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HUMAN FACTORS

International operation – Definitions

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**Terms and definitions for disaster relief  
systems, network resilience and recovery**

Recommendation ITU-T E.102



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# Recommendation ITU-T E.102

## Terms and definitions for disaster relief systems, network resilience and recovery

### Summary

Recommendation ITU-T E.102 applies to disaster relief systems, network resilience and recovery. This Recommendation provides definitions of terms relevant to disaster relief systems, network resilience and recovery, including terms relevant to network architecture, functional elements and interfaces, application level aspects and power supply. Appendix I contains excerpts of the terminology defined by the United Nations International Strategy for Disaster Reduction (UNISDR). Appendix II shows the category classification of terms defined in this Recommendation.

### History

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# Recommendation ITU-T E.102

## Terms and definitions for disaster relief systems, network resilience and recovery

### 1 Scope

This Recommendation contains terms and definitions relevant to providing a common general understanding in the area of disaster relief systems, network resilience and recovery. It also supports the harmonized creation of terms and definitions in this area.

Some of the terms defined in this Recommendation are associated with definitions in other Recommendations, such as [b-ITU-T E.108], [b-ITU-T E.119] and [b-ITU-T L.392]. References to these definitions are given in parenthesis as an aid to ensure consistency between the different Recommendations in the event of future amendments.

### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

None.

### 3 Definitions

#### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1 broadband PPDR radiocommunications** [b-ITU-R Rep-M.2377-1]: Broadband applications enable an entirely new level of functionality, with additional capacity to support higher data speeds and higher image resolution. It should be noted that the demand for multimedia capabilities (several simultaneous wideband and/or broadband applications running in parallel) puts a huge demand for very-high bit rates on a wireless system.

Broadband applications provide voice, high-speed data, high-quality, digital, real-time video and multimedia (indicative data rates are in the range of 1-100 Mbit/s) with channel bandwidths dependent on the use of spectrally efficient technologies.

Examples of possible applications include:

- high-resolution video communications from wireless clip-on cameras to a vehicle-mounted computer, used during traffic stops or responses to other incidents, or for video surveillance of security entry points such as airports with automatic detection based on reference images, hazardous material or other relevant parameters;
- remote monitoring of patients and remote, real-time video views that demand high bit rates. The demand for capacity can easily be envisioned during rescue operations following a major disaster.

Broadband applications are considered capable to cover functionalities provided by narrowband and wideband applications.

**3.1.2 business continuity plan (BCP)** [b-ITU-T E.119]: A plan that enables businesses to continue to operate even during a disaster. The plans are made before a disaster and are used by public organizations mainly to save the lives of victims.

**3.1.3 delay tolerant networks (DTN)** [b-ITU-T L-Sup.35]: A technology that stores the information when it is connected to the source (e.g., mobile terminal), and delivers the information to the destination when it finds the end-user.

**3.1.4 dependability** [b-ITU-T E.800]: A performance criterion that describes the degree of certainty (or surety) with which the function is performed regardless of speed or accuracy, but within a given observation interval.

**3.1.5 digital signage (DS)** [b-ITU-T H.780]: A system that sends information, advertising and other messages to electronic devices (e.g., displays, speakers) in accordance with the time of day and the location of the display, or the actions of audience. Contents and their relevant information, such as display schedules, are delivered over networks.

**3.1.6 disaster message board service** [b-ITU-T E.108]: A type of disaster relief service that enables people to input text messages into a network-based message board facility for delivery to or retrieval by other people.

**3.1.7 disaster relief** [b-ITU-T E.108]: Information or action to be effective for reduction and suppression of a serious disruption of the functioning society. The disruption may be caused by accidents, natural phenomena or human activity, and results in a significant widespread threat to human life, health, property or the environment.

**3.1.8 disaster relief system** [b-ITU-T E.108]: A system that provides disaster relief (response) services to related parties, which include affected victims, rescue workers and systems.

**3.1.9 disaster response** [b-UNISDR]: The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

NOTE – Disaster response is predominantly focused on immediate and short-term needs and is sometimes called "disaster relief". The division between this response stage and the subsequent recovery stage is not clear-cut. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.

**3.1.10 disaster voice message delivery service** [b-ITU-T E.108]: A type of disaster relief service that enables people to input packetized voice messages on to network facilities for delivery to or retrieval by other people.

**3.1.11 early warning system** [b-UNISDR]: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

NOTE – This definition encompasses the range of factors necessary to achieve effective responses to warnings. A people-centred early warning system necessarily comprises four key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection through to community response.

**3.1.12 e-health** [b-ITU-T X.1092]: The transfer of health resources and health care by electronic means.

**3.1.13 emergency call** [b-ITU-T Q-Sup.47]: A call requesting emergency services. A caller is given a fast and easy means of giving information about an emergency situation to the appropriate emergency organization (e.g., fire department, police, and ambulance). Emergency calls will be routed to the emergency services in accordance with national regulations.

**3.1.14 local wireless mesh network** [b-ITU-T L-Sup.35]: A local-area network that consists of multiple relay-capable nodes connected with each other via multiple wireless links (i.e., in a mesh topology), governed by specialized control for discovering communication paths from among available nodes and wireless links and provides information relay services to the user terminals (typically Wi-Fi terminals).

NOTE – The relay nodes are assumed to be placed on the top of the buildings or ground with good visibility in preparation for disaster, installed where needed, or transported by car or plane. Local communication service in a relatively limited area provided by a private company or local government (rather than public network operators) is an initial design target.

**3.1.15 movable and deployable ICT resource unit (MDRU)** [b-ITU-T L.392]: A collection of information and communication resources that are packaged as an identifiable physical unit, movable by any of multiple transportation modalities, and which act as a stand-in (substitute) for damaged network facilities, and reproduce and extend their functionalities.

NOTE – Packed into a container or box, an MDRU accommodates equipment for reproducing ICT services such as switches/routers, wired/wireless transmitters/receivers, servers, storage devices, power distribution unit, and air conditioners.

**3.1.16 network recovery** [b-ITU-T L-Sup.35]: The process of recovering the service level of a given communication network after a disaster.

**3.1.17 network resilience** [b-ITU-T L-Sup.35]: The ability to provide and maintain an acceptable level of service in the face of faults and challenges to normal operation of a given communication network, based on prepared facilities.

**3.1.18 outage** [b-ITU-T X.790] [b-ITU-T X.791]: Unavailability of a service or resource.

**3.1.19 public protection and disaster relief (PPDR)** [b-ITU-R Rep-M.2377-1]: The term Public Protection and Disaster Relief (PPDR) is defined in Resolution 646 (Rev.WRC-15) as a combination of two key areas of emergency response activity:

- Public protection (PP) radiocommunication: Radiocommunications used by agencies and organizations responsible for dealing with maintenance of law and order, protection of life and property, and emergency situations.
- Disaster relief (DR) radiocommunication: Radiocommunications used by agencies and organizations dealing with a serious disruption in the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether suddenly or as a result of complex, long-term processes.

**3.1.20 recovery** [b-UNISDR]: The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

NOTE 1 – The recovery task of rehabilitation and reconstruction begins soon after the emergency phase has ended, and should be based on pre-existing strategies and policies that facilitate clear institutional responsibilities for recovery action and enable public participation. Recovery programmes, coupled with the heightened public awareness and engagement after a disaster, afford a valuable opportunity to develop and implement disaster risk reduction measures and to apply the "build back better" principle.

NOTE 2 – This term is related to definition 3.2.39 provided in [b-ITU-T X.860].

**3.1.21 safety confirmation** [b-ITU-T E.119]: Information about the safety of users who might be affected by a disaster to be collected and managed at more than one site, and be reported to specified person.

**3.1.22 telecommunications for disaster relief (TDR)** [b-ITU-T Y.2205]: An international and national telecommunications capability for purposes of disaster relief. It can make use of

international permanent, shared network facilities already in place and operational, temporary network facilities that are provisioned specifically for TDR, or a suitable combination of the two.

**3.1.23 terminal device (TD)** [b-ITU-T Y.1901]: An end-user device which typically presents and/or processes the content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP terminal or an audio-visual media player.

**3.1.24 victim** [b-ITU-T E.119]: A person affected by a disaster.

## **3.2 Terms defined in this Recommendation**

This Recommendation defines the following terms:

**3.2.1 dedicated PPDR system:** A system for disaster relief and early warning that has been designed, implemented and operated only for a dedicated purpose.

**3.2.2 disaster preparedness:** The state of having been made ready or prepared to counter the effects of a natural hazard (e.g., earthquake, tsunami)

NOTE – This term is related to the definition of "prevention" provided in [b-UNISDR].

**3.2.3 disaster reconstruction phase:** The phase in which the communication infrastructure necessary for the rebuilding of the disaster affected area is provided.

NOTE – This is related to the term provided in clause 3.2.1 of [b-ITU-T H.785.0].

**3.2.4 disaster relief guidance system:** A disaster relief system that provides location information about 1) the current location of the user, 2) user-specified sites (e.g., home or office), 3) other sites (e.g., evacuation shelters, hospitals, stations and public facilities), and route information that guides users to these sites.

**3.2.5 disaster relief phase:** The time period for immediate response after a disaster has occurred to overcome the immediate effects of the disaster.

NOTE – Such relief work includes providing food, clothing, shelter, and medical care to victims. Emergency communication links for connecting people to each other and conveying damage status information are most important. For disasters, such as earthquakes or tsunamis this phase may last for weeks or months.

**3.2.6 disaster restoration phase:** The time period after a disaster has occurred in which efforts are made to establish evacuation shelters for people, to restore the administrative functions of local communities, and to rebuild the basic infrastructure of daily life.

NOTE – This is related to the term provided in clause 3.2.2 of [b-ITU-T H.785.0].

**3.2.7 disaster relief for individuals:** Actions taken to notify individual persons of the latest disaster relief information and/or collect the latest situation information of the individuals.

**3.2.8 disaster relief for general public:** Actions taken to notify general public of the latest disaster relief information.

**3.2.9 disaster relief radiocommunication:** Radiocommunication used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as a result of unexpected complex, long term process.

**3.2.10 m-health:** A sub-category of e-health that uses mobile devices for collecting health data, delivering healthcare information to practitioners and patients, the real-time monitoring of patient vital signs, and the direct provision of care.

**3.2.11 power outage:** An outage of the electrical power to an area.

NOTE – The loss can be short term or long term, also called a blackout.

**3.2.12 privacy policy statement:** A document that describes some or all of the ways of gathering, using, disclosing and managing privacy related information and the related objectives.

**3.2.13 reconstruction:** The act or process of long term rebuilding of the telecommunication infrastructure and/or parts of it.

**3.2.14 safety confirmation and message broadcast service:** A type of disaster relief service that confirms the safety of people in public agencies or discrete groups and broadcasts messages to them regarding their relief activities.

NOTE –For details of the service, please refer to [b-ITU-T E.119].

**3.2.15 telecommunication shared system:** System that is commonly used for both usual services and urgent services such as disaster relief and early warning.

#### **4 Abbreviations and acronyms**

This Recommendation uses the following abbreviations and acronyms:

BCP	Business Continuity Plan
DR	Disaster Relief
DS	Digital Signage
DTN	Delay Tolerant Networks
ICT	Information and Communications Technology
MDRU	Movable and Deployable ICT Resource Unit
NRR	Network Resilience and Recovery
PPDR	Public Protection and Disaster Relief
TDR	Telecommunications for Disaster Relief
Wi-Fi	Wireless Fidelity

#### **5 Conventions**

None.

## Appendix I

### Terminology developed by UNISDR

(This appendix does not form an integral part of this Recommendation.)

The United Nations International Strategy for Disaster Reduction (UNISDR) develops basic definitions on disaster risk reduction to promote a common understanding on the subject for use by the public, authorities and practitioners.

This appendix contains excerpts from UNISDR Terminology on Disaster Risk Reduction, published by The United Nations Office for Disaster Risk Reduction in 2009 [b-UNISDR].

#### **Disaster**

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Comment: Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

#### **Disaster risk**

The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.

Comment: The definition of disaster risk reflects the concept of disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses which are often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socio-economic development, disaster risks can be assessed and mapped, in broad terms at least.

#### **Disaster risk management**

The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Comment: This term is an extension of the more general term "risk management" to address the specific issue of disaster risks. Disaster risk management aims to avoid, lessen or transfer the adverse effects of hazards through activities and measures for prevention, mitigation and preparedness.

#### **Disaster risk reduction**

The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Comment: A comprehensive approach to reduce disaster risks is set out in the United Nations-endorsed Hyogo Framework for Action, adopted in 2005, whose expected outcome is "The substantial reduction of disaster losses, in lives and the social, economic and environmental assets of communities and countries." The International Strategy for Disaster Reduction (ISDR) system

provides a vehicle for cooperation among Governments, organizations and civil society actors to assist in the implementation of the Framework. Note that while the term "disaster reduction" is sometimes used, the term "disaster risk reduction" provides a better recognition of the ongoing nature of disaster risks and the ongoing potential to reduce these risks.

### **Early warning system**

The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Comment: This definition encompasses the range of factors necessary to achieve effective responses to warnings. A people-centered early warning system necessarily comprises four key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection through to community response.

### **Emergency management**

The organization and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness, response and initial recovery steps.

Comment: A crisis or emergency is a threatening condition that requires urgent action. Effective emergency action can avoid the escalation of an event into a disaster. Emergency management involves plans and institutional arrangements to engage and guide the efforts of government, non-government, voluntary and private agencies in comprehensive and coordinated ways to respond to the entire spectrum of emergency needs. The expression "disaster management" is sometimes used instead of emergency management.

### **Preparedness**

The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

Comment: Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response through to sustained recovery. Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities. The related term "readiness" describes the ability to quickly and appropriately respond when required.

### **Prevention**

The outright avoidance of adverse impacts of hazards and related disasters.

Comment: Prevention (i.e., disaster prevention) expresses the concept and intention to completely avoid potential adverse impacts through action taken in advance. Examples include dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high risk zones, and seismic engineering designs that ensure the survival and function of a critical building in any likely earthquake. Very often the complete avoidance of losses is not feasible and the task transforms to that of mitigation. Partly for this reason, the terms prevention and mitigation are sometimes used interchangeably in casual use.

## **Response**

The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Comment: Disaster response is predominantly focused on immediate and short-term needs and is sometimes called "disaster relief". The division between this response stage and the subsequent recovery stage is not clear-cut. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.

## **Recovery**

The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Comment: The recovery task of rehabilitation and reconstruction begins soon after the emergency phase has ended, and should be based on pre-existing strategies and policies that facilitate clear institutional responsibilities for recovery action and enable public participation. Recovery programmes, coupled with the heightened public awareness and engagement after a disaster, afford a valuable opportunity to develop and implement disaster risk reduction measures and to apply the "build back better" principle.

## **Resilience**

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Comment: Resilience means the ability to "resile from" or "spring back from" a shock. The resilience of a community in respect to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need.

## **Vulnerability**

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

Comment: There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure. However, in common use the word is often used more broadly to include the element's exposure.

## **Risk**

The combination of the probability of an event and its negative consequences.

Comment: This definition closely follows the definition of the ISO/IEC Guide 73. The word "risk" has two distinctive connotations: in popular usage the emphasis is usually placed on the concept of chance or possibility, such as in "the risk of an accident"; whereas in technical settings the emphasis is usually placed on the consequences, in terms of "potential losses" for some particular cause, place and period. It can be noted that people do not necessarily share the same perceptions of the significance and underlying causes of different risks.

See other risk-related terms in the Terminology: Acceptable risk; Corrective disaster risk management; Disaster risk; Disaster risk management; Disaster risk reduction; Disaster risk reduction plans; Extensive risk; Intensive risk; Prospective disaster risk management; Residual risk; Risk assessment; Risk management; Risk transfer.

### **Risk assessment**

A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

Comment: Risk assessments (and associated risk mapping) include: a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability including the physical social, health, economic and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities in respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process.

### **Risk management**

The systematic approach and practice of managing uncertainty to minimize potential harm and loss.

Comment: Risk management comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. It is widely practiced by organizations to minimise risk in investment decisions and to address operational risks such as those of business disruption, production failure, environmental damage, social impacts and damage from fire and natural hazards. Risk management is a core issue for sectors such as water supply, energy and agriculture whose production is directly affected by extremes of weather and climate.

## Appendix II

### Category classification of terms defined in this Recommendation

(This appendix does not form an integral part of this Recommendation.)

#### II.1 Introduction

This appendix provides a categorized list of terms described in this Recommendation.

#### II.2 Terms relevant to general definitions on disaster and disaster relief

dependability [b-ITU-T E.800]

dedicated PPDR system

disaster preparedness

disaster reconstruction phase

disaster relief [b-ITU-T E.108]

disaster relief for individuals

disaster relief for general public

disaster relief phase

disaster relief radiocommunication

disaster relief system [b-ITU-T E.108]

disaster restoration phase

disaster response [b-UNISDR]

early warning system [b-UNISDR]

privacy policy statement

public protection and disaster relief (PPDR) [b-ITU-R Rep-M.2377-1]

reconstruction

recovery [b-UNISDR]

telecommunication shared system

victim

#### II.3 Terms related to definitions on network resilience and recovery

##### II.3.1 General

network recovery [b-ITU-T L-Sup.35]

network resilience [b-ITU-T L-Sup.35]

##### II.3.2 Terms relevant to network architecture

delay tolerant networks (DTN) [b-ITU-T L-Sup.35]

local wireless mesh network [b-ITU-T L-Sup.35]

movable and deployable ICT resource unit (MDRU) [b-ITU-T L.392]

telecommunications for disaster relief (TDR) [b-ITU-T Y.2205]

### **II.3.3 Terms related to functional elements and interfaces**

digital signage [b-ITU-T H.780]

terminal device (TD) [b-ITU-T Y.1901]

### **II.3.4 Terms related to application level aspects**

broadband PPDR radiocommunications [b-ITU-R Rep-M.2377-1]

business continuity plan (BCP) [b-ITU-T E.119]

disaster message board service [b-ITU-T E.108]

disaster relief guidance system

disaster voice message delivery service [b-ITU-T E.108]

emergency call [b-ITU-T Q-Sup.47]

e-health [b-ITU-T X.1092]

m-health

safety confirmation [b-ITU-T E.119]

safety confirmation and message broadcast services

### **II.4 Terms related to power supply**

outage [b-ITU-T X.790]

power outage

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