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Societal security — Mass evacuation — Guidelines for planning

Sécurité sociétale — Évacuation de masse — Lignes directrices pour la planification

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 223, *Societal security*.

Introduction

This International Standard provides guidance on planning for mass evacuation. An evacuation in response to a risk or threat is the movement of people from a designated area. In this context a mass evacuation is characterized by the need for multi-agency collaboration and resources. Typically this involves a larger number of people or wider area at risk. It is difficult to define mass evacuation in terms of numbers or scale because disasters, communities and responder capabilities differ. However, it can be considered in terms of the number of evacuees exceeding an everyday scale of response such as the evacuation of a city, region or large populated area.

The need for evacuation can arise from naturally occurring events, human induced events (both intentional and unintentional) and events caused by technological failures. Some events require an immediate evacuation while others give advanced warning.

Effective planning is important to help save human life and reduce suffering. Planning helps to deliver an effective response and is part of emergency management. This International Standard provides guidance for developing mass evacuation plans, supporting decision-making, increasing the potential for an effective response, and strengthening preparedness of the public and organizations. It also recognizes that there are barriers that could hinder people from evacuating, such as concern for pets, valuable possessions or items that sustain livelihoods.

This International Standard is intended for use by those responsible for establishing mass evacuation plans as well as preparing locations to receive evacuees on a mass scale. It includes the following eight activities that also provide the structure to the eight clauses in this International Standard (Clauses 4 to 11), the order of which does not necessarily suggest a sequence.

Table 1 — Clauses 4-11 in this International Standard

General aspects for mass evacuation planning (Clause 4)						
Prepare the public for mass evacuation (Clause 5)	Visualize the areas that are at risk or affected (Clause 6)	Make the evacuation decision (Clause 7)	Public warning (Clause 8)	Analyse evacuee movement (Clause 9)	Assess evacuee shelter requirements (Clause 10)	Evaluate and continually improve (Clause 11)

Table 1 illustrates that there are some general aspects for mass evacuation planning (Clause 4) (for example, risk assessment and exercising) and these support the provisions contained in Clauses 5 to 11. A plan to prepare the public to react effectively (Clause 5) and a plan to understand and visualize an area at risk and/or an affected area (Clause 6) provide decision-makers with information to enable them to decide whether to call for an evacuation. A plan to make the decision to call for an evacuation (Clause 7) aims to ensure that the decision-making process, objectives and participants are appropriate. A plan to warn the public of the need to react as advised (Clause 8) considers protocols for communication and community-based warning systems. Plans also consider the analysis of evacuee movement to an area of safety (Clause 9), for example, to understand transportation needs, demands and availability. Plans also aim to assess evacuee shelter requirements (Clause 10). For example, they can identify the demand for shelters and establish agreements to provide shelters. A plan for evaluating and continually improving evacuation plans (Clause 11) concludes this International Standard.

While this International Standard recognizes the importance of stabilizing the affected area after an evacuation, as well as the importance of protecting property and preserving the environment, these aspects are not its main focus.

Societal security — Mass evacuation — Guidelines for planning

1 Scope

This International Standard provides guidelines for mass evacuation planning in terms of establishing, implementing, monitoring, evaluating, reviewing and improving preparedness. It establishes a framework for each activity in mass evacuation planning for all identified hazards. It will help organizations to develop plans that are evidence-based and that can be evaluated for their effectiveness.

This International Standard is intended for use by organizations with responsibility for, or involvement in, part or all of the planning for mass evacuation. It is applicable to all types and sizes of organizations that are involved in the planning for mass evacuation, such as local, regional, and national governments; statutory bodies; international and non-governmental organizations; businesses; and public and social groups.

This International Standard covers planning for mass evacuation in order to gain a more effective response during the actual evacuation. It will assist organizations to meet their obligation of saving human life and reducing suffering.

This International Standard does not cover activities to stabilize the affected area after an evacuation, protect property and preserve the environment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22300, *Societal security — Terminology*

ISO 22320, *Societal security — Emergency management — Requirements for incident response*

ISO 22322, *Societal Security — Emergency management — Public warning*

ISO 22398, *Societal security — Guidelines for exercises*

ISO 31000, *Risk management — Principles and guidelines*

ISO/IEC 31010, *Risk management — Risk assessment techniques*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22300 and the following apply:

3.1
incident management system
system that defines the roles and responsibilities of personnel and the operating procedures to be used in the management of incidents

3.2
preparedness
knowledge and capacities developed to effectively anticipate, respond to, and recover from the impact of likely imminent or current hazard events or conditions

3.3
community-based warning system
method to communicate information to the public through established networks

3.4
area at risk
location that could be affected by a disaster

Note 1 to entry: The term is more relevant to preventative evacuations

3.5
affected area
location that has been impacted by a disaster

Note 1 to entry: The term is more relevant to immediate evacuations

4 General aspects for mass evacuation planning

4.1 Introduction

The organization should develop, implement and document transparent decision-making processes, some of which are common across all activities for mass evacuation planning. Clause 4 details planning issues which are common across Clauses 5 to 11, including:

— risk assessment (4.2);

— compliance with legislations and policies (4.3);

— information gathering and analysis (4.4);

— planning operational resource allocation (4.5);

— planning and documenting processes (4.6);

— effective multi-agency partnering arrangements (4.7);

— training and exercising (4.8).

4.2 Risk assessment

The organization should develop processes for risk management which includes performing a risk assessment in accordance with ISO 31000 and ISO/IEC 31010. The risk assessments should be:

— strategic (determining the risks associated with when to order an evacuation) or tactical (deciding to evacuate an area with a high proportion of vulnerable people, thereby creating a higher risk of being unable to evacuate them in time);

— conducted for specific locations (including the shelter area);

— conducted for known risks and their different evacuation scenarios;

— conducted before, during and after an evacuation to understand how the situation changes over time in terms of the hazard, population, infrastructure and transportation;

— used to influence resource management and the evacuation response;

— updated during an incident as new data are received from different sources.

4.3 Compliance with legislation and policies

The organization should be aware of all applicable legislation and relevant policies and develop plans for mass evacuation that are consistent with their requirements.

The organization should use applicable legislation and policies operating at international, national, regional and local levels. These should:

— be used to plan for mass evacuation and inform the plans, activities, decisions and models developed;

— be consulted to understand what can and cannot be done to protect the public;

— consider situations where people decide not to evacuate and to determine the risks;

— consider the responsibilities of different organizations during a mass evacuation and the regulations that govern these organizations;

— be used to document and demonstrate how to limit the organization's liability and the damage to its reputation;

— be monitored regularly as part of the planning process to identify changes that could affect the mass evacuation plan.

4.4 Information gathering and analysis

The organization should gather information from multiple sources of planning information and consider the value of each aspect. The information gathered should include the following:

— the demographics of people in an area at risk;

— the proportion of people who would take their own evacuation transport;

— the people who would use evacuation shelters.

The organization should assess the quality of information gathered, determine its reliability and potential long and short-term consequences, and its influence on the evacuation decision, using the following criteria:

— the frequency with which the information is updated;

— the source of the information;

— the methods used to gather the information;

— the level of detail available in the information.

The organization should assess the reliability and credibility of information in accordance with the procedure in ISO 22320.

The organization should use existing or new research information to enable an evidence-based approach to mass evacuation planning. Sources of existing research can include the following:

— academic research;

— pre-evacuation and post-evacuation surveys;

— practitioner reports;

— post-disaster reports;

— post-exercise reports;

— publications and websites from past projects, research and professional and government organizations.

New research can provide situation-specific information to support evidence-based plans and decisions.

The organization and partnering organizations should use reasonable and worst-case scenario simulations to analyse information to understand what might happen when assumptions about a disaster change.

The organization should permit direct access to simulation models in order to update the assumptions and information and re-run scenarios.

4.5 Planning operational resource allocation

The organization should consider during the preparation phase what constitutes an appropriate response and what human and technical resources should be available both in the evacuation area and the areas that could receive evacuees.

The organization should identify the resources required to assist the evacuation. For example:

— personnel and their capabilities;

— logistics and equipment capabilities;

— transportation;

— shelter provision.

The organization should conduct a rapid needs assessment and prioritization in the response phase to determine what resources are required to adequately support a mass evacuation.

4.6 Planning and documenting processes

The organization should establish a formal process to set operational targets and measure their achievement in response to an evacuation order.

The process should be included in the formal plans and integrated with contingency plans. Formal plans should include the following:

— a documented strategy to disseminate a warning message;

— ways to prepare organizations that manage evacuations and prepare the public;

— planning processes and procedures integrated into the organization's management system so that plans are regularly reviewed and updated.

Organizations and partnering organizations should become familiar with each other's plans, identify any conflicts, understand how the plans relate and interact and provide for an integrated response.

4.7 Effective multi-agency partnering arrangements

The organization should identify other organizations and groups to participate in a multi-agency partnership. The multi-agency partnership should specify the delegation of authority to improve the breadth, depth and efficiency of the planning process and reduce barriers to collaboration when a multi-agency response is required. Engagement can take the form of consultation, participation and support.

Partnering organizations can include the following:

— fire, police and paramedic services as well as other emergency response departments;

— military services;

— critical infrastructure facilities (in the area at risk and the surrounding regions);

— environmental and local government officials;

— domain experts, such as nuclear experts and seismologists;

— non-governmental organizations;

— local media and communications;

— representatives of the population (see Table 2).

Effective multi-agency partnering arrangements should include the following:

— designation of a lead organization allowing the partners to speak with a consistent voice;

— an incident management system;

— terms of reference, roles and responsibilities, a planning process and a mechanism for resolving conflicts among the partnering organizations;

— coordination of mass evacuation planning;

— options for mutual aid;

— regular multi-agency meetings to discuss plans and share good practice;

— periodic review of the partnership and plans to confirm the effectiveness of the partnership and to identify additional planning needs and new partners.

Each organization in the multi-agency partnership should have the ability to independently analyse received data to address their specific questions.

The organization should establish partnering arrangements in accordance with the procedure in ISO 22397.

4.8 Training and exercising

The organization should make training and exercising an integral component of the planning process.

Training and exercises should include opportunities to:

— practice communication procedures;

— measure operational capabilities;

— test equipment such as decontamination systems;

— train new staff;

— coordinate with non-governmental and humanitarian organizations;

— communicate with citizen representatives.

All levels of staff should be trained to achieve:

— a basic understanding of each stage of the mass evacuation planning process;

— specialist skills needed for their roles. For example, providing psycho-social support;

— knowledge for responding to different types of incidents.

Exercises can be used to train staff to respond to a variety of scenarios and test aspects of preparedness, including the following:

— communication with the public and key businesses;

— the efficiency of multi-agency coordination;

— telecommunications systems for warning dissemination;

— transportation of evacuees;

— support for vulnerable persons in an area;

— evacuation signs and evacuation routes;

— shelter identification and operation to permit suppliers to source and deliver necessary resources to the shelters.

Organizations should employ a multi-agency approach to training and exercising the public to provide a single consistent message across different response agencies.

The organization should conduct exercises in accordance with the procedure in ISO 22398.

5 Prepare the public for mass evacuation

5.1 General

The organization should develop a plan to inform the public on how to prepare and respond in the event of a mass evacuation. This clause describes how to:

— identify how the public can prepare for mass evacuation (5.2);

— use research findings when developing plans (5.3);

— identify key characteristics of the population (5.4);

— evaluate each identified social group (5.5);

— introduce products, services and activities which improve preparedness (5.6);

— reduce barriers to preparing for mass evacuation (5.7).

5.2 Identify how the public can prepare for mass evacuation

The organization should identify, document and communicate the expectations and responsibilities that the public have to prepare themselves for during a mass evacuation. It should also consider what knowledge the public should have and the behaviours they should be expected to exhibit.

The organization should establish measurable objectives that outline the desired changes in behaviour, knowledge and preparation for those at risk and use these objectives to assess the impact of planning and identify when they have been optimized.

When setting measurable objectives, consideration should be given to the following:

— desired behaviour or knowledge regarding preparations (e.g. collecting personal emergency supplies and knowing where to evacuate to);

— desired change in behaviours and knowledge based on established targets;

— specific time period in which the change should occur;

— review of new research findings to ensure that the objectives are realistic.

5.3 Use research findings when developing plans

The organization should review existing information and conduct additional research to:

— determine existing levels and gain a better understanding of the public's preparedness;

— identify the public's perception of the benefits and barriers to preparing;

— identify the public's information and communication needs;

— ascertain the public's expectations of, and level of confidence in government and non-government organizations as well as other emergency organizations;

— evaluate and implement new research findings.

5.4 Identify key characteristics of the population

The organization should identify key social groups, evaluate their needs and use appropriate communication methods to reach all groups within an affected area or area at risk. Not all public or social groups with particular characteristics need the same information and some require special communication methods based on their particular needs.

Table 2 — Characteristics of the public

Characteristic	Potential considerations
Age	Producing communications materials tailored to different age groups. For example, using pictures for young children, larger text for older adults and social media to reach teenagers and young adults.
Culture	Delivering advice and producing materials that take into account cultural sensitivities.
Duration in the area (permanent resident or in the area for a fixed duration of time)	Targeting members of the public that are in the area for a fixed duration of time. Disseminating communications materials in the main transport hubs (for commuters), hotels and information centres (for tourists), universities and colleges (for students) and key businesses (for employees and customers).
Socio-economic	Providing information in ways that are accessible to different socio-economic groups.
Gender	Producing communications that reflect different gender needs and expectations.
Language spoken	Producing communications in different languages and for different levels of literacy.
Location and proximity to the risk	Producing different hazard maps for different geographic areas.
Mobility and transportation	Providing people who need mobility or transportation support with information and services to aid them during an evacuation.
Occupational obligations	People with responsibilities and obligations related to their occupations can have particular needs during an evacuation. For example, farmers could require information on what to do with their livestock during a mass evacuation.
Political affiliations	Producing communication tailored to different political affiliations.
Religion	Producing communication tailored to the needs of different religions.
Vulnerability	Providing vulnerable persons with information services available to support them during an evacuation. For example, people with hearing difficulties could be warned by text message.

5.5 Evaluate each identified social group

The organization should identify and evaluate those groups potentially needing special attention and support.

This evaluation should include the following:

— the size of the group, as larger target groups can require more resources;

— existing levels of preparedness determined by the number of people in each specific target group who have created an evacuation plan;

— the ease with which each target group can be reached, recognizing that it can be more difficult to reach housebound people or those without access to communication networks;

— the cost of reaching each target group as there is a higher cost of tailoring communications materials to different audiences, such as those who do not speak the national language;

— the attitude of each group to evacuation and shelter;

— the organization's capabilities to evacuate target groups based on their existing resources and expertise.

Once social groups have been identified, the organization should review the objectives to ensure that they are realistic.

5.6 Introduce products, services, and activities which improve preparedness

The organization should consider, based on information about social groups, the provision of products, services, and activities including the following:

— a list of personal supplies and products for evacuation, such as a first aid kit, medication, and medical supplies;

— warning and informing services;

— risk assessment information to help enable the public to understand the risks and establish their own personal plans;

— information centres and displays;

— workshops and information sessions on local hazards and threats;

— internet-based services and websites for the public to monitor the activity of specific hazards;

— educational computer software and computer games on evacuation.

5.7 Reduce barriers to preparing for mass evacuation

The organization should consider ways to reduce possible barriers, and the activity and effort required from the public to prepare for, and participate in, a mass evacuation. Barriers can be financial, psychological, religious and time-related.

The organization should conduct research to identify what the public perceive as the main obstacles to preparing, make decisions on how to reduce or eliminate these obstacles, and identify methods to help the public to prepare and be involved in preparing for mass evacuation. Methods can include the following:

— providing clear information sources and checklists on how to prepare;

— involving the public in organizing and participating in mass evacuation exercises;

— engaging the public in designing and running information sessions.

When these activities are led by public representatives, it will help to ensure that the public retains lessons learned and sustains the momentum generated.

6 Visualize the areas that are at risk or affected

6.1 General

The organization should consider how mapping and visualization technologies can be used when planning for mass evacuation. For the area at risk or the affected area, Clause 6 describes the need to:

— map data about the area that is at risk or affected (6.2);

— consider types of information to capture on maps (6.3);

— ensure the compatibility of data to build maps (6.4).

Clause 6, when combined with Clause 4, aims to ensure that the visualized information shared among the partners is of good quality, accessible and usable, interoperable, adheres to good practice for those using it and is used.

6.2 Map data about the area that is at risk or affected

The organization should develop, use and maintain visualized information in every aspect of planning.

When developing maps, the organization should:

— identify users' real-time information needs such as for transport networks and emergency management resources;

— identify the type of information needed to prepare maps in advance of an incident;

— identify the new data to be collected during the incident to update maps;

— identify processes for collecting this new data;

— inform users of the limitations and strengths of the maps;

— ensure that personnel have the level of expertise required to use the tools in order to satisfy operational requirements.

When using maps, the organization should:

— ensure the maps help visualize the area that is at risk or affected;

— ensure that systems are compatible with geographic information systems (GIS) where possible, so that simulations and analyses can be conducted;

— make the results of simulations available to decision-makers;

— make the underlying data and the appropriate tools available to partnering organizations;

— plan to make maps available to relevant partner organizations at short notice during mass evacuation.

When maintaining maps, the organization should:

— keep maps updated in real-time with available information received from responders and social media, including:

  — an overview of the area used for planning purposes or of the areas that are at risk or affected;

  — the locations of emergency management and other related resources;

— action-specific information that can be provided to appropriate organizations;

— ensure that maps are time-stamped;

— involve all partner organizations in updating their information.

6.3 Types of information to capture on maps

Maps should include visualized information on the location as well as other information about the items listed. The different types of information that can be visualized include the following:

— settled population densities including those who speak a foreign language;

— transient population densities, such as tourists;

— built environment including transport networks;

— topography of the natural environment;

— emergency resources, such as police and fire personnel;

— facilities that require special consideration, such as medical, educational and correctional facilities;

— critical infrastructure such as electricity sub-stations, power plants and water providers;

— emergency evacuation shelters and areas of safety;

— types of land use, for example, livestock farming.

6.4 Ensure the compatibility of data to build maps

The organization should:

— seek the input of data from partnering organizations into a common system so that compatibility problems are not experienced across systems;

— assign, manage and use data from partnering organizations, such as utility companies and local authorities to build detailed maps to visualize the area;

— combine information from all partners and sources to map all visualized data to ensure it is compatible;

— encourage partnering organizations to use the same database and geographic information system to enable information sharing.

7 Make the evacuation decision

7.1 General

The organization should identify a process to help decision-makers be well prepared to order and implement an evacuation. Clause 7 describes the process as follows:

— develop an evacuation decision-making process (7.2);

— use evacuation objectives (7.3);

— resolve conflicting evacuation objectives (7.4);

— identify information needed to order an evacuation (7.5)

— ensure that decision-makers have access to needed information (7.6);

— identify factors that drive decisions for specific risks (7.7);

— develop a system to track and log decisions made (7.8).

The organization should adopt a structure for decision-making in emergencies in accordance with ISO 22322[1)] and conduct risk assessments when preparing for an evacuation decision in accordance with ISO 31000 and ISO/IEC 31010.

7.2 Develop an evacuation decision-making process

The organization should:

— identify a person responsible for its evacuation decision-making process and describe the decision-making structure of partnering organizations so that each organization's responsibilities are clearly understood;

— base the decision-making process on an incident management system to ensure that the roles and responsibilities are clearly defined;

— establish an explicit process for evacuation decision-making within existing command and control arrangements and communicate it across all relevant partnering organizations;

— familiarize partnering organizations with the decision-making process for the emergency scenarios in which they would participate.

The decision-making process should be:

— incorporated into policies;

— supported by organizations' internal processes and protocols;

— routinely reviewed and updated;

— known to those who make evacuation decisions;

— transparent to all partnering organizations;

— flexible to permit change in response to scenarios or hazard or threat intensities;

— incorporate the results of risk assessment.

The organization should consider the requirements for incident response in accordance with the procedure in ISO 22320.

7.2.1 Evacuation activation points

The organization should identify in its evacuation plan the activation points for evacuation, i.e. thresholds that determine when an evacuation would be an appropriate response to an incident. This should include details on the most appropriate response at different activation points, such as the need to deploy more resources or change the evacuation advice. Identifying these activation points on a timeline can aid decision-makers.

7.3 Use evacuation objectives

The organization should:

— identify and explicitly define their objectives for mass evacuation;

— involve citizen representatives in establishing objectives;

— include these objectives in policies, without restricting decision-making during an evacuation in situations where other objectives shall take precedence;

1) To be published.

— confirm that the objectives satisfy policies and align with standard operating procedures;

— use these objectives to evaluate appropriate and inappropriate evacuation actions such as sheltering-in-place, warning the public to be vigilant or advising them to leave the area immediately.

Table 3 — Measuring evacuation objectives

Objective	Measuring this objective
Saving human life should be the primary objective	
Protect the public from a hazard or threat.	Assessment of the fatality and injury rates to the public for the hazard/threat and also the evacuees who are leaving (or staying in) the affected area.
Other objectives that could be considered when saving life	
Limit economic disruption caused by the evacuation.	Measurement of the monetary loss to local business and the public caused by different evacuation actions.
Limit costs of evacuation to emergency organizations.	Measurement of the monetary cost of evacuation actions on all participating evacuation organizations (e.g. emergency services, NGOs).
Minimize public panic and disorder due to evacuation orders.	Assessment of public panic and disorder can be achieved by conducting surveys with the public and emergency managers after an incident.
Minimize public disregard for future evacuation orders.	Measurement using research findings or incorporating the possible effect that false evacuation can have on the public.
Maximize public confidence in officials.	Measurement includes surveys of public attitudes about how different evacuation scenario outcomes affect their confidence in emergency officials.
Maintain the integrity of criminal investigations.	Measured by the delay (in hours or days) to investigations from the evacuation decision.
Minimize the ongoing psychological effect on evacuees and the public.	Measurement of the cost of providing ongoing psychological support through the health care system.

The organization should analyse data on how each objective is satisfied by ordering an evacuation or by implementing a different operational response. The organization should accurately measure performance against evacuation objectives prior to and during an evacuation in order to identify the opportunities for improvements. Examples of some measurements for objectives are listed in Table 3.

7.4 Resolve conflicting evacuation objectives

Conflicting evacuation objectives can arise when a decision that aims to achieve one objective reduces the impact of achieving another objective. These should be identified, documented and understood by the partnering organizations to build a common view of the evacuation objectives for the partnership. For example, a conflicting pair of objectives would be making a decision that could limit the loss of life but could increase economic disruption.

The organization should:

— identify the potential for conflict between utility providers and responder organizations with respect to the timely but not premature isolation of electricity, gas and water supplies and recognize the complications of shutting down a power generating plant or other types of infrastructure;

— identify the potential impacts of evacuation related to commercial activities such as farming and livestock;

— plan for the needs of the people who evacuate and the needs of those who cannot or do not wish to evacuate.

7.5 Identify information needed to order an evacuation

The organization should identify the information needed by decision-makers who are deciding whether to order an evacuation, including the following:

— the nature of the risk including the likelihood and the diversity of impacts on the population;

— the time required to disseminate the alert and notify the public;

— the travel distance and time required for the public to reach a safe area;

— the environmental hazards that might be present as evacuees move to the safe area.

The organization should:

— use the information to plan the necessary resources and to determine how long it could take to evacuate the area and when the decision should be made to evacuate;

— identify when the information available to help make evacuation decisions is ambiguous, uncertain and contradictory;

— train decision-makers to operate in an environment of uncertainty.

7.6 Ensure that decision-makers have access to needed information

The organization should identify the communication between the organizations necessary to produce vital information and which decision-makers will use that information.

The organization's evacuation plans should ensure that:

— information is automatically provided to decision-makers on a real-time basis where appropriate;

— requests for information are transferred to information providers;

— communication options in partnering organizations include both normal and out-of-hours options;

— an effective communication process allows for transferring information from the appropriate information-producer to the decision-maker when real-time information is unavailable.

7.7 Identify factors that drive decisions for specific risks

The organization should consider the conditions at which an evacuation should be ordered and should monitor hazard and risk conditions in order to help anticipate evacuation actions as the situation changes i.e. as new decision thresholds are reached.

The organization should identify the following in evacuation plans:

— the thresholds for the conditions under which evacuation advice can change including thresholds of severity for specific risks, such as the height of flood waters or dose from radiological dispersion;

— risk factors as evacuation thresholds are approached;

— a list of participating organizations to be consulted as the likelihood of an evacuation increases.

7.8 Developing a system to track and log decisions made

The organization should develop and maintain a system to log important decisions made during an incident that records accounts of actions and their rationale and, where appropriate, make the logging system accessible remotely by partner organizations.

The organization should develop a process for incident response planning, including decision logs, in accordance with the procedure in ISO 22320.

8 Public warning

8.1 General

The organization should ensure that public warning messages are appropriate for the intended target groups. Community-based warning systems can be used to warn the public in time to evacuate.

Clause 8 describes the following activities related to alerting the public for mass evacuation:

— systems to warn and inform the public (8.2);

— promote a community-based warning system (8.3);

— protocols for communication with various stakeholders (8.4);

— design and test of a template for the warning message (8.5);

— analyse the anticipated time to warn the public (8.6).

The organization should warn the public in accordance with the procedure in ISO 22322.

8.2 Systems to warn and inform the public

The organization should:

— identify in its plans all official warning systems, including tone alert, sirens, public announcements, television and radio, automated dialling systems and internet systems;

— document how these systems are to be activated and used for mass evacuation;

— formalize the role of other media agencies in the warning dissemination process in addition to official warning systems and document agreements in the evacuation warning plan;

— identify a lead organization from the partnering organizations to coordinate with systems and media agencies on warning and informing;

— establish a process for continuously improving these arrangements including:

  — exercising agreements with media agencies on a wide range of scenarios;

  — training staff in media and public communication;

  — learning from international best practice on establishing positive partnerships with the media;

— measure the performance of the warning systems to understand their effectiveness;

— select an appropriate combination of systems to achieve desired levels of performance given that each warning system can require a different level of investment and have a different effectiveness under different situations.

8.3 Promote a community-based warning system

The organization should use community-based systems to improve the dissemination of warning and informing messages, such as through the spontaneous communication among social networks.

The dissemination of warning and informing messages can be facilitated through the following:

— encouraging the public to inform their neighbours;

— identifying social groups to help in disseminating the warning information;

— preparing advice on how social groups can act as a warning system to disseminate warning information;

— considering the social characteristics of target groups;

— using social networking and new technologies.

The organization should analyse the effectiveness of community-based systems considering that some systems cannot disseminate official or accurate information.

The organization should evaluate the community-based system to disseminate messages on preparing for an evacuation including the following:

— objectives of the messages;

— anticipated impact of communication methods, including:

  — social media;

  — printed materials, such as leaflets and brochures;

  — advertising through newspaper, television and radio, in telephone books and by direct mail;

  — educational initiatives including teaching preparedness in schools;

  — websites;

  — outdoor signage such as information signs, posters;

  — promotional items, for example calendars and mugs;

  — involvement of social groups in schools, workplaces;

  — information sessions at community meeting points, lectures and workshops;

  — traditional information systems and neighbourhood groups;

  — call centres;

— research results identifying the social groups' information needs and their preferred system of receiving information;

— budget assigned to communication, as systems such as television could reach more people but might have a significantly higher costs;

— advantages and disadvantages of each communication system as these could make it more or less suitable for achieving the objectives.

8.4 Protocols for communication with various stakeholders

8.4.1 The public

The organization should use communication systems, such as emergency helplines, media and social media to:

— obtain or provide information to the public on how to respond;

— gain additional information from the public to give to authorities;

— prioritize evacuation actions and communications, for example, asking vulnerable people to evacuate before the rest of the population;

— cope with the influx of information from the public;

— respond to and address the public queries;

— transmit this information to the relevant delegated authorities.

Protocols should accommodate populations with different characteristics such as those identified in Table 2.

The organization should:

— identify stakeholders, such as media agencies, community leaders, non-governmental organizations, ham radio operators and social media users who can provide assistance with alerting the public;

— make arrangements with these stakeholders to help them receive and relay core messages effectively.

8.4.2 Special facilities

The organization should:

— develop protocols for communicating with hospitals, long-term care facilities, nursing homes, schools, prisons, education centres, major buildings housing large numbers of people and areas with a high population of vulnerable people in addition to warning the general public;

— create a list of contacts including both stakeholders and special facilities and update it at regular intervals.

8.5 Design and test a template for the warning message

A single organization should be responsible for coordinating the warning message and for determining the appropriate timing for the release of messages.

An effective warning message should be:

— simple and clearly worded;

— designed in multiple languages relevant to the area;

— providing localized information;

— recommending response action;

— consistent with what has been previously communicated;

— time and date marked.

The organization should develop localized warning message templates to provide the public with information that is relevant to their area. These templates should be based on the following:

— understanding and research on the behavioural response of evacuees;

— research on the public's potential information needs;

— pre-testing of messages with the public.

The content of messages should include consideration of the following:

— the threat and its consequences;

— what the public is to do and not to do;

— how the public is to do what is expected;

— how information can be tailored to specific social groups including those who should take no action;

— the trusted sources of information;

— the time and date of the message.

8.6 Analyse the anticipated time to warn the public

The organization should research the capability to warn the public for different scenarios and the research used to establish operational targets, measure the speed with which the public can be warned (notification time) and the percentage of the population in the area at risk that can be reached (coverage).

Notification time and coverage should be analysed in order to:

— understand the effectiveness of using multiple warning systems in different situations, for example, at different times of day;

— analyse the impact of combining different systems on meeting warning targets to determine the effectiveness of systems;

— identify the vulnerabilities of different warning systems, such as the availability of telephone networks;

— design contingency plans to deal with system vulnerabilities.

The organization should:

— establish achievable, evidence-based performance targets for notification time and coverage;

— account for the potential vulnerabilities of individual warning systems and contingencies;

— consider the extent to which different warning systems can achieve operational targets.

9 Analyse evacuee movement

9.1 General

Organizations should analyse the time required to get pedestrians and traffic evacuees to a place of safety. The organization should collect data, analyse evacuation movement, conduct experiments and analyse their results to ensure that plans encourage safe and quick evacuations.

Clause 9 describes analysing evacuee movement as:

— understanding potential population movement (9.2);

— understanding evacuees' transportation behaviour (9.3);

— identifying demand and availability of the transport network (9.4);

— identifying transport performance measures and targets (9.5);

— analysing transport strategies and policies (9.6);

— communicating transport information to the public (9.7).

9.2 Understand potential population movement

General population movement information should be available even if it was not created specifically for emergency management scenarios or mass evacuation. The organization should obtain evacuation specific population movement models and verify them through testing or operational exercises.

Organizations should:

— analyse the time required to get pedestrians and traffic evacuees to a place of safety;

— use this information to inform the other stages of evacuation planning and determine the time available to make the evacuation decision;

— research the populations to support these analyses and to identify

  — the location of the public at different times of the day to determine the potential impact in an area;

  — the movement of population during an evacuation to understand where bottlenecks can occur and where resources could be needed.

9.3 Understand evacuees' transportation behaviour

The organization should use pre-evacuation and post-evacuation information to identify the potential transportation response of evacuees. Information on the following can be collected:

— the percentage of the public that can evacuate at different stages of alert;

— additional support that could be required by the public;

— the public's evacuation transport preference;

— preferred evacuation destinations;

— preferred evacuation routes if people use their own cars.

The organization should:

— consider how the public can react unexpectedly during evacuations and the special requirements they can have, including the factors set out in Table 2;

— analyse research findings to understand transport utilization and demand, spare capacity and the need for additional transportation.

9.4 Identify demand and availability of the transport network

The organization should:

— collect data during "normal" operations as well as during planned road closures, contraflows or speed restrictions;

— analyse quality and timely data on transportation;

— use data to estimate the daily usage of different types of transport;

— understand the potential demand and availability of the transport network during an evacuation.

To understand demand, data can be collected on the following:

— evacuating population including residents, transients and commuters;

— population size, density and zoning;

— number, type and location of registered vehicles including cars and motorcycles.

To understand availability, data can be collected on the following:

— the number and availability of transport vehicles including the capacity of planes, trains, automobiles, buses, trams, taxis and boats;

— operational issues, such as the number of operators;

— safety issues that could influence transport availability;

— the number of passengers that can use each mode of transport during an evacuation;

— traffic flows and routes including contraflow systems and evacuation routes;

— where additional capacity can be built in the transport network, such as the availability of additional buses;

— conflicts between different modes of transport, for example when more cars cause traffic jams reducing the evacuation speed of buses.

The following data should be analysed and understood:

— the time needed to evacuate;

— transportation required in different areas;

— congestion points where excess queues could build;

— the effect of different strategies and policy options on the transport network during the evacuation.

Models can help to:

— enhance an understanding of the transportation of evacuees;

— inform the setting of operational targets;

— analyse the conditions under which targets should be achievable.

9.5 Identify transport performance measures and targets

The organization should:

— identify performance measures for the transportation of evacuees;

— set operational targets to ensure that the transportation of evacuees meets an appropriate performance level;

— use the data collected to set operational targets;

— analyse whether targets are achievable in different scenarios;

— conduct analyses on how different policies and transport configurations can affect meeting operational targets;

— determine the key factors that can limit an operational response to identify the demand and availability of the transport network and set transport performance measures and targets.

Operational targets should include the following:

— total evacuation time per evacuee: the time from alerting the public to evacuees reaching a safe destination;

— overall evacuation time: the time required from the alert to the last evacuee, or an agreed percentage of evacuees, reaching a safe destination.

9.6 Analyse transport strategies and policies

The organization should:

— consider potential unforeseen challenges, such as the effect of flooded or unusable roads, unexpected responses from evacuees, vulnerability in the transport system posed by tunnels or bridges and unforeseen limited resources, such as availability of fuel or buses;

— identify and analyse a range of challenges to understand their impact on achieving operational targets;

— use the analysis to identify the impact of different strategies on pre-planned evacuation routes and contraflows, traffic signalling systems, restrictions on speed and vehicle type, such as tractors,