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Intelligent transport systems — Emergency evacuation and disaster response and recovery —

Part 1: Framework and concept of operation

Systèmes intelligents de transport — Évacuation d'urgence et intervention en cas de catastrophe et rétablissement —

Partie 1: Cadre et concept opérationnel

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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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

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

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Introduction

This document defines the framework and concept of operation for developing a public transport decision support system for evacuations and disaster response and recovery. This includes establishing the criteria under which public transport prepares for, responds to, and recovers from a disaster. The criteria, as established by national, regional and local governance based on the type and severity of the emergency, are used to identify the roles and responsibilities of public transport within the boundaries of the Intelligent Transport System architecture. For example, the criteria for a localized disaster such as a chemical plant fire will be governed by local or regional response plans and requires fast response times. Whereas, a hurricane having a wider impact may be governed by national response plans, as well as local and regional, and allow pre-planning to take place because they are typically slower moving. It is important to emphasize that this document focuses only on those activities related to ground transportation and does not address societal issues (i.e. sheltering, aid, security, etc.) nor does it address air or rail transportation associated with disaster management. The reader is directed to ISO/TC 292 for societal issues and to ISO/TC 20 SC 17 and ISO/TC 269 for air and rail transportation issues associated with disasters. This document adheres to ISO 22300, which contains terms and definitions applicable to societal security to establish a common understanding so that consistent terms are used.

It is also important to note that this document relies on national, regional, and local policies and authorities to create a concept of operation. The concept of operations defines the set of requirements needed for designing, developing, and deploying a Decision Support System for evacuation and disaster response and recovery. The Decision Support System is an interactive software-based system intended to help public transport emergency services personnel compile useful information from a combination of raw data, documents, and personal knowledge, or traffic models. This knowledge is then used to identify and solve evacuation and disaster response and recovery problems and disseminate those decisions to emergency managers, traffic managers, public transport, and the public itself. The Decision Support System is a natural progression from Computer Aided Dispatch and Automatic Vehicle Location systems which has been the core Intelligent Transportation Systems (ITS) used by public transport. The Decision Support System combines the use of traffic models and analytic techniques with traditional ITS data access and retrieval functions to solve less well structured, underspecified evacuation and disaster response and recovery problems that upper level managers may face in a disaster.

The goal of this document is to save lives and aid recovery by using ITS technologies to coordinate a comprehensive transportation response to disaster. This includes using the Decision Support System to identify routes and manage equipment and personnel to ensure public transport is used to evacuate people out of harm's way and provide transportation support for all response and recovery efforts from major disasters such as hurricanes, tsunamis, or catastrophic accidents. This document recommends public transport to serve as the primary mobility agent for all transportation-related actions before, during and after a disaster. This represents a paradigm shift from past response and recovery efforts such as the Great Japan Earthquake 2011 or Hurricane Katrina in the US, which typically see transportation-related activities coordinated by emergency managers who rely on traffic managers and public transport service operators to provide the services. While the emergency manager is the responsible individual for any disaster and will continue to do so, the role of coordinating transportation between traffic management, emergency services and public transport should be assigned to a public transport professional. The reasoning for this shift of responsibility is that public transport has the most experience and the resources to move large numbers of people efficiently and in a timely manner, which is paramount before, during and after a disaster. This may present problems in rural areas as ITS technologies, equipment and personnel may not be available to carry out these assignments. Additionally, problems may exist due to differences in country-based operational methodology between Asia, North America, and Europe. In Asia, public transport is predominantly run by privately owned and publicly traded mass transit and real estate conglomerates. In North America, public transport is predominantly run by municipal transit authorities. In Europe, public transport is predominantly run by both public-owned and private companies. The ideal solution is to ensure that a public entity is responsible for the public transport emergency management and that personnel operating the Decision Support System are professionals from the public transport sector.

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The ISO/TR 19803- series recommends the creation of a cloud-based Emergency Evacuation and Disaster Response and Recovery (EEDRR) Decision Support System to assist, coordinate, and direct all transportation services, including those used by emergency management, traffic management and public transport. The cloud-based solution allows different services (i.e. servers, storage and applications) to be delivered to emergency management/public transport computers and devices through the Internet; thus, providing access to the EEDRR even when access to the physical area is not possible because of the disaster. The major actors involved in coordinating transportation services related to a disaster and the systems required for communicating the associated information are shown in Figure 1.

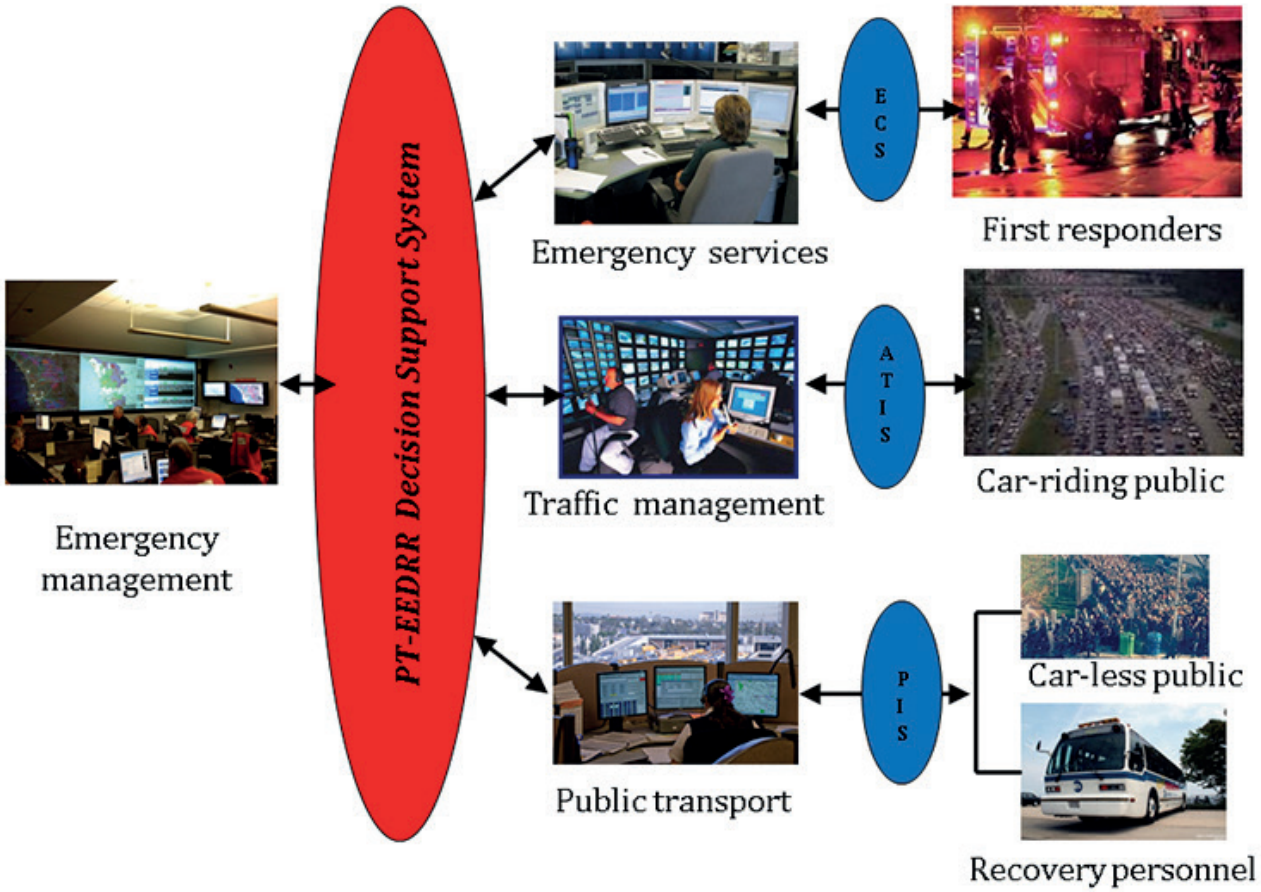


Figure 1 — Coordinated transportation services for disasters

As shown, there are eight major actors associated with transportation service during a disaster. Details of the roles and responsibilities are included in 5.4. The actors are at a group level and may vary from country to country. For instance, first responders include various people such as firefighter, emergency medical personnel, and police. In addition to these, those people who are managing infrastructures like electricity, water, sewage and gas play may also be part of the first responders. Moreover, individuals such as teachers may also act as first responders and be responsible for taking care of their students. The primary role and responsibility addressed by this family of standards is the coordination of emergency transportation services through existing communication channels by professional transportation planners and operators in public transport. The existing communication channels include emergency communications systems (ECS) used by first responders, advanced traveller information systems (ATIS) used by traffic managers, and passenger information systems (PIS) used by public transport. The cornerstone of this document is the EEDRR Decision Support System which will maintain the data and information sets used by public transport to make knowledgeable transportation-related decisions during the chaotic times leading up to, during and after a disaster. Figure 1 depicts the EEDRR Decision Support System being operated by public transport as part of emergency management. Transportation-

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related information and data are collected from and transportation-related decisions and actions are communicated to the other entities involved in the disaster.

The EEDRR Decision Support System is a computer-based transportation information system that supports critical transportation-related decision making activities during a disaster. The EEDRR Decision Support System is part of the Emergency Operations Centre and serves the emergency management, operations, and planning levels of the emergency management organization where planning levels mean those individuals who are responsible for planning the response as opposed to those individuals that are performing the actions required in a response. This system is operated by public transport emergency services personnel and helps to make transportation routing and equipment and personnel resource decisions, which may be rapidly changing and not easily specified in advance. It is an interactive software-based system that aids decision makers by compiling useful information from a combination of raw traffic and public transport data, policy documents, personal knowledge, and traffic models to identify and solve problems and assist transportation professionals in decision making. To ensure the information is useful and the sources are reliable, requires that data suppliers be vetted, data distribution networks are resilient, data management is expandable and modular, and data processing is organized into thematic applications such as floods, hurricanes, fires, earthquakes, etc.

Typical information that the EEDRR Decision Support System gathers and presents includes:

— local, regional, and national criteria for disaster evacuation, response, and recovery based on policies, plans and directives;

— benchmark evacuation times established by evacuation plans through best practices, regulations, or simulations;

— transportation resources available for evacuation, response, and recovery effort including traffic management and public transport;

— digital maps, images, political boundaries, sensor data, integrated transportation network models and other GIS related information;

— weather forecast, alerts, demand forecast, incident notification, and other real time information for mitigating traffic delays;

— damage assessments, risk factors, situational analysis, desired outcomes, and other real time information from field reporting;

— demographics for the regional population, passenger counts, special needs persons, and other information needed to estimate/determine the number of car-less persons in an area of interest;

— social media reporting of situation awareness as reported from various social media outlets (i.e. Facebook, Twitter, Line, Cyworld, Sina Weibo, etc.)

— and in the future, heuristic classifications that may be used to create an expert system as the use of artificial intelligence matures.

The EEDRR Decision Support System is an information processing system that runs on the public transport emergency services personnel PCs. The framework takes into account that each local jurisdiction has its own requirements, and thus in order to be useful this set of international standard should provide generic text that local jurisdictions can make distinctive to their own needs and communities by adding to and/or replacing the generic text with specific details. ISO/TR 19083 includes three parts:

— Part 1 — Framework and concept of operation for the use of public transport during an emergency evacuation or large scale disaster

— Part 2 — Information flow between Public Transport Passenger Information Systems, Public Transport Command and Control Systems, and Regional Emergency Operation Centres during a disaster

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— Part 3 — Use cases needed to support public transport actions in disaster drills/exercises.

The framework for the ISO/TR 19083 series and an associated concept of operation is provided in Clauses 5 and 6, respectively.

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Intelligent transport systems — Emergency evacuation and disaster response and recovery —

Part 1:
Framework and concept of operation

1 Scope

This document

— defines the framework for the ISO/TR 19083 series of standards related to emergency evacuation and disaster response and recovery,

— establishes the criteria under which public transport should support evacuations and disaster response and recovery based on the magnitude of the disaster and the location as these factors drive the policies, directives and plans for each countries disaster prevention/evacuation systems,

— identifies the types of agencies and organizations involved in a regionally supported evacuation and disaster,

— defines the roles and responsibilities public transport entities should provide in planning, preparing for, and conducting evacuations and disaster response and recovery efforts in support of regional authorities,

— recommends the type of information required and necessary actions to be followed by public transport to ensure efficient and effective transportation in response to recovery from a disaster,

— provides a concept of operation describing the characteristics of the EEDRR Decision Support System from the viewpoint of an individual who will use the system for public transport disaster support, it is the guiding document for public transport services operators who voluntarily wish to develop EEDRR Decision Support Systems, and

— identifies guidelines to improve coordination among regional authorities when public transport disaster support is required.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
actor
entity that fulfils a role

Note 1 to entry: The same definition can also be found in EN 302 665.

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3.2
command-level decision making
decisions made by managers to manage and mitigate critical incidents

3.3
command-level decision makers
managers within public transport tasked with making decisions during critical incidents

3.4
command-level roles
management positions within public transport tasked with making decisions during critical incidents

3.5
commercial vehicle
any type of motor vehicle used for transporting goods or paid passengers

3.6
computer-aided dispatch/automatic vehicle location systems
central software used by dispatchers for operations management that periodically receives real-time updates on fleet vehicle locations

Note 1 to entry: Computer-aided dispatch systems use one or more servers located in a central dispatch office, which communicate with computer terminals in a communications centre or with mobile data terminals installed in vehicles.

Note 2 to entry: Utilize the capabilities of geographic information systems (GIS) and GPS-based automatic vehicle location (AVL) to show real time vehicle location on a map display.

3.7
data
reinterpretable representation of information in a formalized manner suitable for communication, interpretation or processing

Note 1 to entry: Data can be processed by humans or by automatic means.

[SOURCE: ISO/IEC 15944-5:2008, 3.35 modified]

3.8
disaster
situation where widespread human, material, economic or environmental losses have occurred which exceeded the ability of the affected organization, community or society to respond and recover using its own resources

[SOURCE: ISO 22300:2012, 2.1.11]

3.9
disaster planning
first phase of disaster management cycle consisting of prevention and preparedness

3.10
disaster recovery
recovery phase that starts after the immediate threat to human life has subsided with the immediate goal to bring the affected area back to normalcy as quickly as possible

3.11
disaster response
second phase of the disaster management cycle consisting of warning/evacuation, search and rescue, providing immediate assistance, assessing damage caused by the disaster, continuing assistance and the immediate restoration of infrastructure

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3.12
emergency management organization
group of people that has its own functions with responsibilities, authorities and relationships to the overall approach preventing and managing emergencies that might occur

Note 1 to entry: In general, emergency management utilizes a risk management approach to prevention, preparedness, response and recovery before, during and after potentially destabilizing or disruptive events.

[SOURCE: ISO 22320:2011, 3.35 modified]

3.13
emergency operations centre
EOC
central location from which local, regional or national governments can provide interagency coordination and executive decision making in support of disaster response and recovery operations

Note 1 to entry: to entry. The purpose is to provide a centralized location where public safety, emergency response, and support agencies coordinate planning, preparedness, and response activities.

Note 2 to entry: to entry. The EOC does not command or control on-scene response efforts, but does carry out the coordination functions through

a) collecting, evaluating and disseminating disaster related information,

b) analysing jurisdictional impacts and setting priority actions, and

c) managing requests, procurement and utilization of resources.

3.14
exercise
process to train for, assess, practice, and improve performance in an organization

Note 1 to entry: Exercises can be used for validating policies, plans, procedures, training, equipment, and inter-organizational agreements; clarifying and training personnel in roles and responsibilities; improving inter-organizational coordination and communications; identifying gaps in resources; improving individual performance; and identifying opportunities for improvement, and controlled opportunity to practice improvisation.

Note 2 to entry: A test is a unique and particular type of exercise, which incorporates an expectation of a pass or fail element within the goal or objectives of the exercise being planned.

[SOURCE: ISO 22300:2012, 2.4.9]

3.15
hazardous material
any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors

3.16
incident
situation that might be, or could lead to, a disruption, loss, emergency or crisis

[SOURCE: ISO 22300:2012, 2.1.15]

3.17
man-made disaster
disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions

3.18
private vehicle
two- or four-wheel vehicle that are not used to carry passengers for a fee

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3.19
public safety agency
includes emergency management agencies, law enforcement agencies, fire departments, rescue squads, emergency medical services and other such entities whose purpose is to enhance the public welfare

3.20
public transport
shared transport service which is available for use by the general public and includes city buses, trolleybuses, trams (or light rail) and passenger trains, rapid transit (metro/subways/undergrounds, etc.) and ferries

3.21
public transport emergency management
managerial function charged with creating the framework within which public transport reduce vulnerability to hazards and cope with disasters

3.22
public transport emergency services personnel
persons within public transport responsible for transportation-related mitigation activities in an evacuation or disaster including pre-disaster planning, response, and recovery

3.23
public transport emergency response team
persons within public transport responsible for transportation-related mitigation activities in an evacuation or disaster including pre-disaster response planning and disaster response

3.24
public transport recovery team
persons within public transport responsible for transportation-related mitigation activities in an evacuation or disaster including pre-disaster recovery planning disaster recovery

3.25
public transport emergency manager
person responsible for the overall strategic command of the emergency response effort such as risk identification and mitigation

3.26
public transport emergency operations coordinator
person responsible for managing the tactical functions such as coordination with field supervisors, assigning vehicles and drivers/operators to routes, monitoring traffic flow, etc.

3.27
public transport emergency planning coordinator
person responsible for the collection, evaluation, forecasting, dissemination, and use of the information about the emergency incident and status of resources

3.28
public transport recovery manager
person responsible for the overall strategic plan of the recovery effort to include damage assessment and recovery planning for short-term, intermediate, and long-term mitigation

3.29
public transport recovery communication coordinator
person responsible for informing outside organizations and the public of recovery plans and services

3.30
public transport recovery project coordinator
person responsible for managing mutual aid request and work associated with infrastructure repair

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3.31
public transport emergency logistics coordinator
person responsible for managing logistical support such as personnel, vehicles, equipment, and supplies

3.32
public transport operator
private, profit-driven entity that provides shared transport service which are available for use by the general public and includes city buses, trolleybuses, trams (or light rail), passenger trains, rapid transit (metro/subways/undergrounds, etc.) and ferries

3.33
public transport service manager
public entity that manages and may provide shared transport service which are available for use by the general public and includes city buses, trolleybuses, trams (or light rail), passenger trains, rapid transit (metro/subways/undergrounds, etc.) and ferries

3.34
regional
layer within the emergency management hierarchy that exists between national and local

Note 1 to entry: Local is this instances means a government entity covering a small geographic area such as a town or city.

3.35
shared-use vehicle
vehicle used by several different individuals throughout the day

Note 1 to entry: There are three basic shared-use vehicle system models: neighbourhood car sharing, station cars, and multimodal shared-use vehicles.

3.36
strategic command
organization responsible for formulating the strategy for dealing with the incident

3.37
tactical functions
formulated from strategic plans the sets of actions dealing with the incident that are completed in the field

3.38
traffic flow models
use of computer modelling to simulate the of interactions between vehicles, drivers, pedestrians, cyclists, other travellers and infrastructure (including highways, signage, and traffic control devices), with the aim of understanding and developing an optimal road network with efficient movement of traffic and minimal traffic congestion problems

3.39
use case
sequence of actions that an actor (usually a person, but perhaps an external entity, such as another system) performs within a system to achieve a particular goal

[SOURCE: ISO 25102:2008, 2.12 modified]

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