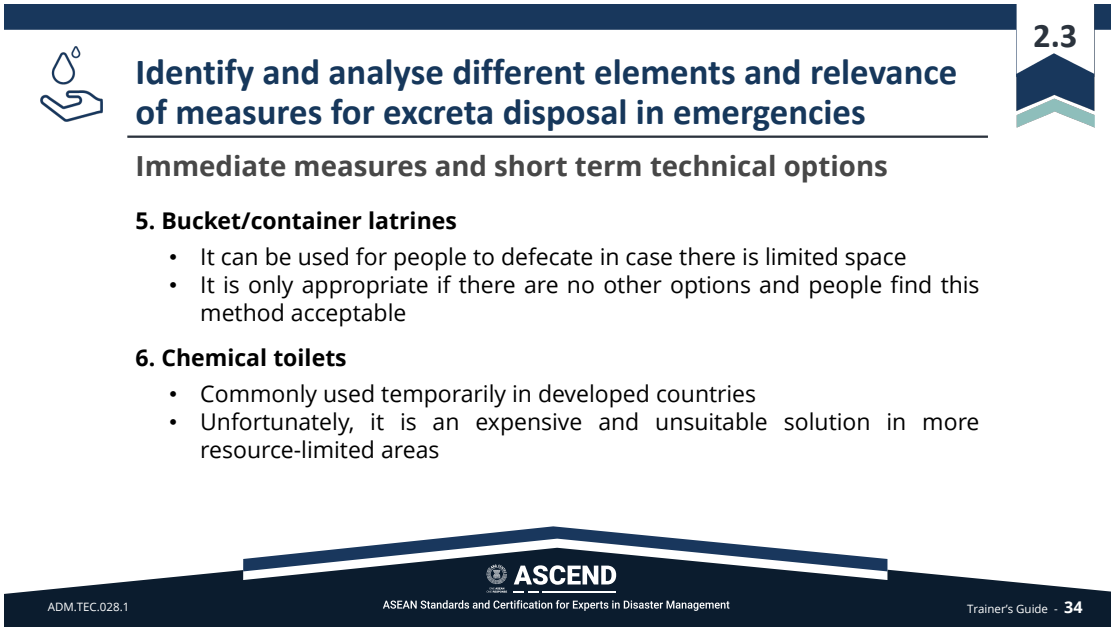
Advantages:

- Cheap
- Quick to construct
- No water is needed for operation
- Easily understood

Constraints:

- Unsuitable where water table is high, the soil is too unstable to dig or ground is very rocky
- Often odour problems
- Cleaning and maintenance of communal trench latrines are often poorly carried out by users

Image 34: Slide 34



Slide No. **34**

Trainer Notes

Bucket/container latrines

Advantages:

- Defecation containers can be procured easily and transported
- Once containers are provided only the final disposal system need to be constructed
- Can be used in flooded areas or where the water table is very high

Constraints:

- Many people find the method unacceptable
- Large quantities of containers and disinfectants are required
- Extensive education regarding final disposal is required
- The disposal site must be fairly close to homes to minimise transportation needs
- Containers may be used for alternative purposes

Chemical toilets

These are normally single prefabricated plastic units incorporating a sit-down toilet, lockable door and effluent tank containing chemicals to aid digestion and reduce odour

Advantages:

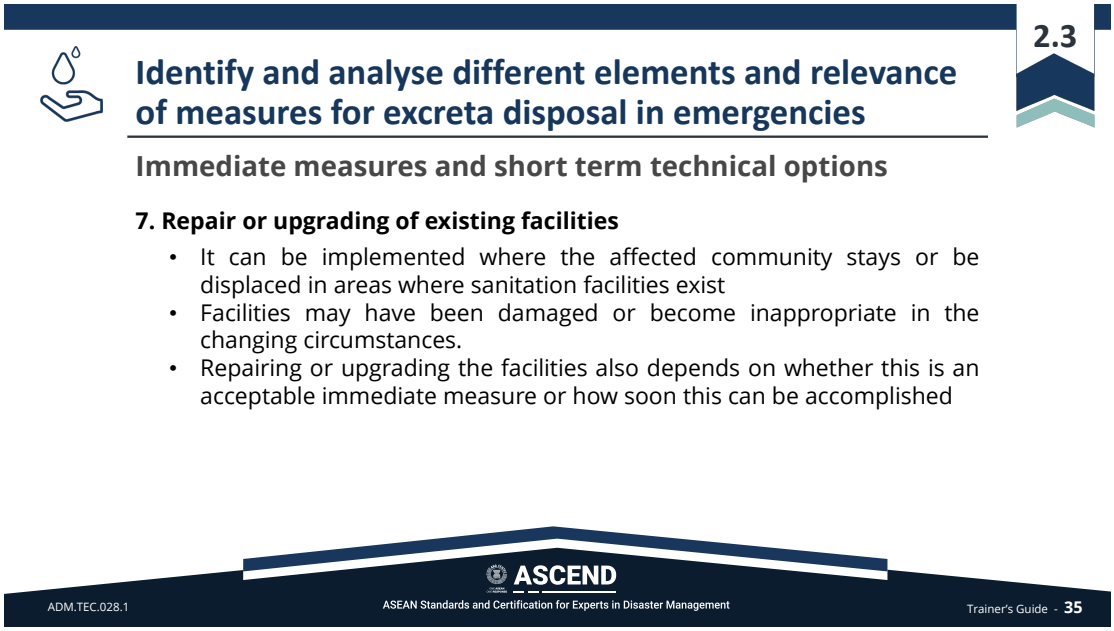
- Portable
- Hygienic
- Minimised odour
- Can be mobilised rapidly

Constraints:

- High cost
- Difficult to transport

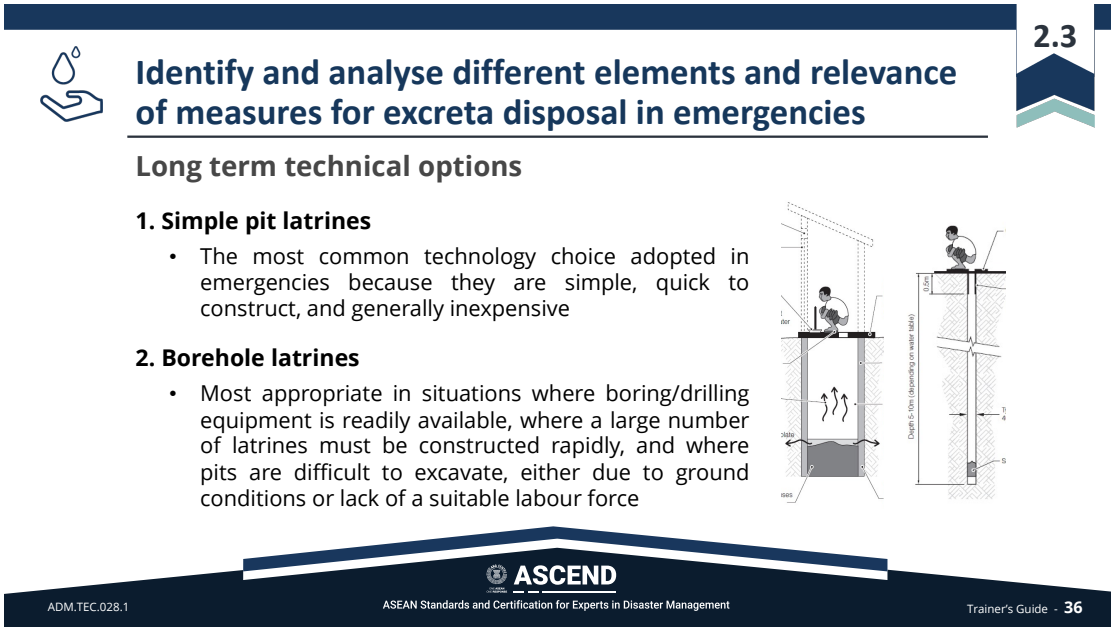
- Unsustainable
- Regular servicing and emptying required

Image 35: Slide 35



Slide No.	**35**
Trainer Notes	**Repair or upgrading of existing facilities** Advantages: • The basic infrastructure is in place to build on • Indigenous technology and materials are used Constraints: • There are limited expansion possibilities • Repair and upgrading may take time

Image 36: Slide 36



Slide No. 36

Trainer Notes

Simple pit latrines

Advantages:

- Cheap
- Quick to construct
- No water is needed for operation
- Easily understood

Constraints:

- Un-suitable where water table is high, the soil is too unstable to dig or ground is very rocky
- Often odour problems

Borehole latrines

Advantages:

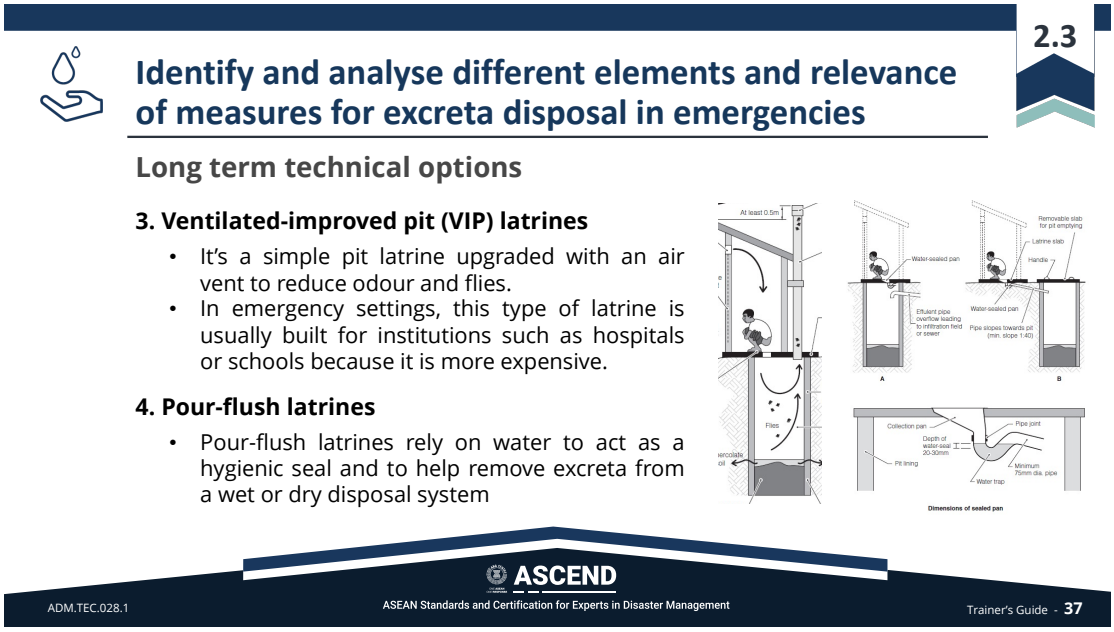
- The borehole can be excavated quickly if the equipment is available
- Suitable in hard ground conditions (where there are no large stones or rocks)
- Appropriate where only a small workforce is available

Constraints:

- Drilling equipment is required
- There is a greater risk of groundwater pollution due to greater depth than pit latrines
- Lifespan is short
- Sides are liable to be fouled
- Causing odour and attracting flies
- There is a high likelihood of blockages

This option should only be considered in extreme conditions when pit excavation is not possible

Image 37: Slide 37



Slide No. 37

Trainer Notes

Ventilated-improved pit (VIP) latrines

Advantages:

- Reduced odour
- Reduces flies
- Good quality
- Long-term solution

Constraints:

- Difficult and expensive to construct properly
- Design and operation are often not fully understood
- Construction may take time
- Dark interior may deter young children from using it
- Does not deter mosquitoes
- Low replicability as PVC pipes are expensive
- Increased odour outside

Pour-flush latrines

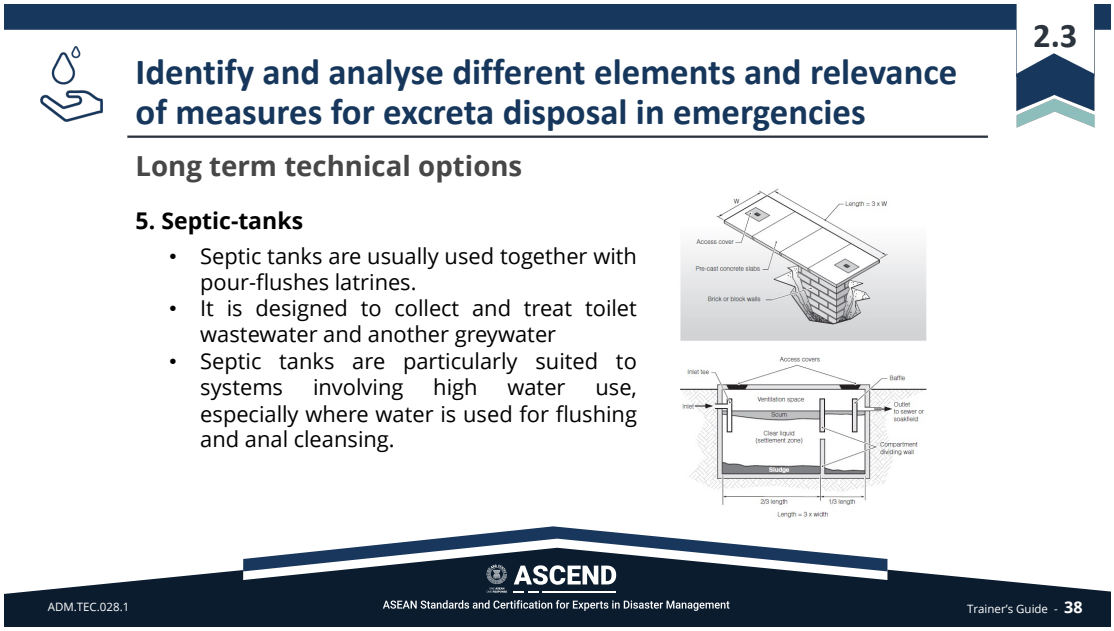
Advantages:

- Lack of odour
- Ideal where water is used for anal-cleansing
- Easy to clean
- The off-set design does not require a self-supporting latrine slab

Constraints:

- Increased quantity of water required
- Solid anal-cleansing materials may cause blockages
- More expensive than simple pit latrines

Image 38: Slide 38



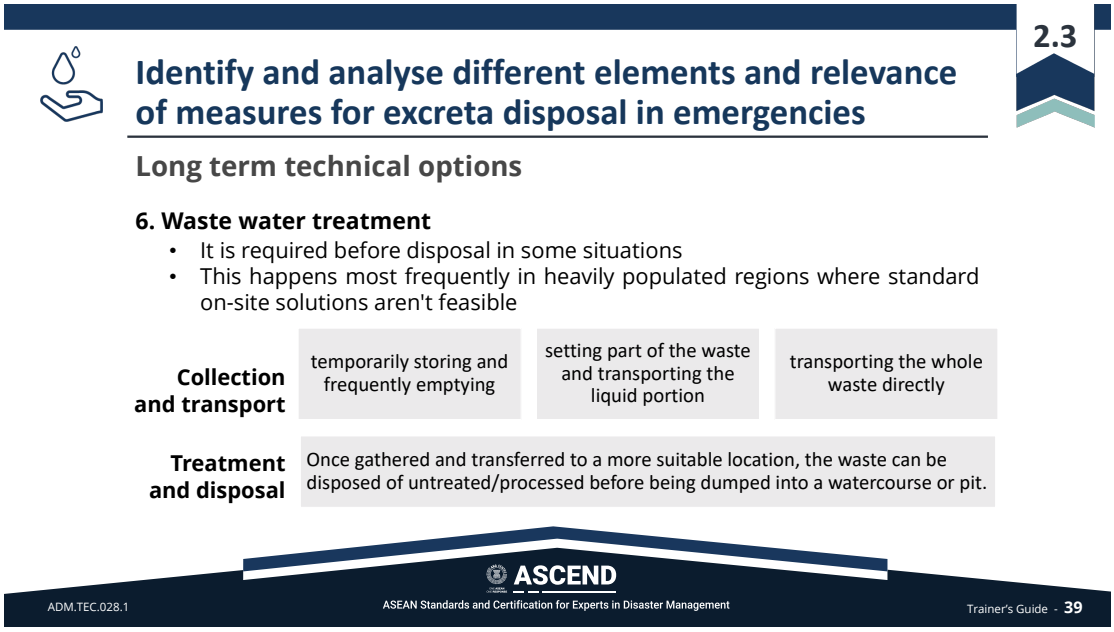
Slide No.	**38**

Trainer Notes

Septic-tanks

- It is appropriate to use in situations where the amount of wastewater produced is too high for pit latrines to handle and water-borne sewerage is uneconomic or expensive.
- They are difficult to manage for large populations and are best suited to single households or institutions such as hospitals or schools.
- All septic-tanks require a system for removing the sludge and disposing of it hygienically

Image 39: Slide 39



Slide No. 39

Trainer Notes

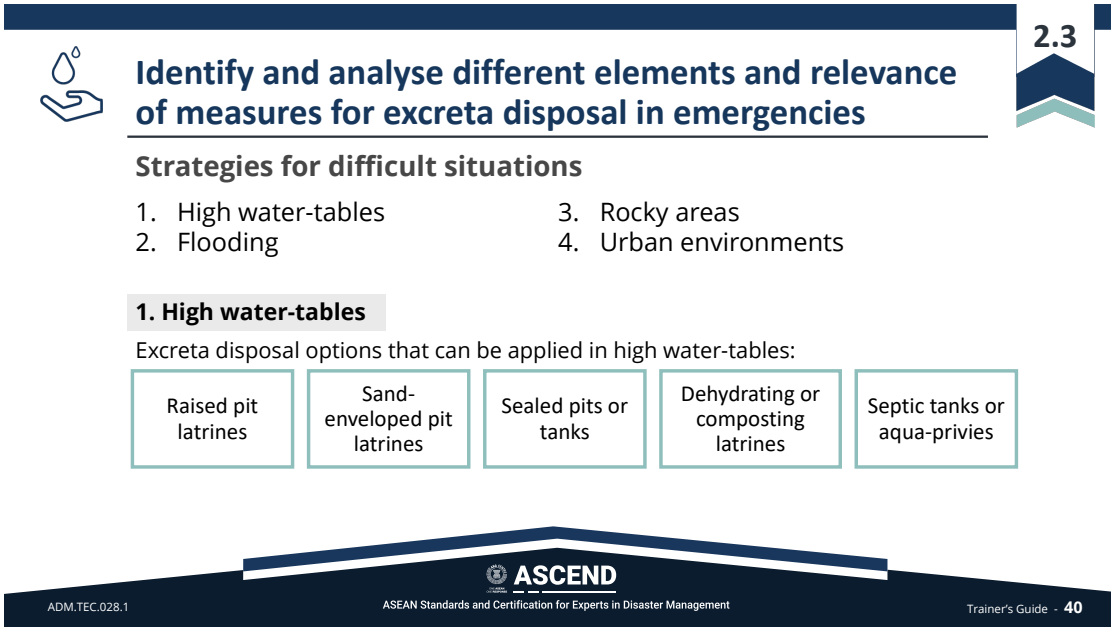
Waste water treatment

- Wastewater treatment systems collect and transport waste from toilets, allowing for safe excreta disposal
- Collection and transport can be done essentially in one of three ways:

1. By temporarily storing the excreta in appropriate tanks and frequently emptying these by vacuum trucks
2. By setting part of the waste in a septic-tank and transporting the liquid portion of the waste to the treatment or disposal site by means of a small-bore sewerage system by gravity or pumping
3. By transporting the whole waste directly to the treatment or disposal site by means of a larger bore system and more water

All wastewater treatment systems produce sludge as part of the treatment process either continuously or intermittently. This sludge requires careful handling and can be disposed of in a pit, an incinerator or on agricultural land

Image 40: Slide 40



Slide No. **40**

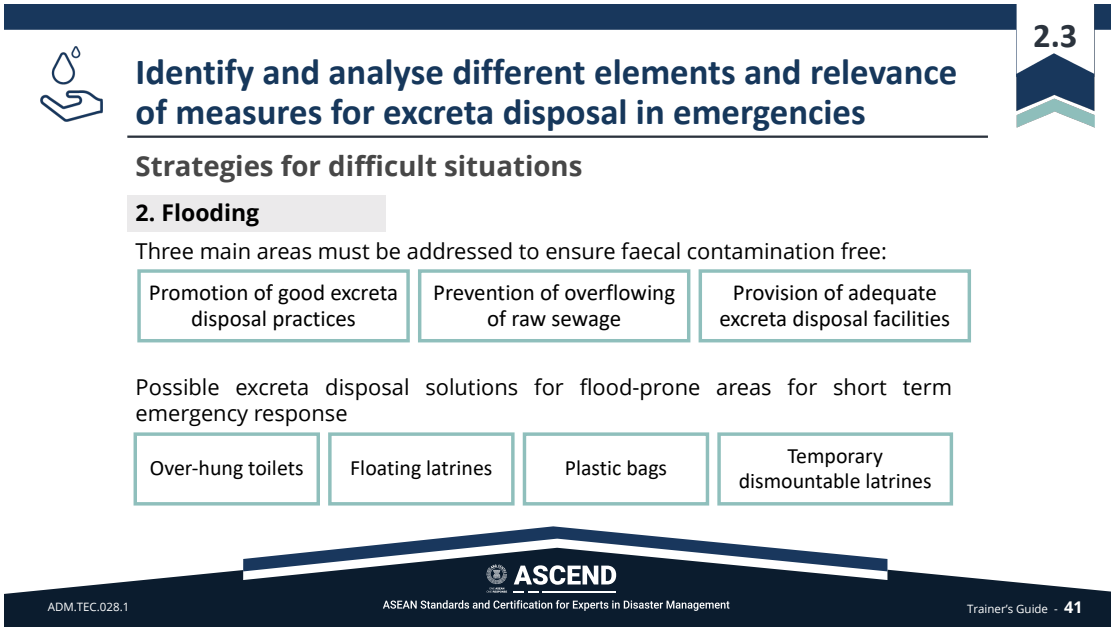
Trainer Notes

1. High water-tables

Where the water table is high and groundwater is used as a water source, there are a number of excreta disposal options that can be applied, including:

- Raised pit latrines – widespread solution, relatively simple to construct, require emptying, may be single or twin-pit
- Sand-enveloped pit latrines – relatively time-consuming to construct, require suitable sand, can be combined with a raised pit
- Sealed pits or tanks – must be water-tight, can be above or below ground, relatively expensive
- Dehydrating or composting latrines – can be raised or shallow twin-pit, work best where people are already accustomed to their use or where there is agricultural activity
- Septic-tanks or aqua-privies – can be above or below ground, relatively expensive, require water and space.

Image 41: Slide 41



Slide No. **41**

Trainer Notes

2. Flooding

Proper excreta disposal can have a significant impact on the health of the affected communities in these conditions. Three main areas must be addressed to ensure an environment free from faecal contamination:

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

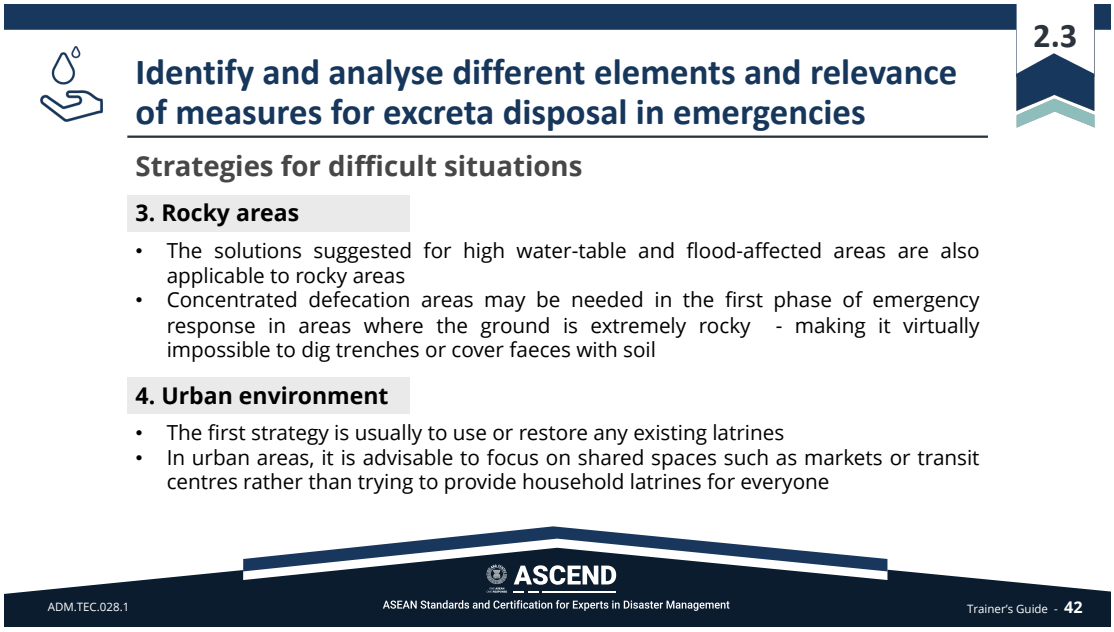
Possible excreta disposal solutions for flood-prone areas for short term emergency response are summarised below.

1. Over-hung toilets – In floods where there is still flowing water or a river nearby, one of the quickest ways to eliminate the public health risk is to excrete directly in the river. Before this option is selected it is essential that a sanitary survey of downstream water use is conducted to ensure that it does not present major health risks for people downstream.
2. Floating latrines – Similar in principle to over-hung latrines, floating latrines are designed so that faeces fall directly into a river or into floodwaters. The base of the latrine superstructure is commonly made from timber/bamboo so that it floats like a raft.
3. Plastic bags – In the immediate aftermath of some flood events, such as those in Bangladesh in 1998, people can defecate in plastic bags

and then float them away. This is an emergency short-term measure only and if the bags are not collected and disposed of properly, or a river does not take them out to sea, this would constitute a serious health risk.

4. Temporary dismountable latrines – Where flooding has damaged existing sanitation facilities, temporary latrines that can be disassembled after use and reused elsewhere can be constructed locally. These are designed to be assembled above a pit latrine with urine separation to a soakaway.

Image 42: Slide 42



Slide No. 42

Trainer Notes

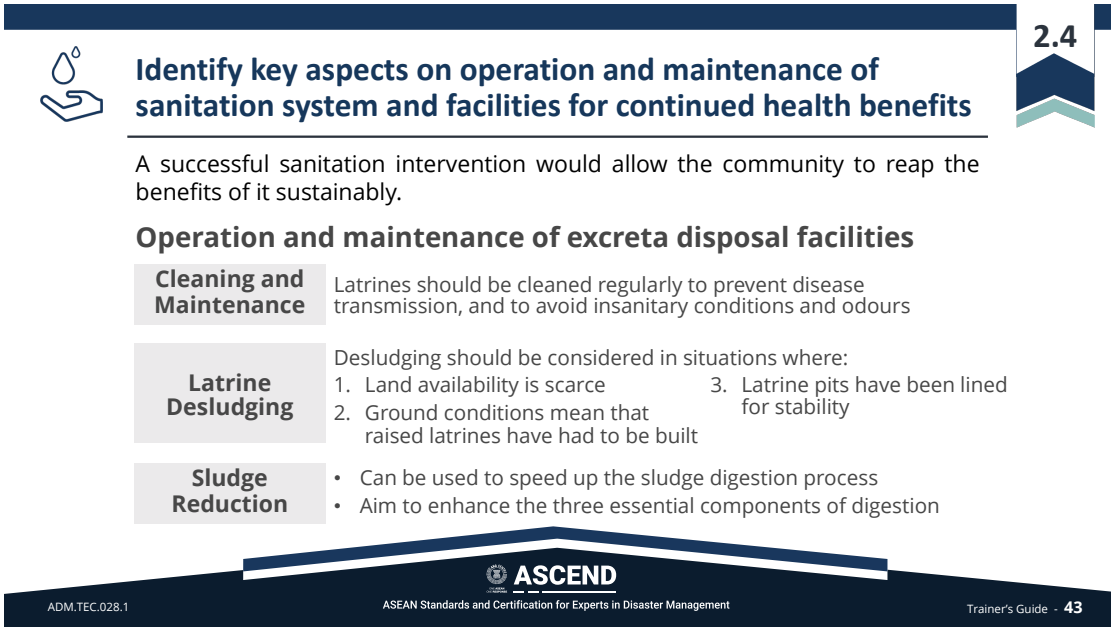
Rocky areas

A defecation site is set up in this case and each individual who goes to use it is given a shovel and a cup of burnt lime to take with them. They then sprinkle half of the lime on the sand before defecating on top. The rest of the lime is used to cover the faeces, which are then scooped up on the shovel and taken out to be put in a covered container at the side of the fenced-off area. Staff empty the containers into an off-site pit or load them onto a truck for disposal elsewhere

Urban environments

- If the sewerage system was severely damaged, measures should be taken to locate septic tanks and construct temporary latrines that feed into them.
- Portable toilets may be available for rent in some circumstances. But they require desludging daily in populated areas and should only be considered if regular desludging can be maintained.
- Discussions with community groups could help identify risks and potential alternatives, such as several households sharing one toilet or public latrines in strategic places.

Image 43: Slide 43



Slide No. **43**

Trainer Notes

Cleaning and Maintenance

Sometimes the single most difficult problem in promoting communal latrines use. Latrines should be cleaned regularly to prevent disease transmission due to contact with faeces and flies, and to avoid insanitary conditions and odours that may discourage people from using them.

Latrine Desludging

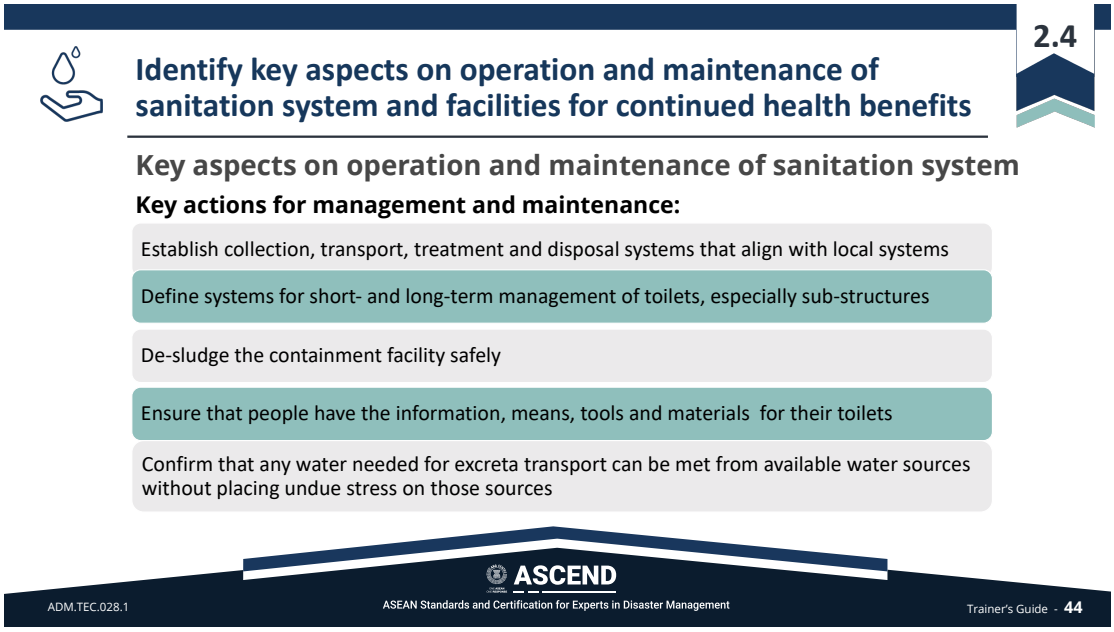
Pits should be correctly sized or replaced whenever possible to avoid the need for regular emptying or desludging. Desludging should be considered in situations where:

1. Land availability is scarce (i.e., it is not possible to dig another pit nearby when one is full)
2. Ground conditions mean that raised latrines have had to be built (e.g., high water-table, impermeable ground or hard rock areas)
3. Latrine pits have been lined for stability or to prevent groundwater pollution (if the pit is not lined there is a danger of pit collapse when the solids are removed)

Sludge Reduction

Sludge reduction agents can be used to speed up the sludge digestion process. These bio-additives aim to enhance the three essential components of digestion: nutrients, enzymes, and bacteria. Some research has examined the efficacy of various sludge-reduction additives that are useful in speeding the volume reduction and reducing fly infestation

Image 44: Slide 44



Slide No. **44**

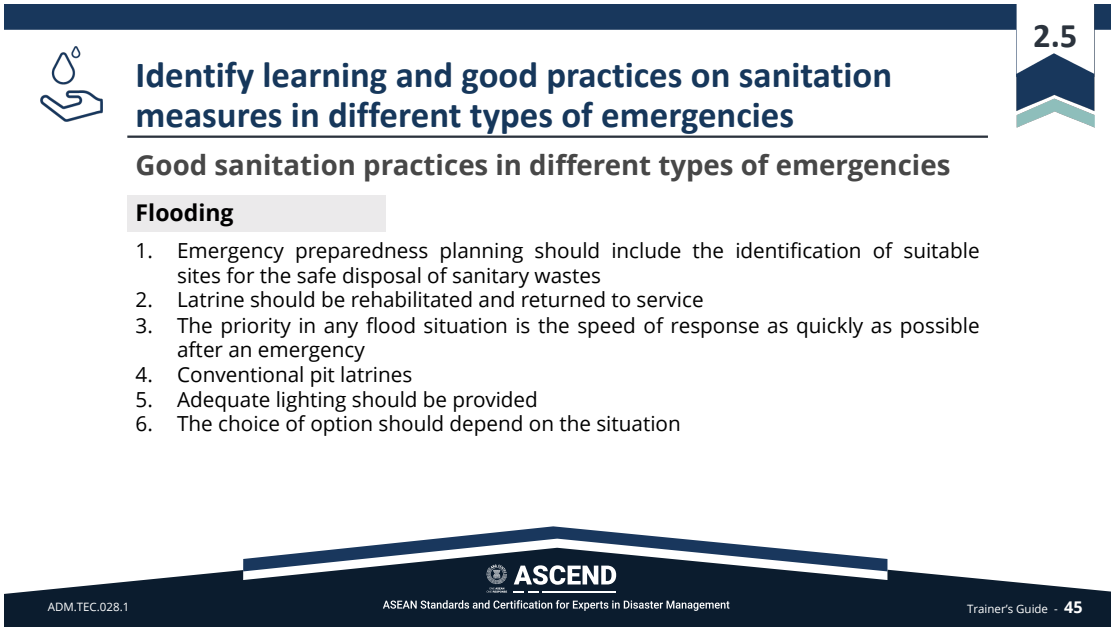
Trainer Notes

Sphere has developed the standard for management and maintenance of sanitation systems, especially in excreta disposal management:

1. Establish collection, transport, treatment and disposal systems that align with local systems by working with local authorities responsible for excreta management.
2. Define systems for short- and long-term management of toilets, especially sub-structures (pits, vaults, septic tanks, soakage pits).
3. De-sludge the containment facility safely, considering both those doing the collection and those around them.
4. Ensure that people have the information, means, tools and materials to construct, clean, repair, and maintain their toilets.
5. Confirm that any water needed for excreta transport can be met from available water sources without placing undue stress on those sources.

Key indicator: All human excreta is disposed of in a manner safe to public health and the environment

Image 45: Slide 45



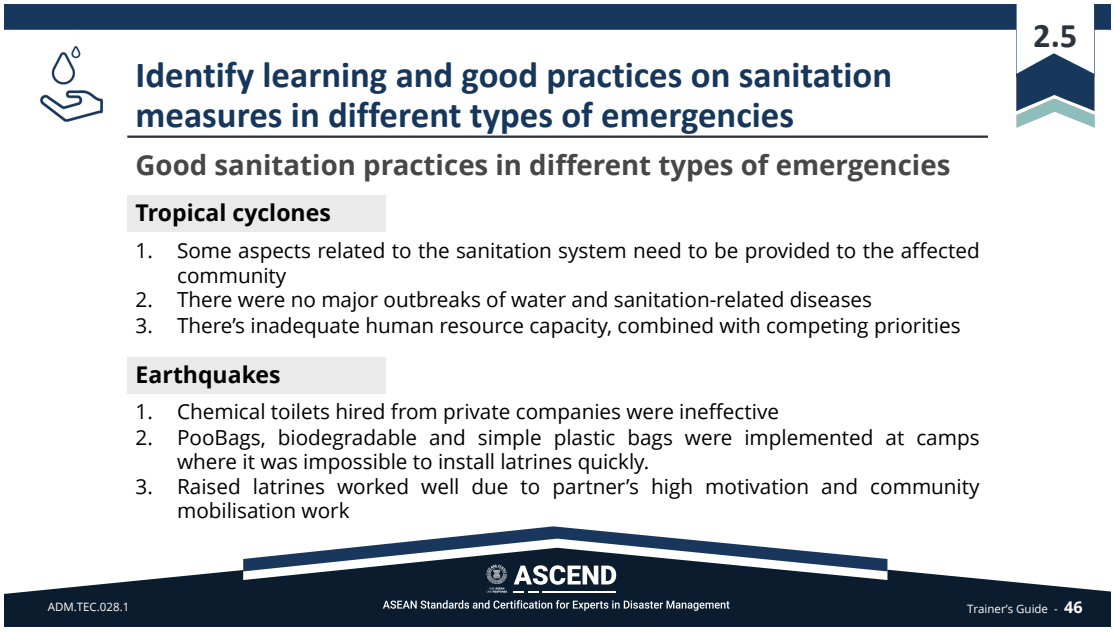
Slide No. **45**

Trainer Notes

The information below is gathered by the Global WASH Cluster from flood emergencies in various locations.

- Emergency preparedness planning should include the identification of suitable sites for the safe disposal of sanitary wastes, such as sewage and faecal wastes from latrines. Suitable sites should also be identified in advance for the disposal of solid waste and flood debris. The WASH cluster should establish a technical working group to advise on debris management in flood situations.
- Latrine should be rehabilitated and returned to service as quickly as possible after an emergency. Desludging of latrine should be an early priority for any flood response.
- The priority in any flood situation is the speed of response. It is essential that any first phase technology can be installed quickly and that it is effective in containing excreta.
- Conventional pit latrines – that use traditional infiltration techniques – are never flood proof; other technology options (e.g. Those that involve raising latrine pits) should be explored and used in flood-prone areas.
- Adequate lighting should be provided so that people can use latrines safely at night. The provision of torches with hygiene kits is sometimes useful in this regard.
- The choice of option should depend on the situation, in particular, whether the flood has displaced communities or whether they have decided to sit the flood out.

Image 46: Slide 46



Slide No. **46**

Trainer Notes

Earthquake

UNICEF'S response to Cyclone Nargis that hit Myanmar in 2009 produced some of the good practices of WASH interventions in emergencies. The followings are sanitation-related lessons learned from the event.

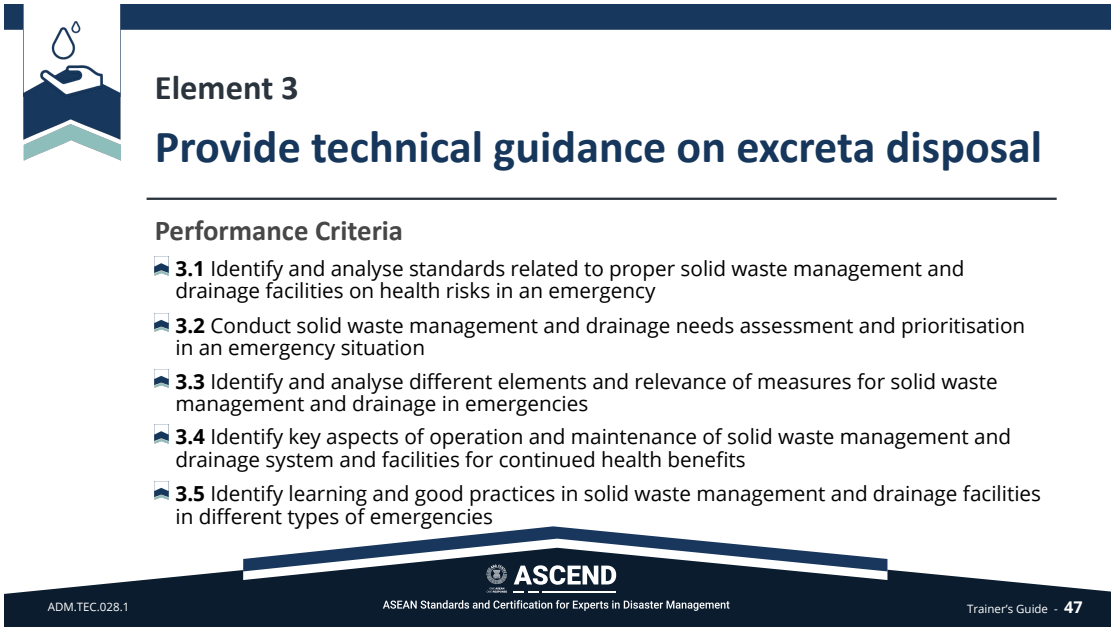
- Some aspects related to the sanitation system that need to be provided to the affected community are: health education focused on good personnel hygiene, sanitary habits, consumption of safe drinking water, fly proof latrines, and the use of insecticide-treated bet-net.
- During and after the cyclone relief and early recovery phase there were no major outbreaks of water and sanitation-related diseases (cholera in particular). Despite the poor living conditions in camps, and contamination of water sources in the villages, there has been no alarming increase in the incidence of diarrhoea. This is an indirect indication of proper treatment of drinking water and proper use of disinfectants to clean sewer and open drainage.
- One of the constraints that occurred in the cyclone emergency response is that there's inadequate human resource capacity, combined with competing priorities for a limited pool of skilled workers in the affected township have been a major constraint to quickly rebuilding water supply and sanitation infrastructure

Earthquake

The Oxfam response to Haiti 2010 earthquake has provided useful information about how sanitation measures were implemented where challenging poor hygiene practices in urban areas existed. Key lessons that can be learned are as follows.

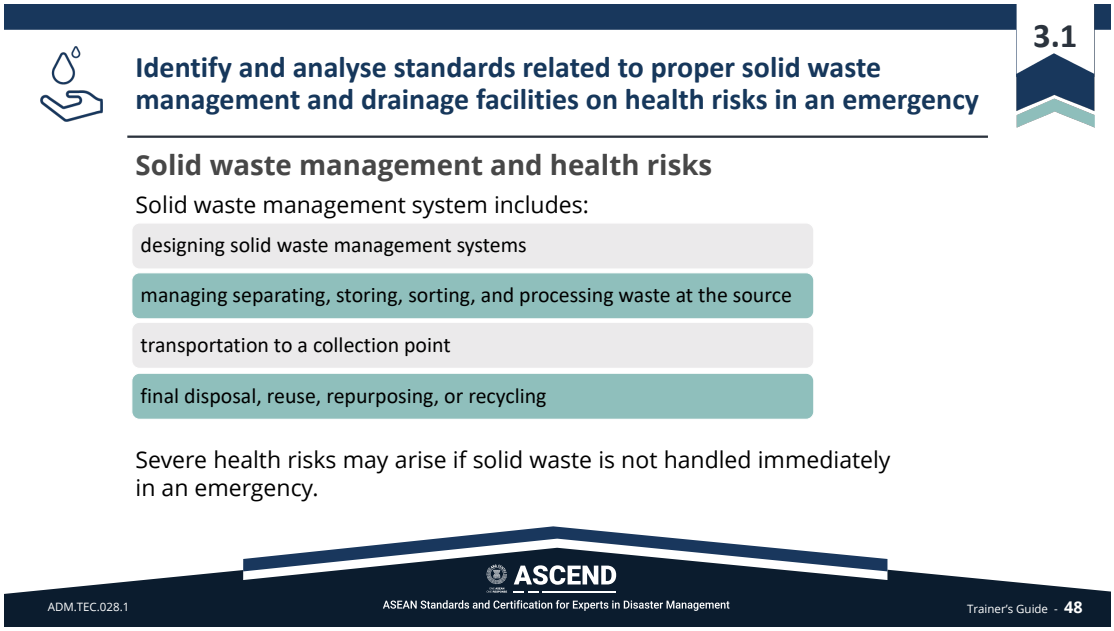
- Chemical toilets hired from private companies were ineffective due to the limited size of the storage capacity and high maintenance cost for emptying and cleaning.
- PooBags, biodegradable and simple plastic bags were implemented at camps where it was impossible to install latrines quickly. It had improved people's sanitation practices. The elderly, less, less physically able, and women particularly appreciated this practice, as these could be used at night in their tents. The use of an organised bag collection system also prevented them from being discarded indiscriminately into drainage channels. This measure was particularly liked because it can reduce smells, especially when used inside tents.
- Raised latrines worked well due to partner's high motivation and community mobilisation work. Paid toilet attendants, on daily labour rates, is one-factor ensuring high user satisfaction with the units.

Image 47: *Slide 47*



Slide No.	**47**
Trainer Notes	Trainer identifies for participants the Performance Criteria for this Element, as listed on the slide.

Image 48: Slide 48

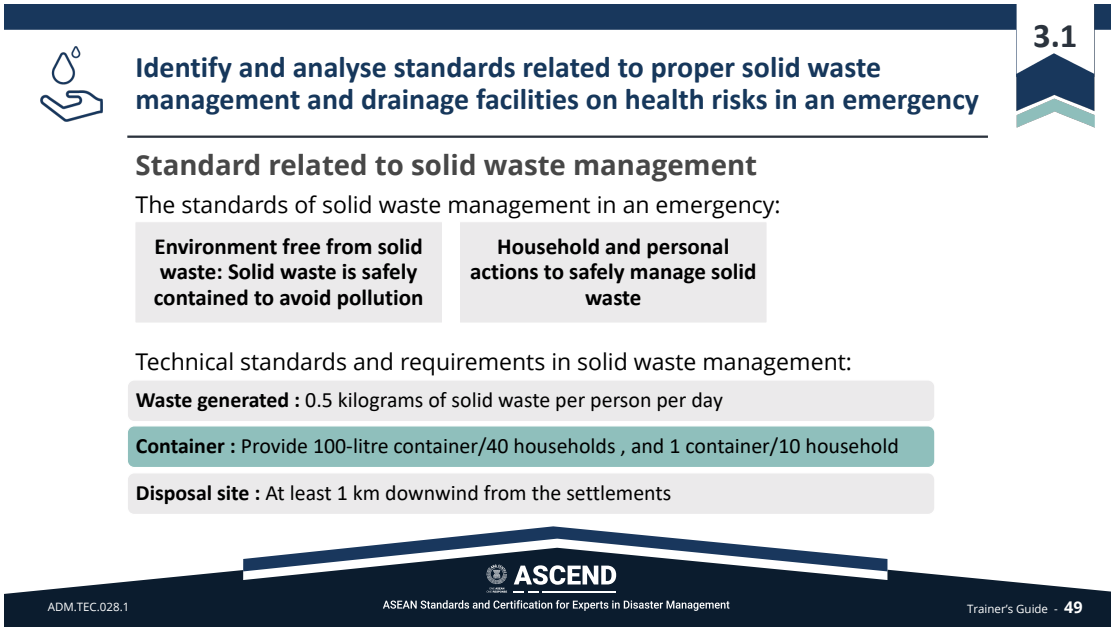


Slide No. 48

Trainer Notes

- **Solid waste management:** The process of managing and disposing of organic and inorganic solid waste is known as solid waste management
- **Solid waste:** any non-liquid waste created by human activities, as well as a variety of solid waste material arising from the disasters
- Some health risks caused by inadequate solid management can be seen in the table 22

Image 49: Slide 49



Slide No. **49**

Trainer Notes

The general standard of solid waste management in an emergency is that people should be able to live in an environment free of solid waste

Sphere defines the standards related to solid waste management in an emergency:

1. Environment free from solid waste: Solid waste is safely contained to avoid pollution of the natural, living, learning, working and communal environments

Indicator:

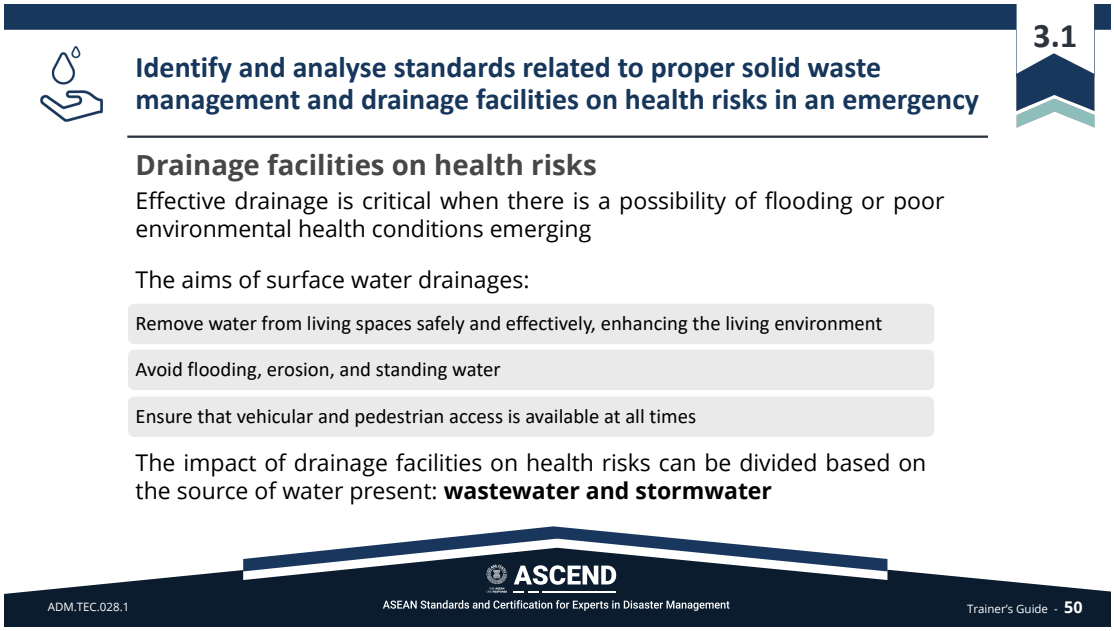
- There is no solid waste accumulating around the designated neighbourhood or communal public collection points

2. Household and personal actions to safely manage solid waste: People can safely collect and potentially treat solid waste in their households

Indicator:

- Percentage of schools and learning centres with appropriate and adequate waste storage
- Percentage of public markets with appropriate and adequate waste storage
- Percentage of solid waste pits or incinerators at schools, learning centres, public markets and other public institutions that are managed safely

Image 50: Slide 50



Slide No. **50**

Trainer Notes

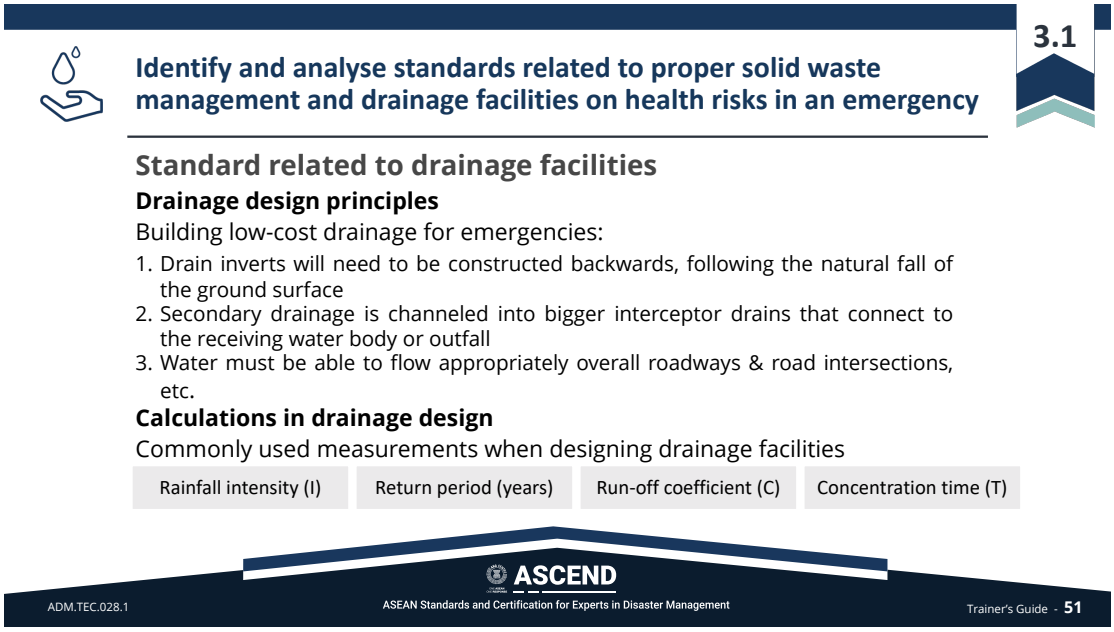
- Effective drainage is critical when there is a possibility of flooding or poor environmental health conditions emerging as a result of standing water, muddy conditions, or erosion
- It should be addressed once the immediate demands for water, sanitation, and hygiene have been fulfilled

The primary health issues connected with this water problem are:

- contamination of water sources and the living environment;
- damage to latrine and shelters;
- the development of vector breeding sites; and the risk of drowning.

Inadequate drainage facilities could harbour harmful bacteria that can cause various faecal-oral diseases that may be harmful to children playing nearby, and can serve as mosquito breeding sites

Image 51: Slide 51



Slide No. **51**

Trainer Notes

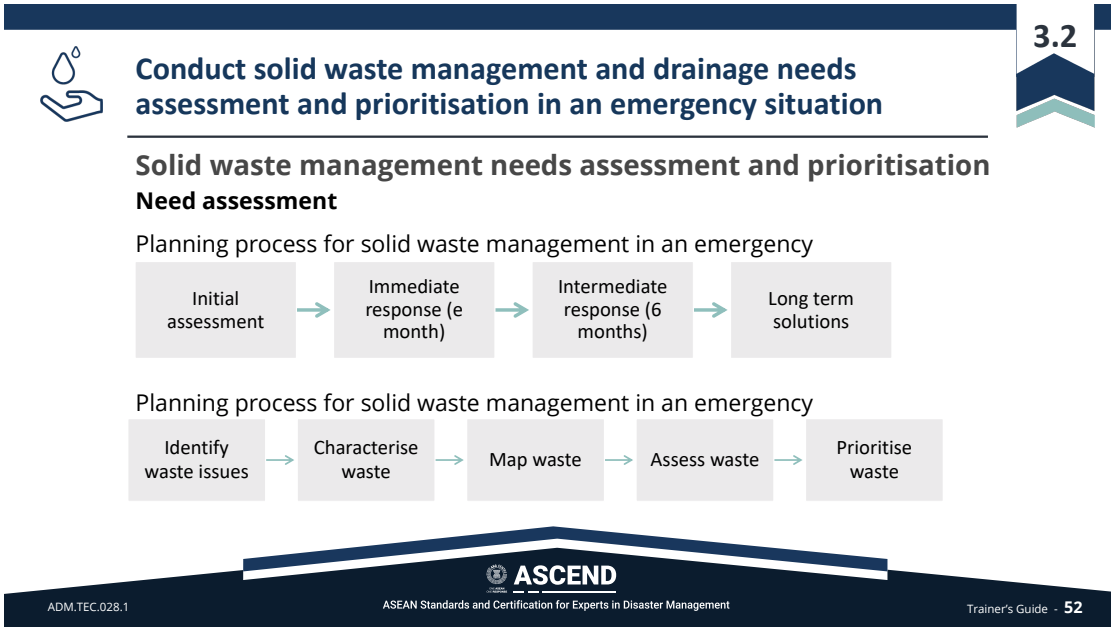
During an emergency, drainage may be particularly important in camp and urban settings.

To ensure the quality and effectivity of drainage design, this may be useful for an engineer in building low-cost drainage for emergencies:

- The receiving water body or outfall is the starting point for drainage planning. Drain inverts will need to be constructed backwards from this point, following the natural fall of the ground surface as much as possible;
- Secondary drainage is channelled into bigger interceptor drains that connect to the receiving water body or outfall;
- When the water reaches a crossing point, it should not be allowed to stop flowing. Water must be able to flow properly overall roadways (over or under) and road intersections, while still enabling vehicle and pedestrian access;
- Water should ideally flow quickly enough to prevent particles from being deposited in the drain. Drains with sloping slides and thin bases help to keep the flow consistent;
- Protection against scouring effects will be required when the fall at the bottom of the drain is steeper than 1% (falls larger than 1 unit in 100 units' distance), either by lining or providing protection at especially vulnerable places along the network;
- A steep slope is defined as one that has a slope of more than 5%. Drainage will necessitate design elements such as turn-out-drains, building drainage following contours, or incorporating stairs or check-walls in drain profiles to slow the flow.

- Construction, operation, and maintenance of effective drainage systems benefit from the participation of local communities and/or impacted people.

Image 52: Slide 52



Slide No.	**52**

Trainer Notes

When dealing with solid waste management and drainage facilities in an emergency, it is important to consider how much of a health risk they pose, how acute the risk is, what other problems they cause, and more

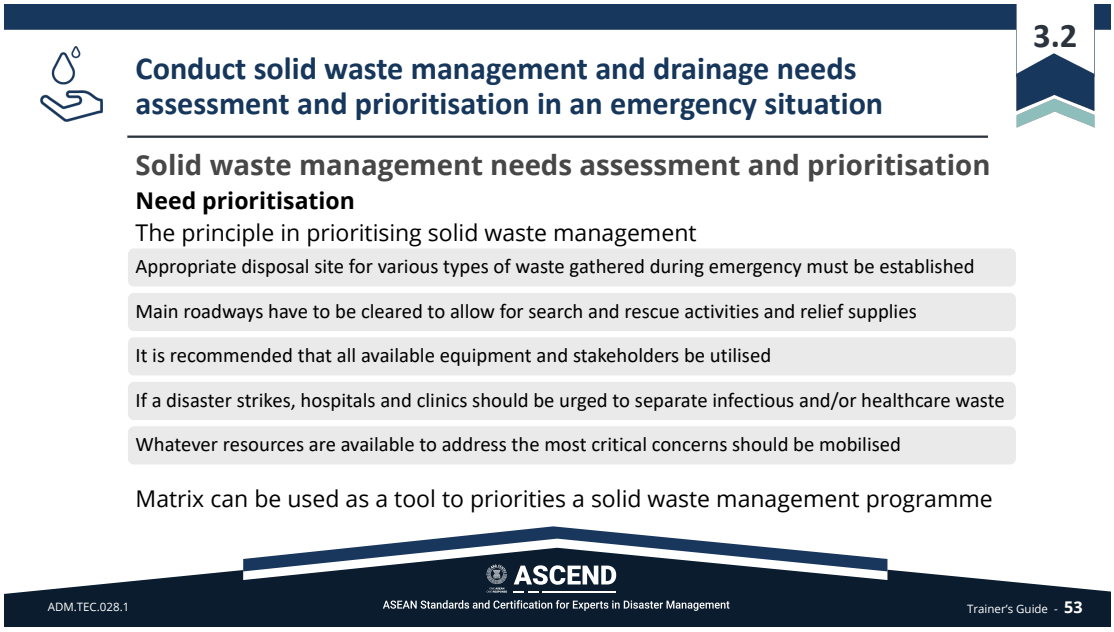
Planning process for solid waste management in an emergency to help engineers and other WASH actors plan programmes.

1. Initial assessment: understanding the emergency context and waste generation
2. Immediate response (1 month): clearing scattered waste and introducing onsite and community pits
3. Intermediate response (6 months): developing collection and disposal system and building landfills pits away from settlements and consulting and educating users
4. Long term solutions

Steps in a needs assessment:

1. **Identify waste issues**: Determine the waste's geographic location using government sources, Geographical Information systems, news, and information from local organisations.
2. **Characterise waste:** In a brief, identify the quantity and quality of waste generated in the assigned area. Do not forget to identify existing waste streams and dumps (e.g. landfill).
3. **Map waste:** Use the information above to create a waste map of the affected area. Throughout the process, the map will be a useful tool and it may be updated as new information becomes available.
4. **Assess waste:** Determine the "pathway" and "receptor", if any. Asses the existing waste to allow prioritisation.
5. **Prioritise waste:** Rank the solid waste management programme based on urgency.

Image 53: Slide 53



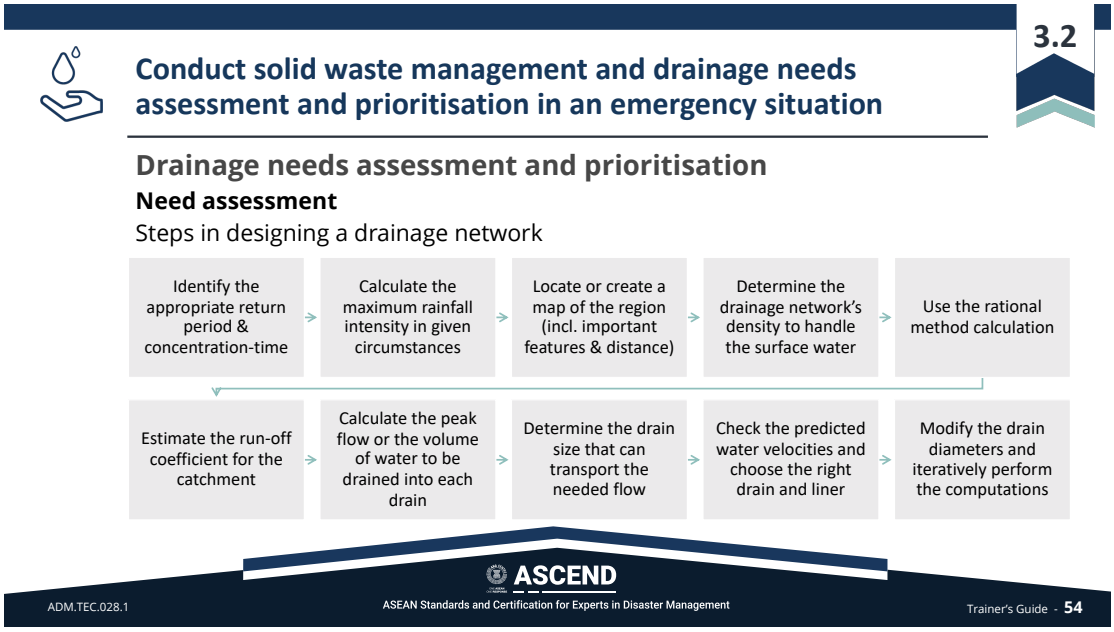
Slide No. **53**

Trainer Notes

The principle in prioritising solid waste managements are the following.

- **Appropriate disposal site for various type of waste** gathered during the emergency period must be establish. If there is an existing disposal site, it should be quickly inspected for environmental compliance before being used. If there is no existing disposal site, a temporary disposal site may be selected and created.
- **Main roadways have to be cleared to allow for search and rescue activities**, as well as relief supplies. If any case, any disaster waste that is relocated should remain the emergency area. It should not be removed until a suitable disposal place has been identified and located.
- It is recommended that **all available equipment and stakeholders be utilised**. Where excavators, trucks, and skips do not have access, wheelbarrows and wooden carts carried by animals can be utilised.
- If a disaster strikes**, hospitals and clinics should be urged to separate infectious and/or healthcare waste**, store it separately, and move it to temporary specific treatment or disposal facilities.
- Whatever resources are available to address the most critical concerns highlighted in the above study should be mobilised.

Image 54: Slide 54



Slide No.	**54**

Trainer Notes

It is important to assess the capacity of roads, bridges, culverts, fords and drifts to ensure that they can carry the necessary loads needed for building drainage facilities.

The steps in **designing drainage network** are the following:

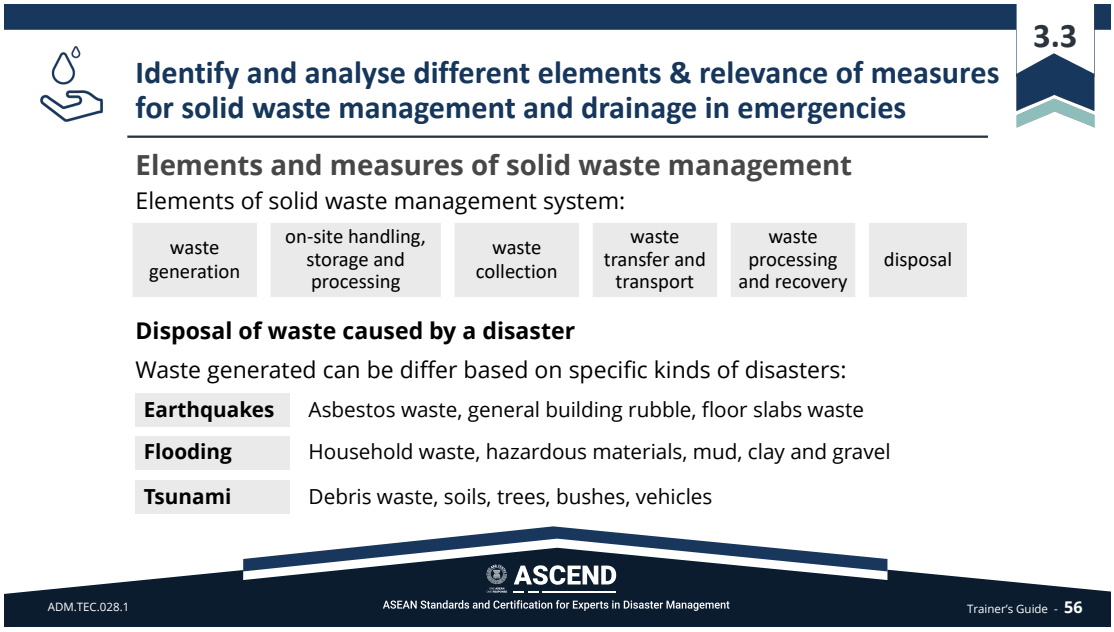
- Identify **the appropriate return period and concentration time** (based on literature review, local condition and local knowledge);
- **Calculate the maximum rainfall intensity in mm/hour** given such circumstances. This is generally available from the hydrogeology or water resources department;
- **Locate or create a map** of the region that includes important features and distances;
- **Determine the drainage network's density** in order to handle the surface water. Draw the drain lines on the map as closely as possible to the contours. Cut the ground up around each drain artificially to show which portions of land will feed into each drain, referred known as the **"catchment area (A)".**
- **Use the rational method calculation**: the method which implies that the storm duration acceptable for a drainage catchment is equal to the whole time it takes for rain falling on the catchment's furthest point to flow down to the catchment's outfall point.
- **Estimate the run-off coefficient for the catchment**, which these standards below.
- Calculate the peak flow or the volume of water to be drained into each drain per second (Q) with this equation: **Q (l/s) = 2.78 x C x A (ha) x I (mm/hr)**

- Determine the drain size that can transport the needed flow, using Manning Formula and the Manning Roughness Coefficient, shown in the table below.
- To reduce deposits and restrict scour, check the predicted water velocities and choose the right drain and liner.
- Modify the drain diameters and iteratively perform the computations until the velocity is ultimately acceptable.

Image 55: Slide 55

Slide No.	**55**
Trainer Notes	Prioritisation will differ based on the programme's short-, medium- and long-term aspects. While the shift from emergency to recovery and development should be smooth. The programme must consider the longer aspects of disaster recovery rather than just taking the shorter view of emergency response. Improved services to enhance health, nutritional security, and improved livelihoods will be long-term goals that will feed into a recovery strategy.

Image 56: Slide 56



Slide No. 56

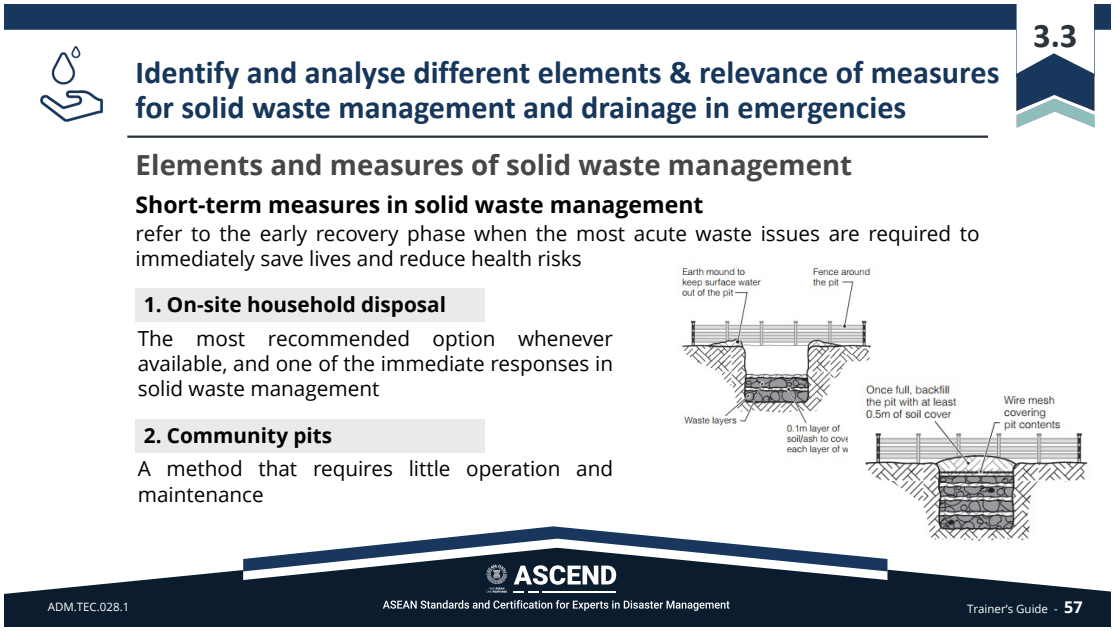
Trainer Notes

- Solid waste management and drainage facilities measures should be designed as part of a wider preventative health strategy
- These should be adjusted based on the assigned area and the resources available

Waste generated from different disasters:

- **Earthquakes:** Asbestos waste, general building rubble, floor slabs waste
- **Flooding:** Household waste, hazardous materials (e.g., household cleaning products and electronic goods), mud, clay and gravel
- **Tsunami:** Debris waste, soils, trees, bushes, vehicles
- **Hurricanes, typhoons, cyclones:** Brick, concrete walls, roofing materials, dust, asbestos, ships, boats, vessels, electrical and telephone grids
- **Conflict (short-term and protracted):** Rockets, missiles and bombs, infrastructure waste, furniture, debris, bricks, stones, bridges, roadways, railway structure, unexploded ordnance (UXO)

Image 57: Slide 57



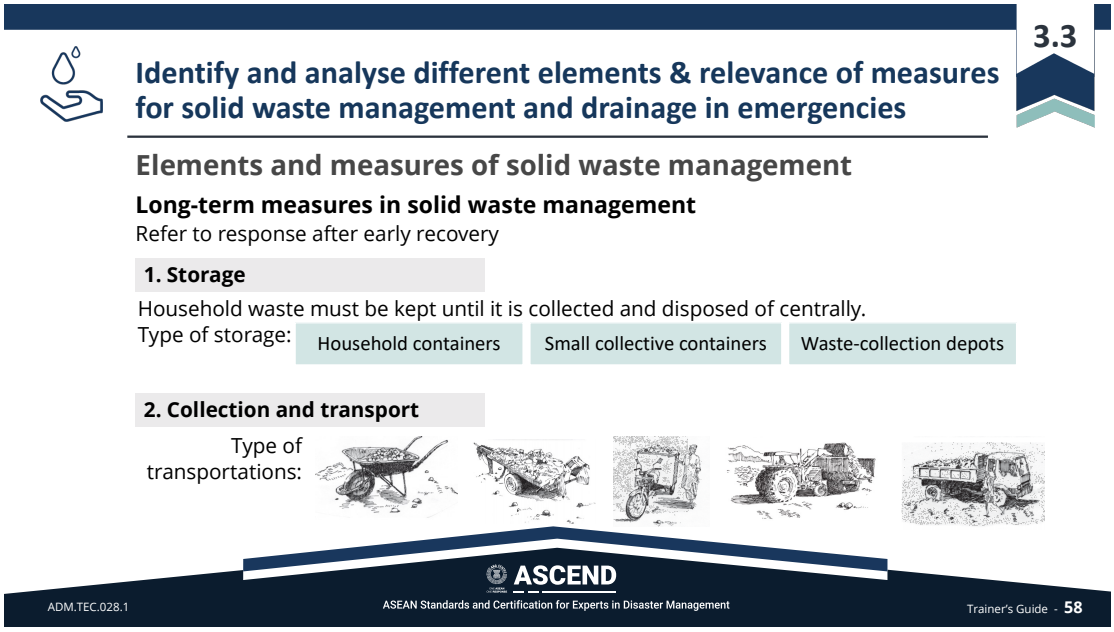
Slide No. **57**

Trainer Notes

The **On-site household disposal** method is applicable in these conditions:

- The waste has a high organic content (it will decompose and reduce in volume);
- The space available is not too limited;
- Rats and other vectors are not a serious problem;
- There are gardens cultivated (the organic decomposition will be useful);
- There is advanced household cooperation.

Image 58: Slide 58



Slide No.	**58**

Trainer Notes

The solid waste management system should be contextualised based on the condition of the affected community and needs assessment in the early phase of an emergency.

Storage

When it is a central system, household waste must be kept until it is collected and disposed of centrally. People should be able to dispose of their trash daily or at least twice a week.

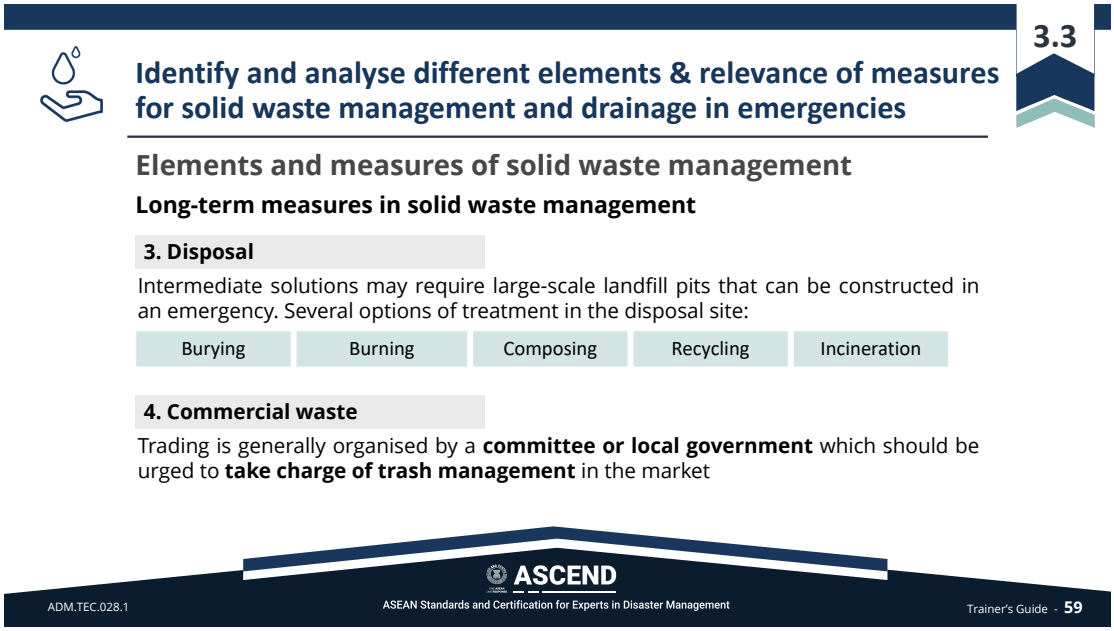
- **Household containers:** Dispose waste in each shelter/household
- **Small collective containers:** Roadside containers to collect waste from several people/shelter/household
- **Waste-collection depots:** Collect waste for all people around settlements

Collection and transport

Empty waste depots every day and small containers like oil barrels every two weeks. There are various methods of transportation:

1. **Hand-carts**
2. **Animal-carts**
3. **Small powered vehicles**
4. **Skip trucks and tractors with trailers**
5. **Ordinary trucks**

Image 59: Slide 59



Slide No.	**59**

Trainer Notes

Disposal

There are several options of treatment in the disposal site:

Burying: 500 metres from living areas and downwind, and 50 metres away from water supplies

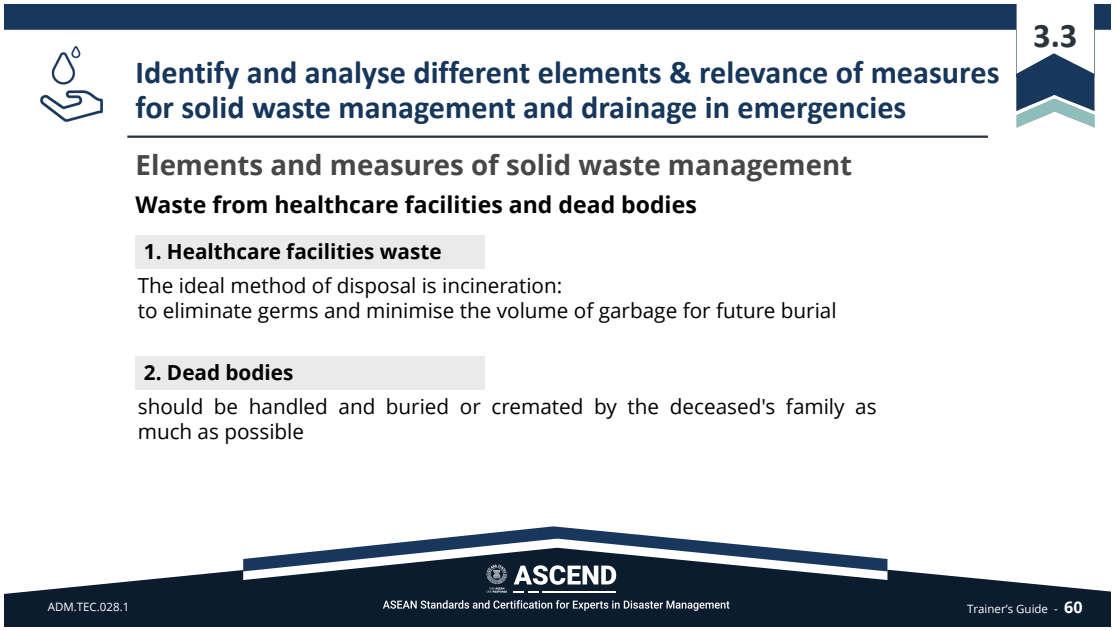
Burning: Suitable for a high organic and low moisture content waste

Composing: Leave the waste in pits for several months until it becomes useful for soil fertility

Recycling: There may be a very few resources to be recycled in camps

Incineration: At least 1 km downwind of settlements, and ashes should be covered by soil daily

Image 60: *Slide 60*



Slide No. **60**

Trainer Notes

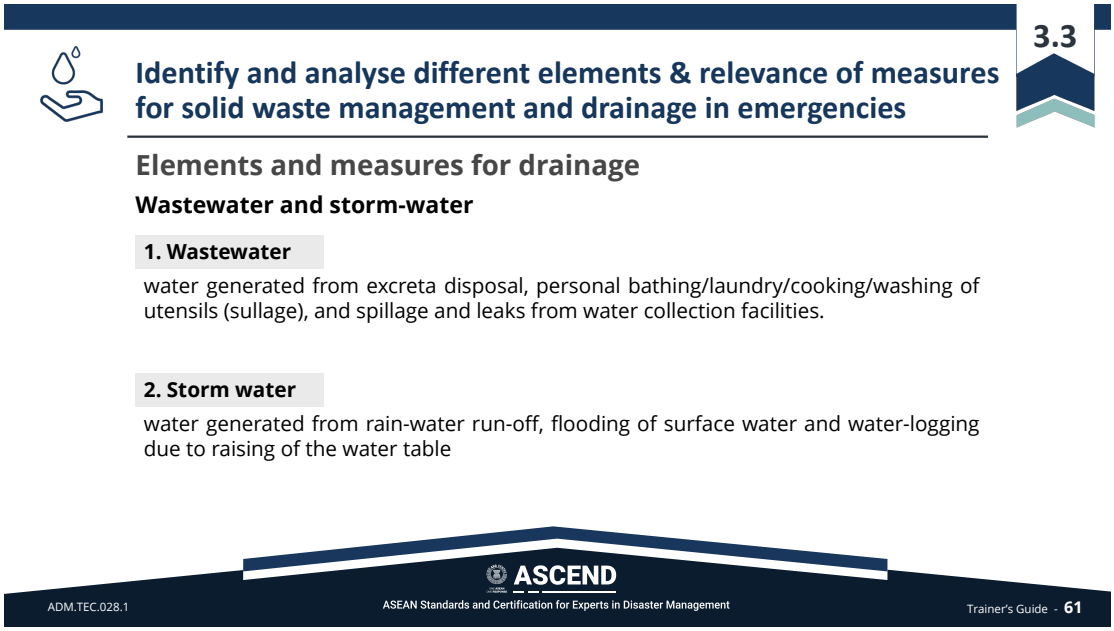
Healthcare facilities waste

- Health care facilities, feeding centres, and orphanages generate garbage that poses a health concern and requires specific management.
- Waste should be collected in covered containers and regularly emptied by workers
- Contaminated and non-contaminated waste should be separated. Hazardous medical waste should never be combined with garbage for regular collection

Dead bodies

When dead bodies are found in water resources, or died of cholera, typhus, or plague, it is important to retrieve the remains to minimise any potential health risks (safe handling and disposal of corpses need special attention)

Image 61: Slide 61



Slide No. 61

Trainer Notes

Drainage options related to wastewater:

Excreta disposal:

- Sprinkle the spillage with sand and quicklime to absorb and disinfect water
- Control flies frequently
- Pump the spillage back to the operating sewers
- Use storm drains to clear the contamination from public areas
- Ensure no leakage in the water supply distribution system

Sullage

- Avoid disposing of water to the ground because it may cause blockages including to the soil surface.
- If there is no option: install a grease trap, expand the soakaway, build a parallel drain with regular maintenance
- Flow the water into the open drains for further channelled into natural watercourses
- Utilise the water for irrigation
- Consider over-design in the early phase of an emergency because the quantity will likely increase throughout time

Spillage

- Direct away from water-collection point to avoid vector-breeding sites
- Utilise for watering animals (at least 30 metres from water point)
- Maintain taps regularly along with the tools and spare parts

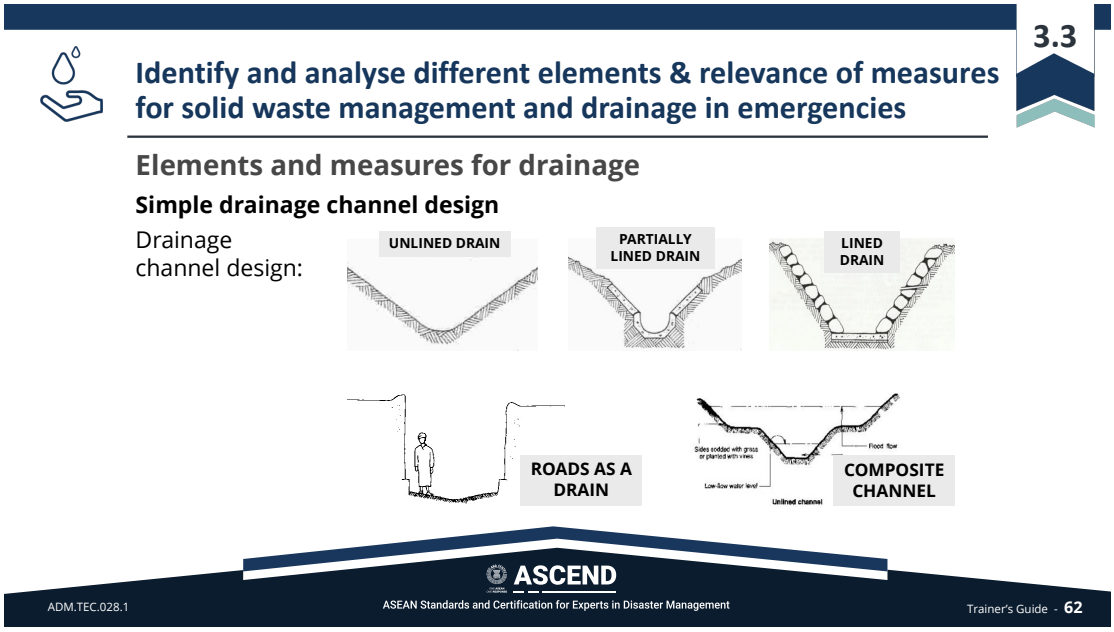
Treatment options related to storm-water.

Rain-water run-off

Divided by two purposes: to avoid latrines damages, and to enhance water drain

Flooding of surface water
Divided by two purposes: in locating the settlements, and in dealing with a flood
Water-logging due to high water table
Avoid marshy areas with rocky and impermeable soils

Image 62: Slide 62



Slide No.	**62**

Trainer Notes

There are various options in low-cost drain cross-sections, and the size, shape, and lining of drainage channels depend on the purpose and the area characteristics.

Drainage channel design:

Unlined drain: The cheapest drainage type can be cut along the roadside with a road grader.

Partially lined drain: A cheaper option than the lined drain with a slope of 1% - 5%. Need special protection in vulnerable points by laying turf or sowing grasses

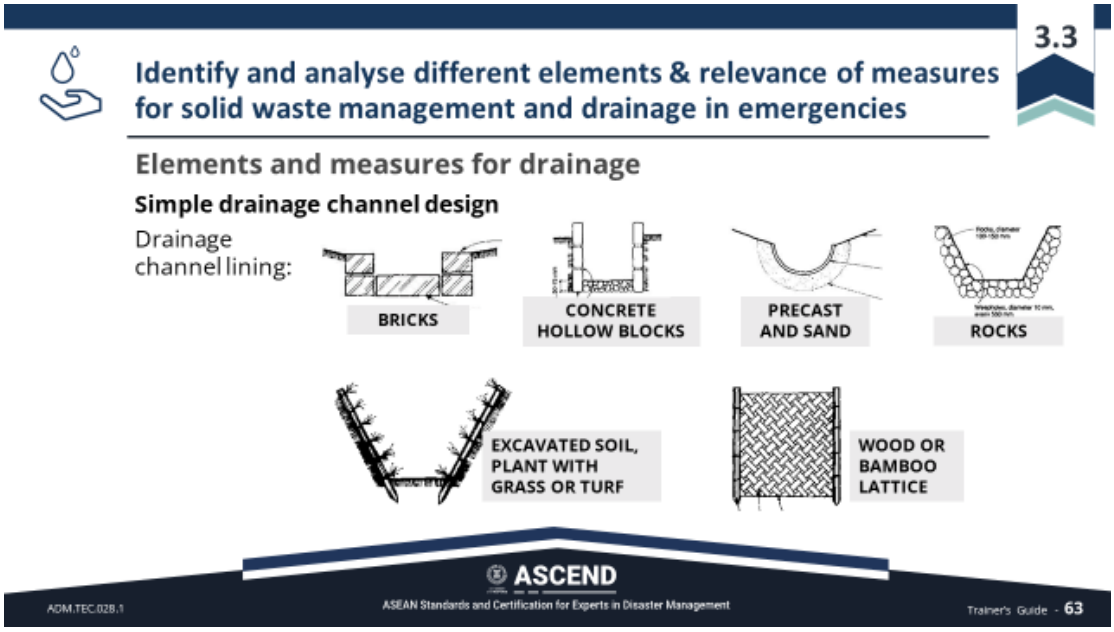
Lined drain: Lined drainage type with permanent or temporary lining. There may be a problem that water may not enter from the ground at either side and can be overcome by providing weep holes about 10 mm in diameter

Roads as a drain: Applicable in very narrow streets where heavy vehicles do not pass, with 5% slope and the road has surfaced to avoid erosion

Composite channel: A small drain within a drain is built for places where there is likely to be a large range inflow, particularly when sullage is dumped into the drain. A smaller channel is useful for preventing sullage water deposits.

- It is advisable not to construct expensive lined drains in temporary camps
- But simple unlined drains may not be suitable on their own if the ground is steeply sloping and there is a possibility of gulley developing and causing harm to residential spaces
- A drain with vertical slides may be the only option when space is limited

Image 63: Slide 63



Slide No.	**63**
Trainer Notes	The sides should be lined to avoid erosion unless the drainage is only needed for a brief period

Image 64: Slide 64

Slide No. **64**

Trainer Notes

Programme sustainability

The programme's sustainability will depend on:

- **Technical capabilities:** Local capacities must be developed so that there is sufficient technical competence to continue operating and maintaining the waste management systems even after the project ends.
- **Financial self-sufficiency:** Ensuring a steady flow of funding (e.g., collecting fees) will help sustain waste management systems and keep them operating after the recovery period.

Health and safety disaster waste management

Personnel health and safety is critical to the success of any waste management programme

The following are the minimum requirements:

- Ensure that all the employees in charge of and supervising solid waste management activities have the required experience and that adequate safety mechanisms are in place;
- Ensure that all the solid waste management systems apply personal protective equipment standards (PPE), such as footwear (hard boots to prevent spikes and minimise the harm from heavy and sharp materials), hard hats, gloves, overalls, and masks.
- Take into account the health and safety in the new waste disposal plant such as one-way traffic systems and restricted cross-over between cars and humans. People who work with waste should have access to adequate and clean change and washing facilities both during and after their working hours;

- An effective dust suppression (e.g., water spraying) is required where debris is crushed or waste is handled. Noise, vibration, and hazardous emission reduction devices, as well as machinery guards, should be installed in facilities and equipment to prevent accidents.

Image 65: Slide 65

Slide No. **65**

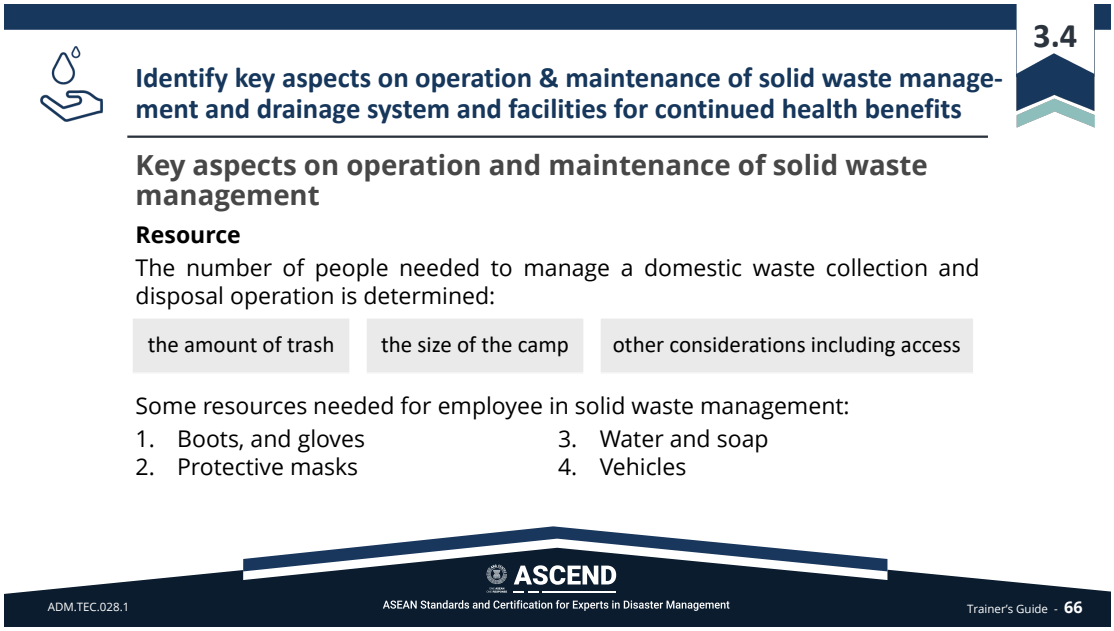
Trainer Notes

Communication and stakeholder management

The points below serve as a reminder:

- Sending messages to encourage disaster waste cleaning
- Assure that national authorities have information outlining who performs what, what data/information has been gathered, and the outcomes of any waste assessment and planning mission.
- Assist local governments in providing clear and open information on clean-up efforts future timetables, and other issues.
- Ensure the implementing agencies coordinate and communicate to streamline waste assessment project;
- Develop information exchange and coordination mechanisms among stakeholders;
- Implement a comprehensive communication strategy as a wider part of solid waste management.

Image 66: Slide 66



Slide No.	**66**

Trainer Notes

Some resources needed for employee in solid waste management:

- Boots, and gloves should be supplied to staff who handle the waste.
- Protective masks should be used by workers who are burning trash or handling dusty debris.
- Water and soap should be supplied at disposal locations for cleaning hands and faces, as well as
- Vehicles that have been transporting hazardous waste, such as latrine sludge.

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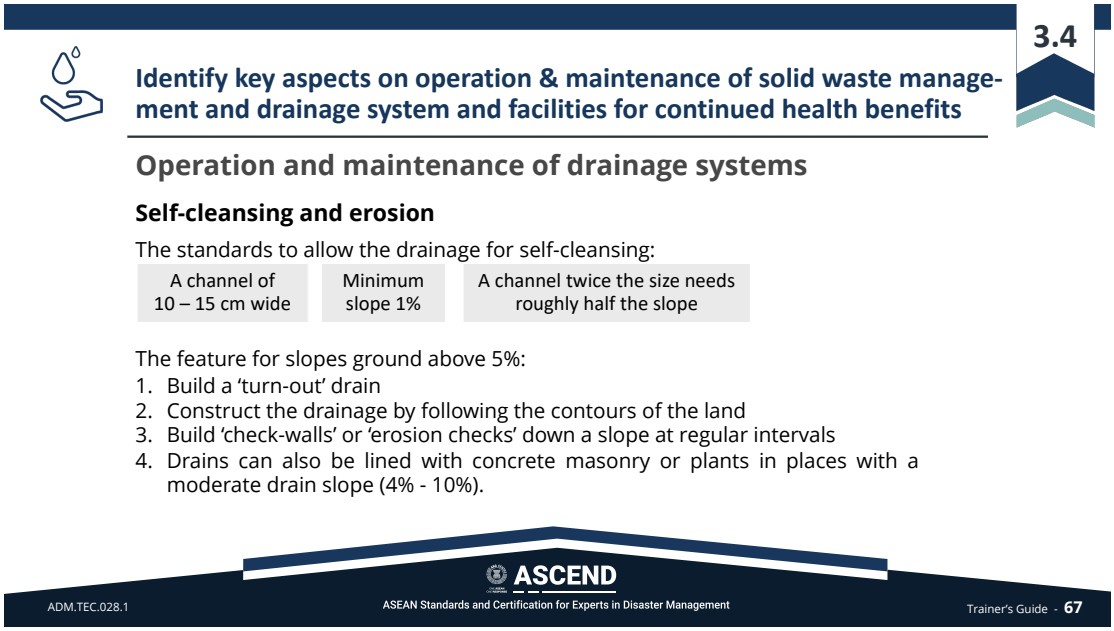
Image 67: Slide 67



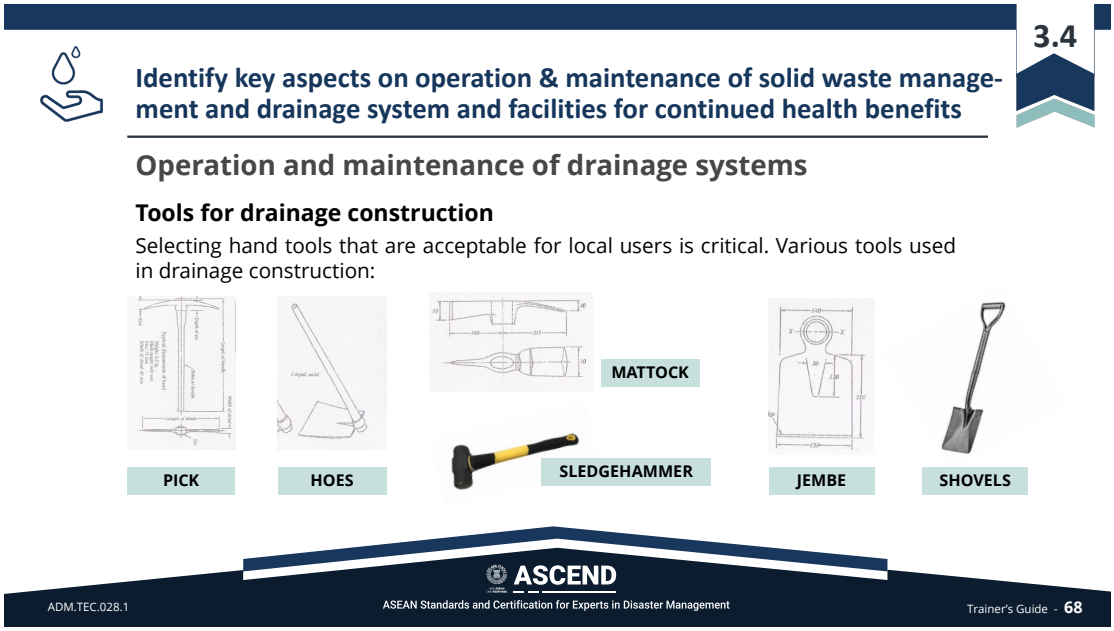
Slide No. **67**

Trainer Notes

Moreover, for slopes ground above 5%, the engineer should consider getting additional features to avoid erosion and reduce the speed of the water. The feature includes:

1. Build a 'turn-out' drain that diverts water away from the main drainage system and direct it onto fields to soak up. These are typically only available in rural areas or in metropolitan areas where there is enough open space.
2. Construct the drainage by following the contours of the land.
3. Build 'check-walls' or 'erosion checks' down a slope at regular intervals. These form tiny walls across the drain and can be made of stone, wooden poles, or brickwork, or gabions (huge wire baskets with big stones placed within) for large drains. The water stops behind each check-wall on its way down the drain and dumps its solid burden. After a period, the solids pile up to the point when a stepped effect occurs, lowering the drain's effective slope.
4. Drains can also be lined with concrete masonry or plants in places with a moderate drain slope (4% - 10%).

Image 68: *Slide 68*



Slide No.	**68**
Trainer Notes	Care must be taken to ensure that the tools are sharpened on a regular basis and that the handles are properly attached into the heads without additional wood being fitted into the gaps - as with any tools used for labour hard work

Image 69: Slide 69

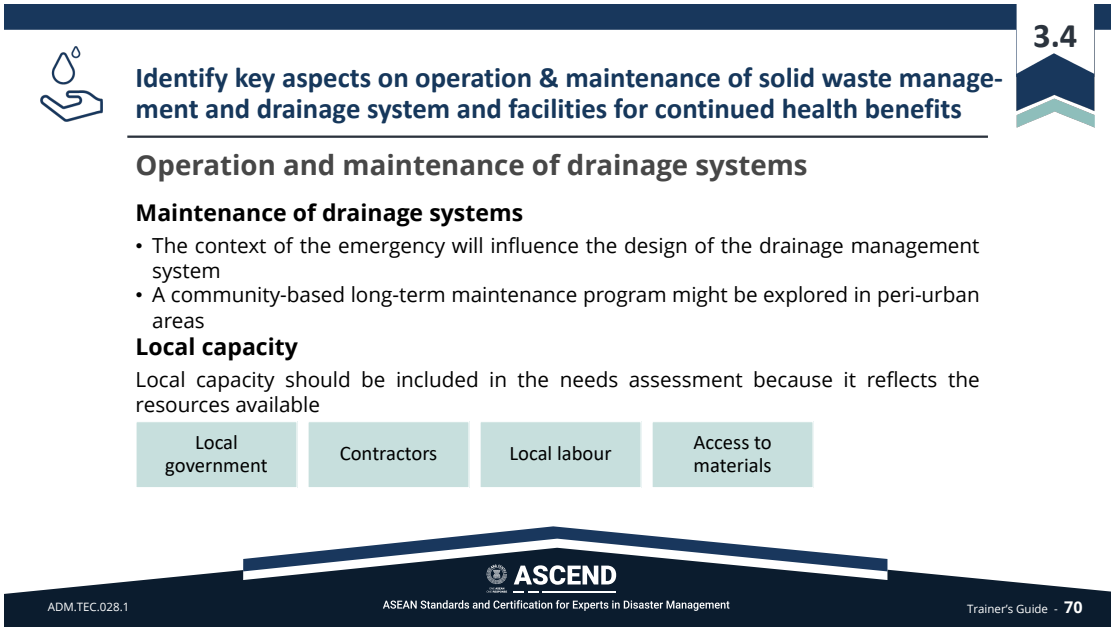
Slide No.	**69**

Trainer Notes

Drainage is divided into several types, with each type having its own function and applicable location

- **Catch water drains:** A diversion to avoid run-off from the higher ground causing substantial floods of the track or road
- **Surface drainage:** small rise across a track which diverts water from the track to a side drain which flows the water away safely
- **Side drainage:** Drainage operates by excavating ditches or drains
- **Drifts:** Drain crossings with small flows that can be constructed of a range of sizes, with large stones, well-graded road gravel and small chippings, or have a surface of the concrete with weld mesh of reinforcement bars
- **Culverts:** Road crossing with 600mm diameter of pipe with headwalls to provide a visible indication of the edge of the road for vehicles and pedestrians
- **Vented fords:** Cross between a pipe culvert and a drift to allow water to pass through the pipes under a road during normal flows

Image 70: Slide 70



Slide No. 70

Trainer Notes

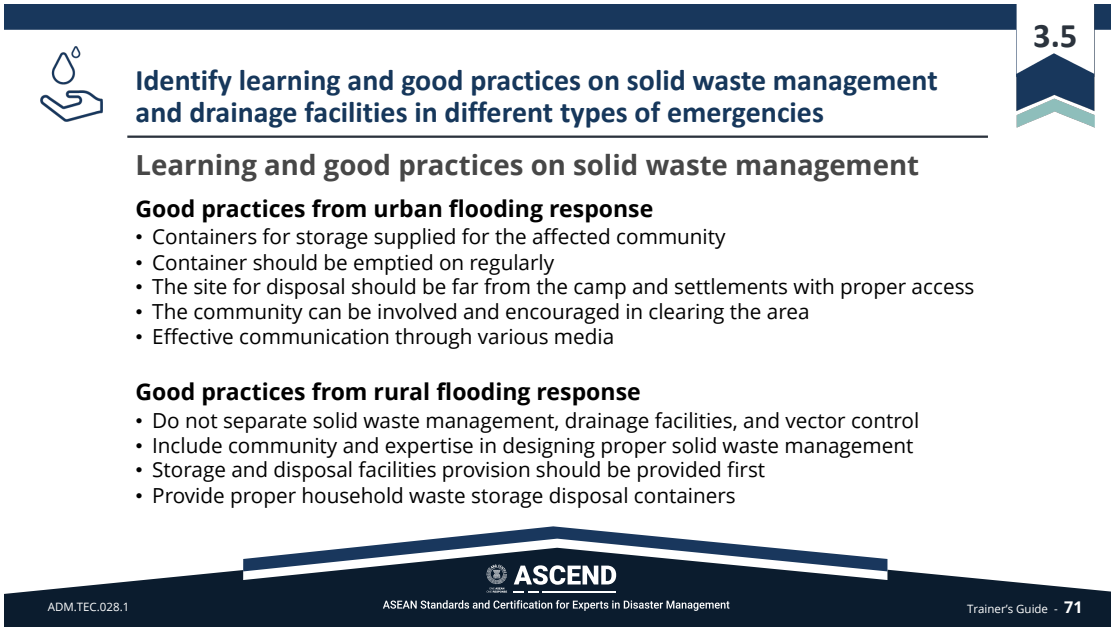
Maintenance of drainage systems

- In an emergency, cleaning the drainage system on a cash-on-work basis can be done on occasion
- people will need suitable equipment to clean the drain and remove the deposited debris from the edges of the drains so that it does not wash back in during the next rain

Local capacity

- **Local government:** Speak with the local authority in charge of highways to learn about current responsibilities and capabilities for road development and maintenance. Governments have set up their own emergency agencies in certain situations and assigned staff to be in charge of the various sectors.
- **Contractors:** Examine the idea of contracting out certain tasks. Examine their abilities by looking at examples of their work and inspecting their tools.
- **Local labour:** Inquire about local development concerns and their strategy to collaborative work with local development organisations. Emergencies disrupt ongoing development efforts. Check any minimum or maximum wages and the relevant labour laws.
- **Access to materials:** Learn about the rules that govern access to, and ownership of, land and materials. There will be legal and customary procedures, both of which must be followed, even if they take time

Image 71: Slide 71



Slide No. **71**

Trainer Notes

Good practices from urban flooding response:

- There should be containers for storage supplied for the affected community
- The container should be emptied on a regularly and the transport and collection should be provided by the stakeholder responsible
- The site for disposal should be far from the camp and settlements with proper access for vehicle
- The community can be involved and encouraged in clearing the area. The tools needed should be provided.
- Effective communication through various media (local radio, newspaper, poster) is important in solid waste management

Good practices in rural flooding response

- Do not separate solid waste management, drainage facilities, and vector control. They are interconnected with one another
- Include community and expertise in designing proper solid waste management
- Storage and disposal facilities provision should be one of the first things to provide to the affected community after rural flooding
- Provide proper household waste storage disposal containers, especially when the populations are displaced

Image 72: Slide 72

Slide No. **72**

Trainer Notes

Lebanon in 2011

Lessons learned:

- Community engagement and participation is important in WASH activities
- It is a good investment to provide the local community with proper training

Haiti in 2010

Good practices:

- Prioritise debris waste clean-up by the local community and governments in the early days of emergency response
- Conduct cash-for-work programmes in the later months for debris management
- Dispose of the debris waste to coastal areas
- Utilise the existing landfill for household waste disposal and healthcare waste with a collection system
- Utilise the functional incinerator in certain hospitals to process the healthcare waste

Lessons learned:

- Waste management planning has to keep up with implementation
- Debris waste has to be sorted as some may be more dangerous than the others (e.g., debris from school laboratories)
- Assess the existing condition of facilities properly and thoroughly

Turks and Caicos Island (TCI) in 2008

Good practices:

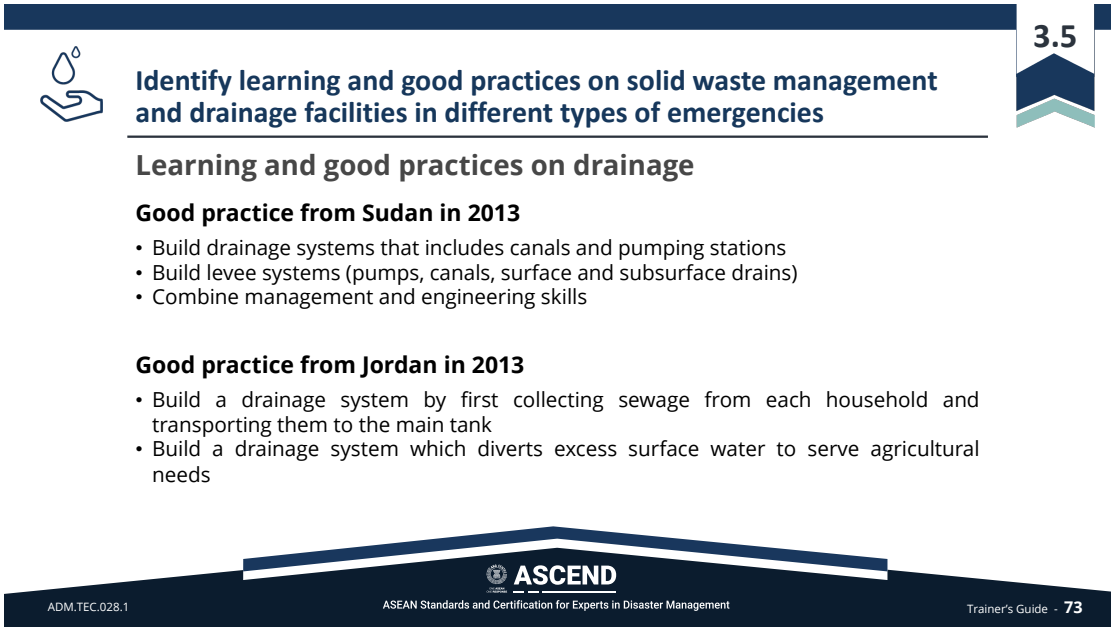
- Classify the hazardous and non-hazardous waste for collection

- Clean up debris in salt ponds and creeks
- Prioritise and manage the waste
- Collect, analyse and assess the groundwater's quality and other water sources to identify the health risk in the medium- and long-term

Lessons learned:

- The support from UN and local government is critically needed in an area such as TCI
- Impacts on fishing livelihoods and fish must be assessed
- Other water and sanitation infrastructure programme should be incorporated in the long-term plan

Image 73: Slide 73



Slide No. **73**

Trainer Notes

Sudan in 2013

Good practices:

- Build drainage systems that includes canals and pumping stations
- Build levee systems (pumps, canals, surface and subsurface drains)
- Combine management and engineering skills

Lessons learned:

- The proper assessment should be conducted to decide where the camp should be located (e.g., local topography and hydrological conditions)
- Design the drainage system as a long-term project, since the camps usually become larger throughout the time
- Design a mechanism to regularly report the situation in the camp and standards for appropriate documentation. This will enable the analysis of programme impacts.

Jordan in 2013

Good practices:

- Build a drainage system by first collecting sewage from each household and transporting them to the main tank. Then, transporting surface water drainage and greywater to the wastewater treatment plant.
- Build drainage system which diverts excess surface water to serve agricultural needs.

Image 74: Slide 74

Slide No.	**74**
Trainer Notes	This remarks the end of the training. Trainer may advise learners with additional materials references or gives a sharing session related to the training materials. Trainer gives closing statements.

ASCEND

ASEAN Standards and Certification for Experts in Disaster Management

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