
**Security and resilience — Emergency
management —**

Part 1:
**General guidelines for the
implementation of a community-
based disaster early warning system**

Sécurité et résilience — Gestion des urgences —

*Partie 1: Lignes directrices générales pour la mise en oeuvre d'un
système d'alerte communautaire rapide en cas de catastrophe*



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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 292 *Security and resilience*.

A list of all parts in the ISO 22328 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Disasters such as earthquakes, tsunamis, volcanic eruptions, high river flows (e.g. floods, low river flows, sudden flash floods), landslides, storm surges and hurricanes as well as slow-onset events such as drought, extreme temperatures, heat waves or soil erosion can have devastating impacts. Disasters can happen anytime to anyone who lives in a disaster-prone area. These disasters injure and kill people and result in tremendous economic, social and environmental losses. Disasters can be caused by natural hazards and/or by human beings.

Disaster mitigation can be conducted by using various approaches, including the construction of prevention and protection works, which require a high investment of cost and time. In addition, disasters can have a varied and wide range of impact, meaning that implementing these measures may not be effective. Therefore, effective disaster risk reduction is implemented through various approaches, by means of improving the community's preparedness and consequent resilience through the implementation of an early warning system (EWS).

A community-based disaster EWS is proposed to empower individuals and communities who live in hazard-prone areas to be more aware, to react or evacuate in a sufficient time, and to reduce losses caused by disasters, such as injuries, loss of life, and damage to property, economy and the environment.

The implementation of a community-based disaster EWS is consistent with the Sendai Framework for Disaster Risk Reduction of 2015–2030^[6], specifically target g) of the seven global targets: "Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030". Based on the fourth priority of the framework, the improvement of preparedness is the basis for the capability to respond effectively to a disaster. Improvement of preparedness can be achieved by implementing an EWS, in addition to improving the dissemination and communication of knowledge about the early warning of disasters at local, national, regional and international levels.

According to UN-ISDR^[7], a complete and effective EWS consists of four interrelated key elements:

- a) risk knowledge;
- b) monitoring and warning service;
- c) dissemination and communication;
- d) response capability.

All of these elements are strongly correlated to the implementation of a community-based EWS.

EWSs are incorporated not only into engineering, but also into social aspects such as demography, economics and culture. This document encourages the active response of the community to disasters and considers social aspects in general. Further dissemination and communication of knowledge to the community are carried out by the authority at local and national levels.

By referring to the four key elements of a community-based EWS, this document promotes uniformity in the development and implementation of an EWS. It will improve the preparedness of the communities and interested parties vulnerable to disasters.

The community-based disaster EWS considers the different communication channels, legal aspects and responsibility allocation as well as final decision-making and its communication.

This document recognizes population behaviour response planning as a key part of the preparedness. It takes into account the approach of ISO 22315:2014^[3] and ISO 22322:2015^[4] and provides additional specifications for a disaster EWS.

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Security and resilience — Emergency management —

Part 1:

General guidelines for the implementation of a community-based disaster early warning system

1 Scope

This document gives guidelines for the implementation of a community-based disaster early warning system (EWS). It describes the methods and procedures to be implemented and provides examples.

This document is applicable to communities vulnerable to disasters, without taking secondary/indirect effects into consideration.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22300, *Security and resilience — Vocabulary*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

community vulnerability

characteristics and conditions of different exposed elements at risk, such as individuals, groups or infrastructures, that put them at risk for the destructive effects of a hazard

3.2

early warning

provision of information through local networks, allowing affected individuals to take action to avoid or reduce risks and to prepare responses

3.3

community-based early warning system

community-based EWS

method to communicate information to the public through established networks within institutional, political, legal and social contexts

Note 1 to entry: The warning system can consist of risk knowledge, monitoring and warning service, dissemination and communication, and response capability to avoid, reduce risks and prepare responses against disaster.

[SOURCE: ISO 22300:—, 3.27,¹⁾ modified — “early” has been added to the term and “within institutional, political, legal and social contexts” has been added to the definition.]

3.4
evacuation command

series of orders to evacuate people

3.5
evacuation drill

activity that practises a particular skill related to evacuation and often involves repeating the same thing several times

EXAMPLE A drill to practise safely evacuating a neighbourhood or village from a disaster.

[SOURCE: ISO 22300:—, 3.69, modified — “disaster” has replaced “landslide” in the example.]

4 Community-based disaster early warning system

4.1 General

The community-based disaster EWS should comprise five main sub-systems:

- a) risk assessment, see [4.2](#);
- b) dissemination and communication of knowledge, see [4.3](#);
- c) monitoring and warning service, see [4.4](#);
- d) response capability, see [4.5](#);
- e) commitment of the authority and community on the sustainability of the EWS, see [4.6](#).

4.2 Risk assessment

The disaster preparedness team should conduct a risk assessment in accordance with ISO 31000:2018, Clause 6^[5], and identify vulnerabilities.

The disaster preparedness team should consider the following factors in its risk assessment:

- Technical: To help understand the physical conditions of the vulnerable area; to classify the types and the range of hazards, their potential extremes and their dependencies; to collect information regarding the indicators of a disaster; and to determine vulnerable and safe zones. These indicators may include specific symptoms and conditions that indicate the potential hazards area. These indicators may be used to determine the placement of the EWS instruments.
- Institutional: To understand whether there are established organizations currently responsible for monitoring and mitigating in the disaster-prone areas and if respective legal frameworks are provided.
- Socioeconomic and cultural: To collect information on community demographics, such as population, by age, education, mobility and financial situation, the number of households, vehicles and livestock, and cultural considerations. These factors also provide information on the community’s knowledge concerning disasters. This information provides insight into the community’s perception of disaster risk and disaster risk reduction means (technology, population preparedness, etc.) that can be used to improve the successful introduction of the EWS and to gain an understanding of the community’s vulnerabilities and complexities.

NOTE 1 Information on potential vulnerable inhabitants and infrastructure due to disasters is important to determine the level of community vulnerability.

1) Under preparation. Stage at the time of publication: ISO/FDIS 22300:2020.

NOTE 2 The community's eagerness and motivation to actively participate is relevant to design strategies for disaster risk reduction programmes that are suitable for the local social conditions.

NOTE 3 The programmes can give knowledge and increase people's capacity to be able to decide what needs to be done in order to prevent and protect themselves from disasters.

4.3 Dissemination and communication of knowledge

The disaster preparedness team should:

- develop methods and materials on how to disseminate and communicate knowledge that provides the public with a comprehension and an understanding of the potential for disasters;
- provide information on the types of disasters, how and why they occur, the factors that control and trigger the events, and the structural and non-structural strategies to mitigate the consequences, including an EWS, warning levels and signage.

The dissemination and communication of knowledge should use clear language, provide useful information, identify the authoritative agency and provide multiple communications, including by traditional means but also using modern social media methods to ensure the maximum number of people is reached.

Effective dissemination provides for better understanding about disasters and knowledge about how to minimize risks once the EWS is in place.

The dissemination of information should lead to the identification of key people/organizations with an interest in participating in a disaster preparedness team.

These methods and materials for dissemination and communication of knowledge should be based on the preliminary data of the risk assessments.

4.4 Monitoring and warning service

The disaster preparedness team should place early detection devices in areas that cover the high-risk zones.

The installation of the equipment should be coordinated with the authority, with the aim to increase the sense of ownership and responsibility for the equipment's condition to guarantee safety.

The type and amount of early detection equipment and alert levels should be appropriate to the type of disaster.

The early detection devices installed to support the EWS should include the devices required to ensure the work of the EWS and additional tools to improve measurement accuracy.

To implement a community-based disaster EWS, the monitoring and early detection devices should use appropriate and adaptive technology.

The warning service should consider the different conditions and knowledge of the public (e.g. age of people, special requirements for vulnerable groups).

For information on monitoring and warning services to the public and communities, refer to ISO 22322:2015, 5.2 and 5.4^[4].

Monitoring data can be collected, transferred, stored and analysed. The results should be made available to the different users, such as experts, responsible entities and the public based on conditional access, which should be defined within the legal conditions and the warning service.

4.5 Response capability

4.5.1 General

The community should be able to respond to disasters in sufficient time with the right manner. In order to achieve a high level of coordination, community involvement is a key determinant of the successful implementation of an EWS. The authority should establish a disaster preparedness team, see [4.5.2](#). This disaster preparedness team should:

- determine an evacuation shelter, see [4.5.3](#);
- develop an evacuation map and routes, see [4.5.4](#);
- develop standard operation procedures; see [4.5.5](#);
- conduct an evacuation drill, see [4.5.6](#).

4.5.2 Establishing a disaster preparedness team

Disaster preparedness team members should be selected based on their knowledge and abilities in disaster preparedness, prevention, mitigation and post-disaster management.

The establishment of the disaster preparedness team is decided by the authority. The community is encouraged to initiate the proposal of the establishment of the disaster preparedness team to be approved by the authority.

[Annex A](#) gives an example of a community disaster preparedness team.

The disaster preparedness team should have expertise including knowledge of the disaster-prone area, data and information management, early warning and mass evacuation systems, first aid, logistics and security. The additional expertise required by the disaster preparedness team should be determined according to the needs of the community.

The disaster preparedness team should conduct preparedness activities, including:

- a) determining potential risk zones, evacuation shelter and evacuation routes;
- b) leading, preparing and training the community;
- c) organizing the design, installation, operation and maintenance of the technical system;
- d) defining the appropriate warning levels and explaining the behavioural consequences of each warning level for the different interested parties. See [Annexes C, D and E](#).

NOTE Points a), b), c) and d) can lead to the appropriate reaction mentioned in the standard operating procedure.

4.5.3 Determining an evacuation shelter

The evacuation process should be supported by a proper evacuation shelter, supporting facilities in the shelter and evacuation routes. Supporting facilities in the shelter should be ready all year round and consist of basic needs during emergency situations.

The evacuation shelter should be located in a place considered safe from disasters based on the technical risk assessment. Public buildings are encouraged to be used as shelter.

The evacuation route should be accessible to and from the evacuation shelter in all directions on foot and/or by vehicles.

In some incidents, it can be necessary to shelter in place. According to the incident, immediate evacuation may not be necessary. Shelter in place is only possible if the location is in the safe zone.

4.5.4 Developing an evacuation map and routes

The evacuation map and routes should:

- be developed based on the identification of risk zones;
- provide operational guidelines for the disaster preparedness team and the community to leave the risk zone, following a predetermined route, and to gather in the evacuation shelter;
- provide specific detail on secure locations to be used as assembly points and the evacuation routes toward the evacuation shelter.

The risk zones should be determined by the disaster preparedness team and should then be approved by the authority, institution officials or experts.

The evacuation map can include the information on:

- a) high-risk and low-risk (safe) zones;
- b) residences, including the estimation of the number of residents in each;
- c) critical infrastructures and community facilities: schools, places of worship, community health centres, offices, markets and landmarks;
- d) streets and alleys, rivers, and the coastline;
- e) locations of EWS installation points;
- f) alert devices (e.g. warning lights, sirens);
- g) assembly point(s);
- h) evacuation route(s);
- i) location of shelter(s).

[Annex B](#) gives an example of a layout of the evacuation map and route.

4.5.5 Developing standard operating procedures

Standard operating procedures (SOPs) should contain the procedures and guidelines for the disaster preparedness team, the potentially affected individuals and the authority responsible for responding to the alert issued by the disaster early warning instrument.

SOPs should be prepared based on the discussions and agreements of each division in the disaster preparedness team under the direction of relevant interested parties and the authority to follow the flow of warning information, delivery mechanisms and evacuation commands as well as in consultation with the public within a risk governance process.

The SOP may contain alert levels, such as:

- Level 1 (CAUTION: disaster occurrence possible);
- Level 2 (WARNING: disaster occurrence likely);
- Level 3 (EVACUATE: disaster occurrence imminent).

Not all of these SOP levels apply in all communities.

[Annex C](#) gives an example of a scheme of a community-based EWS.

[Annex D](#) gives an example of a flow of warning information and evacuation command.

[Annex E](#) gives an example of an evacuation SOP.

NOTE For all SOPs, the consequent and respective actions of all involved parties have to be defined and communicated in a manner appropriate for the respective groups.

4.5.6 Conducting an evacuation drill

An evacuation drill, based on a scenario in accordance with the SOP, to ensure the function of the devices as well as the capacity of the community should be conducted when:

- the risk assessment is conducted;
- the disaster preparedness team is formed;
- the evacuation map and routes are determined;
- the evacuation SOP is available and the devices are installed.

The objectives of an evacuation drill are:

- to improve the capacity of the disaster preparedness team, the community and the authority to respond quickly and appropriately in the event of a potential disaster;
- to introduce the local community residents to their responsibilities in the event of an evacuation and to familiarize residents with the alert or notification (e.g. sirens, lights or other suitable alert channels) issued by the early warning detection devices.

The evacuation drill should:

- be based on a scenario in accordance with the SOP to ensure the function of the devices as well as the capacity of the community to be prepared;
- include regular exercises of the emergency management team and the responsible institutions as well as with the potentially affected public society;
- be conducted at least once a year.

The scenarios of the SOP should not only be based on conditions already experienced in the past, but should also consider extreme events, even if they have not been reported yet.

NOTE The evacuation drill can compromise the whole workflow, but can also be focused on specific aspects within the warning chain.

4.6 Commitment of the authority and community on the sustainability of the early warning system

The authority and community should:

- demonstrate a strong commitment to the disaster EWS and sustain the operation and maintenance of the system;
- determine the responsibility for ownership, installation, operation, maintenance and security of an EWS in each location based on local conditions.

NOTE The installation of a clear warning chain includes different alert levels and the definition of respective actions.

Annex A
(informative)

Example of a community disaster preparedness team

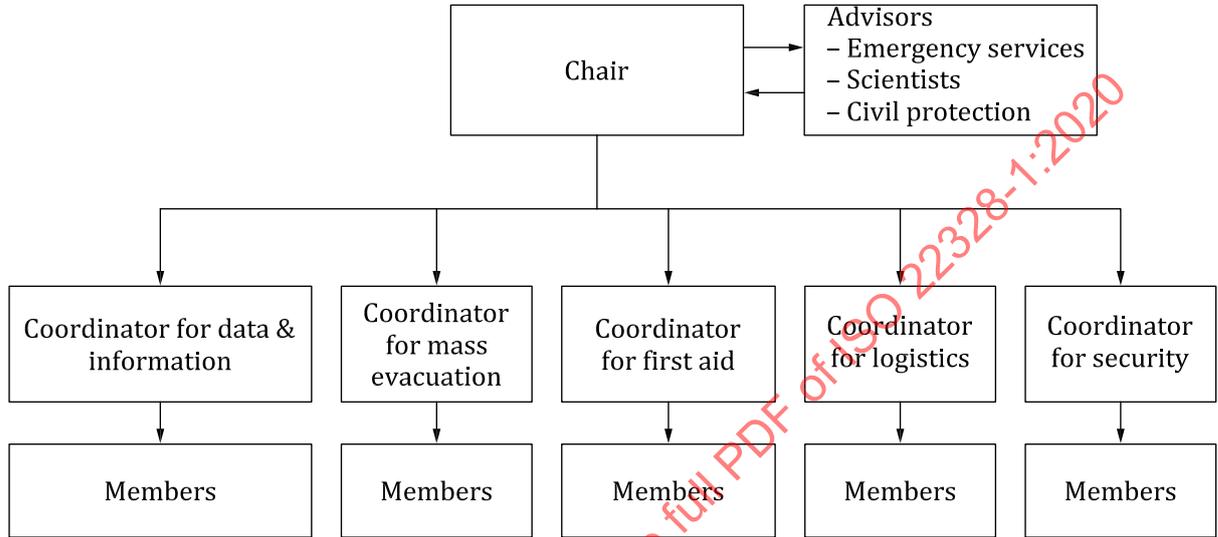
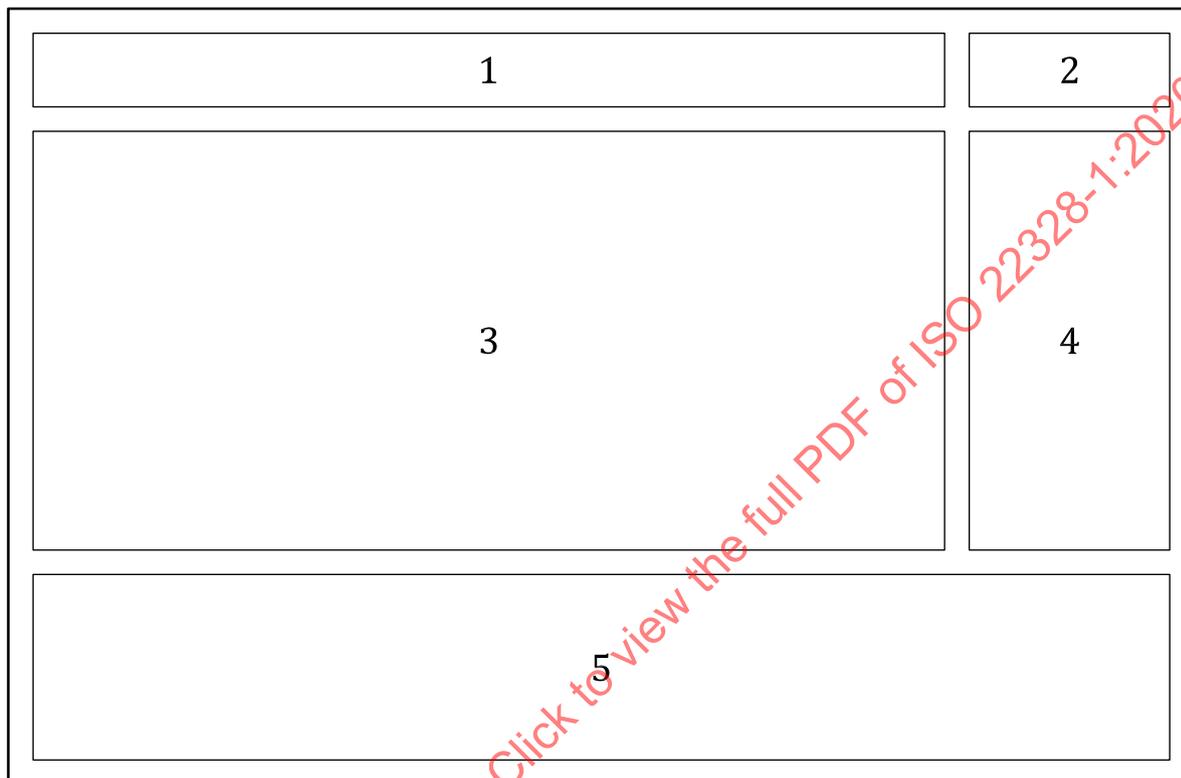


Figure A.1 — Example of a community disaster preparedness team

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Annex B (informative)

Example of a layout of the evacuation map and routes



Key

- 1 title of the evacuation map indicating the location of the EWS implementation
- 2 logo of the local authorities or other relevant interested parties
- 3 evacuation map and routes
- 4 legend and important information (landmarks) including common signs easily recognizable by the community
- 5 other information

Figure B.1 — Example of a layout of the evacuation map and routes

The evacuation map does not need to include the scale but only the north direction, which can be placed in the legend. The north direction may not face up, depending on the local customs.

When setting up an evacuation route, the appropriate symbols from ISO 7001^[1] and ISO 7010^[2] should be used.

Annex C (informative)

Example of a scheme of a community-based early warning system

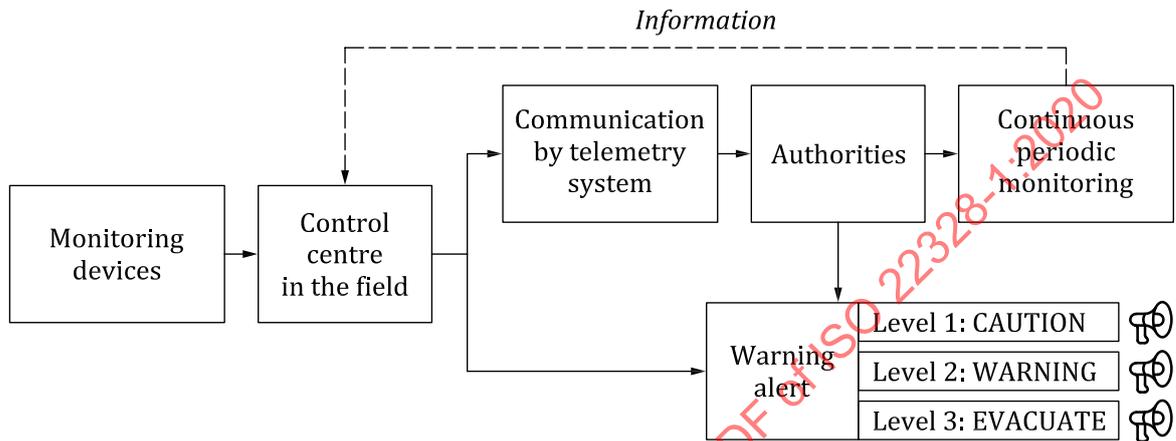


Figure C.1 — Example of a scheme of a community-based early warning system

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Annex D (informative)

Example of a flow of warning information and evacuation command

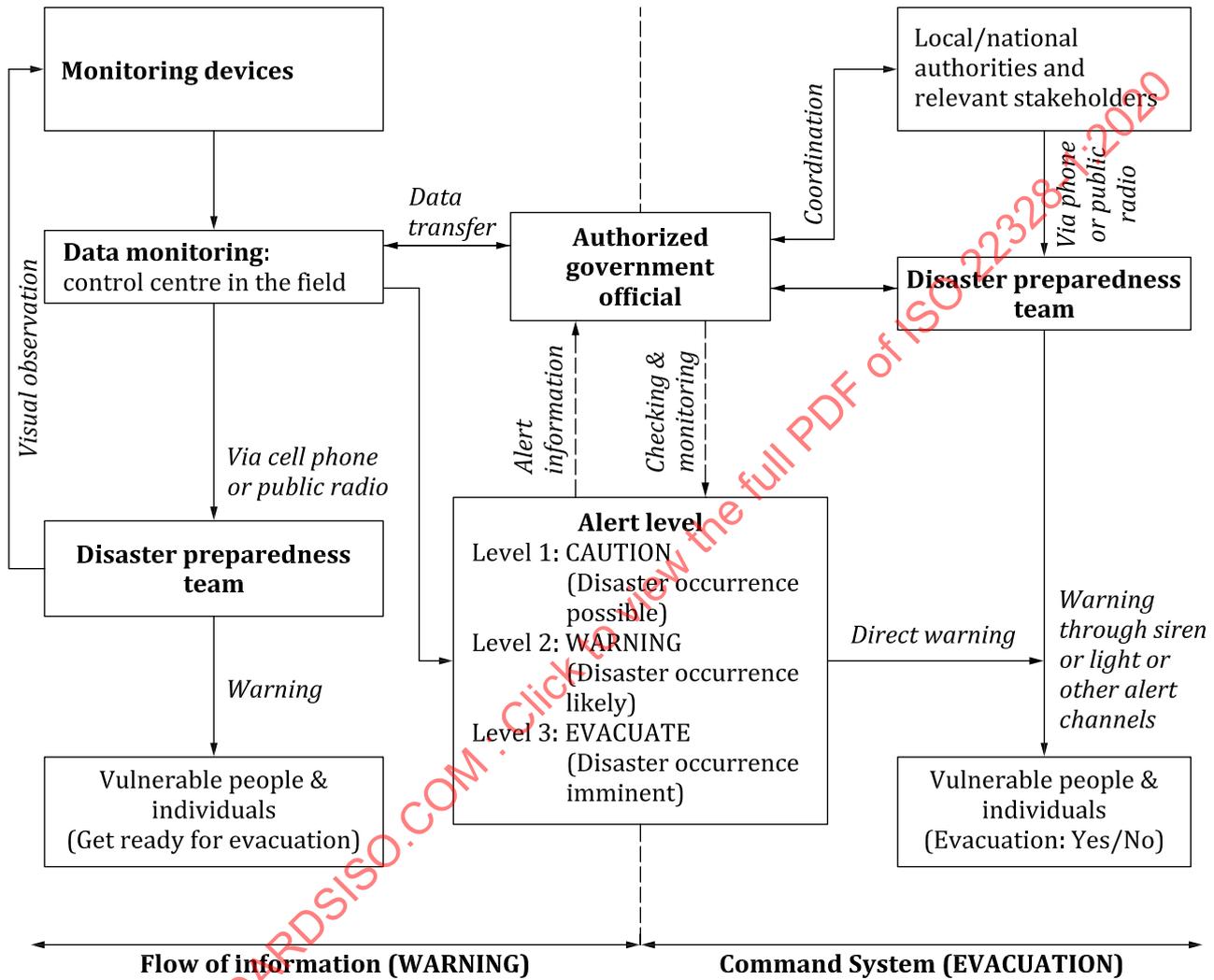


Figure D.1 — Example of a flow of warning information and evacuation command

Annex E
(informative)

Example of an evacuation standard operating procedure

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