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CascEff Glossary and Definitions



result of a cause in the presence of a hazardous situation (ISO 22301:2014)

Emergency

A sudden and usually unforeseen event that calls for immediate measures to avert or limit adverse consequences. (UNDHA, 1992)

Emergency management

An ongoing process to prevent, mitigate, prepare for, respond to, and recover from an event that threatens life, property, operations, or the environment. (NFPA 1600, 2012)

Emergency Management Phases

See Disaster management cycle

Emergency planning services

Organisation in charge of developing external emergency plans for the authority

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Executive Summary

Topic and purpose

Clear definitions of key terms are essential in order to avoid misunderstandings and to help deliver informed decision-making during cascading disasters. This is particularly important within the overlapping fields of emergency management, risk management and disaster management, where certain terms may be understood differently by different stakeholders depending upon the region and field in which they operate. Hence, this deliverable presents definitions for the parameters, phenomena, and processes used within the CascEff project. The compilation of this list of definitions began early in the project and has continued throughout the past two years. This is by no means an exhaustive list and it is envisaged that further additions and clarifications may be required in the final year of the project.

Methodology

Terms and definitions presented in this report have been determined in one of two different ways:

- 1) Review of relevant literature for specific project deliverables
- 2) Feedback from partners and members of the EEAB during project meetings.

They were also subject to further scrutiny by the consortium prior to their inclusion in this report.

Findings and conclusions

The list of definitions below contains terms used in detailed processes within CascEff, as well as those used to describe generic processes within relevant fields, e.g. within emergency management. In some cases more than one definition is given in order to show that the same term can be defined differently within closely related fields, and to show how their use has evolved over time.

This work has proven to be very important for CascEff in order to make sure that the consortium shares the same understanding of what these terms mean. Furthermore, discussions with stakeholders, other EU projects and research collaborators suggested that it was important that such clarifications were made at the earliest possible opportunity in order to avoid potential misinterpretation of the Key findings in the project deliverable.

Limitations

This report does not claim to contain a comprehensive list of terms and definitions relating to incidents with cascading effects. Rather, the terms below reflect the objectives of specific deliverables and Work Packages within the CascEff project. While other definitions for these terms are available in official documents and guidelines, it is anticipated that those included in this report should be of interest and use to key stakeholders engaged in the management of cascading disasters.



Nomenclature

Abbreviations

COP: Common Operational Picture or Common Operating Picture

DoW: Description of Work

FEMA: Federal Emergency Management Agency

FRS: Fire and Rescue Service

ICT: Information and Communication Technology

IET: Incident Evolution Tool

IMT: Incident Management Tool

ISO: International Organization for Standardization

NFPA: National Fire Protection Association

OCHA: United Nations Office for the Coordination of Humanitarian Affairs

UNDAC: United Nations Disaster Assessment and Coordination



1 Introduction and methodology

Clear definitions of key terms are essential in order to avoid misunderstandings and to help deliver informed decision-making during cascading disasters. This is particularly important within the overlapping fields of emergency management, risk management and disaster management, where certain terms may be understood differently by different stakeholders depending upon the region and field in which they operate. Hence, this deliverable presents definitions for the parameters, phenomena, and processes used within the CascEff project. The compilation of this list of definitions began early in the project and has continued throughout the past two years. This is by no means an exhaustive list and it is envisaged that further additions and clarifications may be required in the final year of the project.

Terms and definitions presented in this report have been determined in one of two different ways:

- 1) Review of relevant literature for specific project deliverables
- 2) Feedback from partners and members of the EEAB during project meetings.

They were also subject to further scrutiny by the consortium prior to their inclusion in this report.

Some of the definitions presented in this document have been based on definitions found in other publications and when that is the case, references are given. In cases when references are not given, the presented definitions have been decided and agreed on within the CascEff consortium. This does not mean that it is developed completely isolated from what can be found in the literature, but that it has not necessarily been based on any specific existing definition.

Definitions are also developed over years as both the reality and the use of different terms change. There might also be similar but different definitions used within different related fields. There are several publications on terms relating to disaster management (UNDHA, 1992; UNISDR, 2009; UNDAC, 2013; UNISDR, 2015). CascEff concerns, however, incident/emergency management not only for disasters, but rather for any incident where cascading effects can occur. This might be understood from some of the choices of CascEff definitions.

The development of the CascEff IET has required agreed definitions for some specific terms. Since they are of a different type compared to the more general terms, the IET related terms are presented in a specific separate sub-section.

2 Limitations

This report does not claim to contain a comprehensive list of terms and definitions relating to incidents with cascading effects. Rather, the terms below reflect the objectives of specific deliverables and Work Packages within the CascEff project. While other definitions for these terms are available in official documents and guidelines, it is anticipated that those included in this report should be of interest and use to key stakeholders engaged in the management of cascading disasters.



3 Glossary and definition

3.1 General definitions

Ability or capacity

The combination of knowledge and equipment that can be used to perform a certain task.

Activity (or Task)

A task is a single unit of activity that produces a partial result.

Buffer time

The time between the start of an outgoing effect in the originating system and the time before a cascading effect occurs in a dependent system, i.e. when the performance of the dependent system starts to degrade, see Figure 3.1.

The buffer time is the sum of the Propagation time and the Endurance time

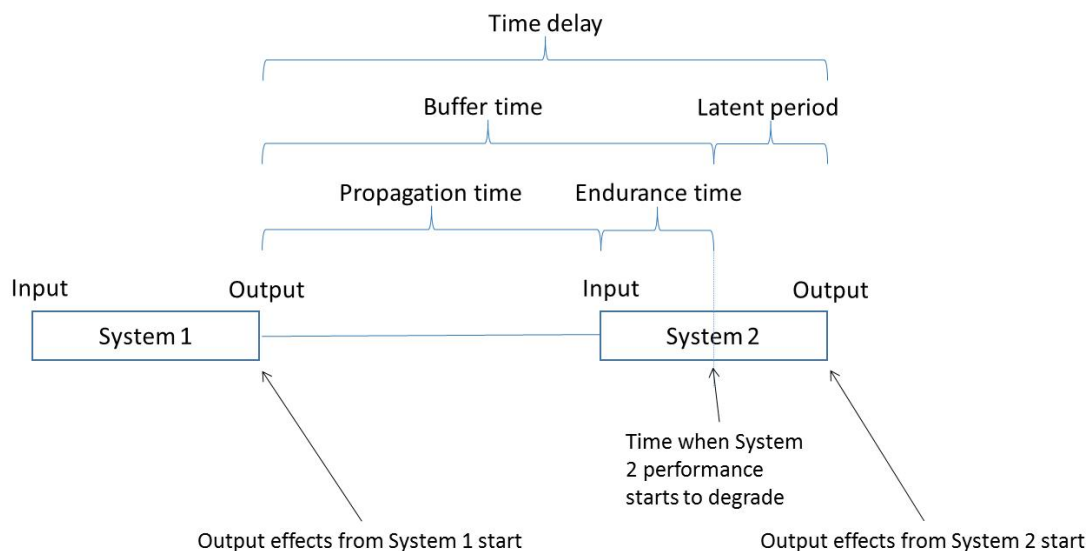


Figure 3.1 Illustration of Buffer time, Propagation time, Endurance time and Latent period.

Capacity

See Ability

Cascade order

The number of stages in a propagation from a directly impacted system to a particular system that is impacted indirectly (for example, an event propagating from one originating system to one dependent system represents a first order cascading effect, while the event would be referred to as a second order cascading effect if the same event would further propagate to yet another system). See Figure 3.2 for the schematics of the dependencies between systems in case of cascading effects and cascade order. .

Cascading Effects

Pescaroli and Alexander published a summary of how "cascade" or "cascading" are used in relation to disasters and/or emergency management (Pescaroli and Alexander, 2015). One



example is cascading event which by FEMA is described as " events that occur as a direct or indirect result of an initial event" (FEMA, 2016). Another example is Helbing expressing: " The understanding of cascade effects requires knowledge of at least the following three contributing factors: the interactions in the system, the context (such as institutional or boundary conditions), and in many cases, but not necessarily so, a triggering event" (Helbing, 2013). Pescaroli and Alexander summarize their discussion as (Pescaroli and Alexander, 2015): "Cascading effects are the dynamics present in disasters, in which the impact of a physical event or the development of an initial technological or human failure generates a sequence of events in human subsystems that result in physical, social or economic disruption."

In CascEff a clear definition was needed to both determine what incident to include in different studies and to have as support when developing different scenarios to be used for validation. The consortium ended up with two different definitions. the main definition is the so called technical definition, which should be used for the purposes described above, while a so called pedagogic definition was included as well. The latter could be used in communication when the technical one can be considered to be too complicated for the purpose.

Technical definition (e.g. for selection of scenarios) (Reniers, G. and Cozzani V., 2013):

Cascading effects are the impacts of an initiating event where

1. *System dependencies lead to impacts propagating from one system to another system, and;*
2. *The combined impacts of the propagated event are of greater consequences than the root impacts, and;*
3. *Multiple stakeholders and/or responders are involved.*

Pedagogical definition:

An incident can be said to feature cascading effects when a primary incident propagates resulting in overall consequences more severe than those of the primary incident.

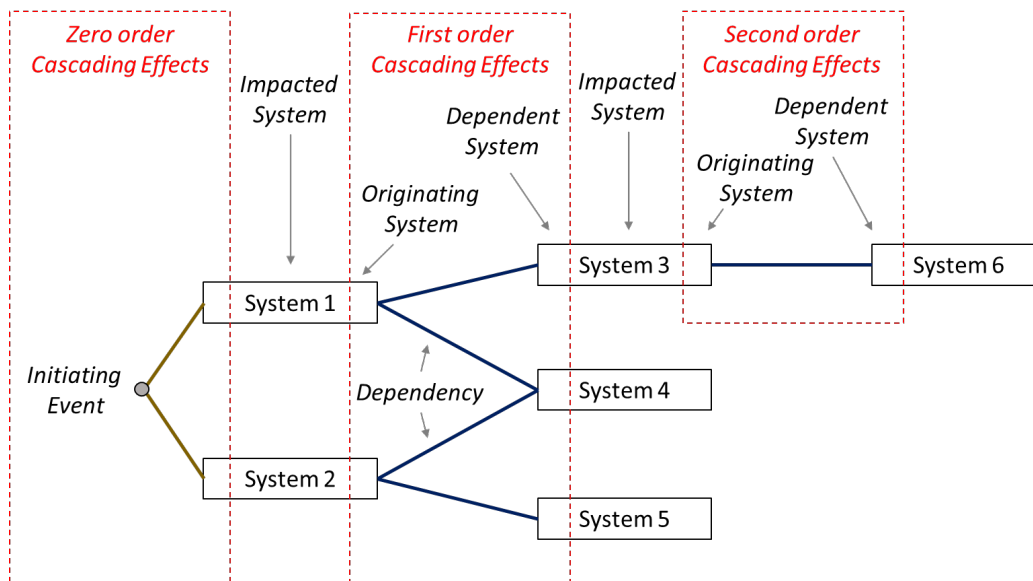


Figure 3.2 Schematics of the dependencies between systems in case of cascading effects.



Competent authority

Authority liable from a legal perspective (D1.3)

Common Operational Picture or Common Operating Picture (COP)

Single display of information collected from and shared by more than one agency or organisation that contributes to a common understanding of a situation and its associated hazards and risks along with the position of resources and other overlays of information that support individual and collective decision making. (UK Cabinet Office, 2013)

Conditions

Circumstances that can enable, prevent, aggravate or mitigate dependencies and impacts.

Concept of command capacity

The organization's capacity to manage itself in relation to its surroundings

Crisis

Situation with high level of uncertainty that disrupts the core activities and/or credibility of an organization and requires urgent action (EN ISO 22300:2014).

Crisis management scenario

A description of the conditions under which the crisis management system or crisis management policy to be designed, tested or evaluated is assumed to perform (Walker, 1994, based on a more general definition suggested by Quade (1989))

Critical infrastructure

The physical structures, facilities, networks and other assets that support services that are socially, economically or operationally essential to the functioning of a society or community. (UNISDR, 2015)

Dependency

Mechanism whereby a state change in one system can affect the state of another system. Note that this definition differs from the way the concept "dependency" is used in the DoW. The use of the concept "dependency" in the DoW corresponds to what we refer to as "impacted system" in Deliverables D2.1-D2.3.

Dependency type

Rinaldi (2001) identified four types of dependencies.

- Physical dependency occurs when the state of different types of systems are dependent on the output(s) of another.
- Cyber dependency occurs when the state of one system depends on information transmitted through the information or telecommunications infrastructure.
- Geographic dependency occurs when systems are located in one region and where changes in the local environment can create state changes in all of them.
- Logical dependency occurs when a state change in one system results in a state change in another, without any of the other dependencies occurring.



From this classification, the first two were combined into the broader concept of functional dependency in D2.1-2.3, which was defined as follows:

- Functional dependency occurs when the state of a system is dependent on the output(s) of another system(s).

Dependent/Impacted system

A system that is negatively affected by either an initiating event or an originating system.

Digital media

Any media that are encoded in a machine-readable format and can be created, viewed, distributed, modified and preserved on computers. (Vellaichamy, A. and Jeyshankar, R., 2015)

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. (EN ISO 22300:2014)

Disaster management

The organization, planning and application of measures preparing for, responding to and, initial recovery from disasters. (UNISDR, 2015)

Disaster management cycle / Emergency management phases

CascEff uses the four Emergency Management Phases as defined in the internationally accepted practices for disaster management by OCHA and emergency management by FEMA: Mitigation, Preparedness, Response, and Recovery, see **Fel! Hittar inte referenskölla..** Sometimes the term Prevention is used instead of Mitigation (King, 2007). Sometimes Prevention is seen as being part of Mitigation. The different phases are presented as separate entries in the glossary.

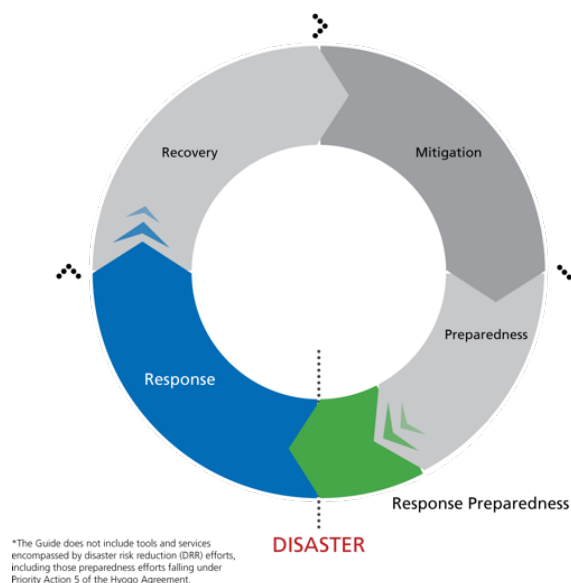


Figure 3.3 The disaster management cycle.



In Appendix 1 a comparison of how these phases are used in different organisations and countries is presented.

Early warning system

An interrelated set of hazard warning, risk assessment, communication and preparedness activities that enable individuals, communities, businesses and others to take timely action to reduce their risks. (UNISDR, 2015)

Effect

Result of a cause in the presence of a hazardous situation (ISO 22559:2014)

Emergency

A sudden and usually unforeseen event that calls for immediate measures to minimize its adverse consequences. (UNDHA, 1992)

Emergency management

An ongoing process to prevent, mitigate, prepare for, respond to, and recover from an incident that threatens life, property, operations, or the environment. (NFPA 1600, 2016)

Emergency management phases

See Disaster management cycle

Emergency planning services

Organisation in charge of developing external emergency plans for the authorities and Rescue Services system. (D1.3)

Emergency services

The set of specialized agencies that have specific responsibilities and objectives in serving and protecting people and property in emergency situations. (UNISDR, 2009)

This includes all public agencies involved in incident response: fire rescue services, police, healthcare department, civil defence, etc.

Emergency situation

Every event that causes or could cause a damaging impact on society (such as a serious disturbance of public safety/security, a serious threat to life or the human health or to important material assets) requiring the coordination of disciplines to eliminate the threat or to limit the damaging consequences. (RD, 2006)

Endurance time

Time a system can resist incoming effects before they start to create impact on the system, see Figure 3.1.



Event

A singular instance of a phenomenon affecting one or several systems.

Extraordinary event

An event that deviates from the norm, implies a serious disturbance or imminent risk of a serious disturbance in important societal functions and requires urgent action by a municipality or a county council, a crisis management committee should be established (SFS, 2006)

Fire weather

Collectively, those weather parameters that influence fire occurrence and subsequent fire behaviour (e.g. dry-bulb temperature, relative humidity, wind speed and direction, precipitation, atmospheric stability, winds aloft) (CIFFC, 2003)

First responders

“blue light organizations”, e.g. fire and rescue services, police and ambulance.

Functionality

Refers to the ability of the predetermined function e.g. providing drinking water to the inhabitants, to work as it is supposed to.

Hazard

Source of potential harm. (EN ISO 22300:2014)

Impact

Describes the effect (usually negative) of an incident on a system or, where systems are dependent, on multiple systems. The impact may be measured in one of the five interrelated dimensions: technical, organizational, social, economic and environmental:

- The technical (physical) dimension refers primarily to the physical properties of systems; technical impact describes the damage and loss of function of technical systems, physical components and output.
- Organizational impact relates to the organizations and institutions that manage the physical components and output of the systems. This domain encompasses impact to systems in terms of organizational capacity, planning, training, leadership, experience, and information management.
- The social dimension of impact encompasses population and community characteristics that result from social groups being vulnerable to hazards and disasters.
- Economic impact refers to the impact in terms of both direct and indirect economic losses resulting from disasters.
- Environmental impact encompasses the effects on natural resources (flora, fauna)

Impacted system

See Dependent system

Incident

Situation that might be, or could lead to, a disruption, loss, emergency or crisis. (EN ISO 22300:2014)



In Casceff also the following explanatory definition is used:

A chain of events affecting multiple systems, either in series or spreading in parallel.

Incident Evolution Tool (IET)

An incident evolution tool is based on a methodology (the IET methodology) which relies on input from either incident data, Incident Management Tools, models or past experience to describe how the impact of an incident on a system may spread to dependent systems. The IET is an informative tool, which can be used for improved crisis management by supplementing the knowledge and experience of crisis managers with additional information as to the likely progression of an incident from initiating event through multiple dependent systems.

Incident management

An ongoing process to prevent, mitigate, prepare for, respond to, and recover from an incident that threatens life, property, operations, or the environment.

(see Emergency management)

Incident management system

System that defines the roles and responsibilities of personnel and the operating procedures to be used in the management of incidents. (ISO 22315:2014)

Incident Management Tool (IMT)

An Incident Management Tool (or Incident Management System) is actually a toolbox from which an incident commander can pick a tool to assist them in managing an incident (Cote, 2003). An incident management tool can be used for different purposes and during different phases of the incident management cycle: pre-planning, response, debriefing, and training.

The proposed contribution to Incident Management Tools is a means whereby the IET will be able to communicate with existing tools. This means that the IET will form a part of the toolbox from which an incident commander can pick to assist them in managing an incident. The development in the Casceff project will be the ability to draw on information which is presented to the incident commander IC by the IET so that the incident commander can make better informed decisions about their response strategy including, e.g. allocation of capital resources (e.g. equipment), personnel, and knowledge.

Incident response

Actions taken in order to stop the causes for the imminent hazard and to mitigate the consequences of potentially destabilizing or disruptive events and to recover to a normal situation (EN ISO 22300:2014)

Incident response team (Rescue Services)

All public agencies involved in incident response: fire rescue services, police, healthcare department, civil defence, etc. (D1.3)

Initiating event (initiator)

The first in a sequence of natural (e.g. flood), accidental (e.g. fire) or intentional (e.g. bombing) events that may affect one or several systems. (D2.3)



Interdependency

A mutual dependency between two systems, i.e. system A is dependent on system B and vice versa. (D2.3)

Intra-system propagation

Propagation of effects between sub-systems within the same system (D2.3)

Key decision points

An opportunity to affect the links between the originating system and the dependent system when an intervention may prevent the event from cascading or cause such effects. With reference Figure 3.2, the key decision points can affect the dependency between the different systems, where intervention action may prevent crises from escalating from one system to a dependent system¹.

Latent period

The time period from the point when an incoming effect give rise to input effects on the dependent system until the same system creates outgoing effects, see Figure 3.1.

Lead time

Period of a particular hazard between its announcement and arrival, also used for the mobilization of resources needed in relief operations. (UNDHA, 1992)

Licensing authority

Government body in charge of providing the Risk owner a license (environmental permit, building permit, license to operate, etc.). (D1.3)

Method

A method is the practical instruction to perform a task, and it describes “HOW” to perform each tasks (Estefan 2007). Following this definition, the words “method,” “technique,” “practice,” and “procedure” can be used interchangeably.

Methodology

Methodology can be defined as a collection of related processes, methods, and tools. A methodology is essentially a “recipe” and can be thought of as the application of related processes, methods, and tools to a class of problems that all have something in common (Bloomberg, and Schmelzer 2006).

Mitigation

Measures taken to prevent, limit and reduce impact of the negative consequences of incidents, emergencies and disasters. (EN ISO 22300:2014)

¹ The action taken at the key decision point may actually have a beneficial impact also on the originator.



Natural hazard

Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. (UNISDR, 2009)

Originating system

A system in which a failure propagates to another system. (D2.3)

Phases of disaster (emergency) management:

- Mitigation,
- Preparedness,
- Response
- Recovery

Each phase can be found as a separate entry in the glossary. See also Disaster management cycle

Preparedness

Knowledge and capacities developed to effectively anticipate, respond to, and recover from the impact of likely imminent or current hazard events or conditions. (ISO 22315:2014)

Preventative measures

Those measures taken to minimize the consequences due to an incident, e.g. installing cable barriers on the highway to avoid frontal collisions.

Prevention

Activities to avoid or stop an incident from occurring. (NFPA, 2016)

Process

A process is a series of tasks that produce a result. "A process defines "WHAT" is to be done, without specifying "HOW" each task is performed" (Estefan 2007). The process is structured in a way that is possible describe different levels of detail.

Propagation time

The time it takes for the effects from the initiating event or an output of a system to propagate and reach the borders of a dependent system. The concept can be used to understand how fast effects spread, irrespectively of systems abilities to tolerate disturbances. Some effects can be seen as having zero propagation time (i.e. infinite spreading rate), e.g. power outage. To determine the impact on the dependent system, and the timing of such an impact, see Endurance time.

Recovery

Restoration and improvement, where appropriate, of operations, facilities, livelihoods or living conditions of affected organizations, including efforts to reduce risk factors. (ISO 22300, 2012)



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. (UNISDR, 2009)

Response

Immediate and ongoing activities, tasks, programs, and systems to manage the effects of an incident that threatens life, property, operations, or the environment. (NFPA, 2016)

Risk owner

The legal entity that creates or owns the risk. E.g. industry, festival organizer, building owner. In case there is no private risk owner the Competent Authority is the risk owner: e.g. municipality or province for natural reserves, county for rivers. (D1.3)

Scenario

Pre-planned storyline that drives an exercise, as well as the stimuli used to achieve exercise project performance objectives. (ISO 22398, 2013)

Situational awareness

The perceptions of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future. (Endsley, 1998)

Social media

The collection of software that enables individuals and communities to gather, communicate, share and in some cases collaborate or play. (Boyd, 2009)

System

A “system” refers to a distinct societal unit (such as a sector, function, collective, infrastructure or nature resource) which may be affected by, or give rise to, consequences in another unit. (D4.3)

Task

See Activity

Time delay

The time until when the output of a specific system is affected in relation to when the initiating event starts or the output of a system it depends upon is firstly affected. Time delay is hence the sum of the Buffer time and the Latent period. The concept can be used to signal “windows of opportunities” for breaking chains of cascading effects.

Tool

An “instrument” that could be applied to a method to enhance it (Martin, 1996). Referring specifically to the CascEff project, it is possible to find definitions for both Incident Management tools and Incident Evolution tools.



Traditional media

Media introduced before the advent of the internet that are for the purposes of mass communication e.g. billboards, magazines, newspapers, radio and television broadcasting. (Lee, 2013)

User generated content

Content created by social media users rather than journalists/editors. (Boyd, 2009)

Vulnerability

Intrinsic properties of something resulting in susceptibility to a risk source that can lead to an event with a consequence. (EN ISO 22300, 2014)

3.2 Definitions related to the IET**Case (Data model, IET)**

A case is a specific collection of systems defined in the Database, based on a selection (filter) of system properties or geographic area.

Data model

An abstract model that organizes elements of data and standardizes how they relate to one another and to properties of the real world.

(Wikipedia https://en.wikipedia.org/wiki/Data_model retrieved June 28, 2016)

Clone (Cloning a IET System or Case)

A duplicate of an existing System or Case in the database which can be modified by the user. A clone contains a reference to its originating system or case.

The state of a systems origin referring to it being copied from an already existing system as a separate entity in the Data models database.

The opposite is Reference.

Reference (Referencing a IET System or Case)

A property of a system or case referring to it being a Reference of an already existing system and as such not being a separate entity but a pointer to the original system in the Date Model Database. The opposite is Clone.

Initiating event (In the Data model)

Referring to the system that outputted the first trigger of cascades in a Scenario. This system can represent ideas and disaster types as well as physical entities. For example a Malfunction in the Powerplant is a initiating event, but a Fire or the Weather are too, as is the idea of a theoretical fault

Scenario (IET)

An IET Scenario is the process of calculating cascading effect over time starting form a specified Initiating Event. Allowing a user to look ahead or back in time and update or change systems for that scenario only.



Template systems (IET)

The Template systems are regular systems in the Data Model, but in the IET these are shown as choose able when creating a new System.



4 Conclusions

Important terms have been presented and defined. The list of definitions in this report contains terms used in detailed processes within CascEff, as well as those used to describe generic processes within relevant fields, e.g. within emergency management. In some cases more than one definition is given in order to show that the same term can be defined differently within closely related fields, and to show how their use has evolved over time.

This work has proven to be very important for CascEff in order to make sure that the consortium shares the same understanding of what these terms mean. Furthermore, discussions with stakeholders, other EU projects and research collaborators suggested that it was important that such clarifications were made at the earliest possible opportunity in order to avoid potential misinterpretation of the Key findings in the project deliverable.



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Appendix 1 Terminology for emergency management phases used by different organisations and national systems

The following table provides a mapping of the CascEff terminology on the terminology used in national emergency management systems. Both terms in the original language and corresponding terms translated into English are included in the table. Sometimes it has been an interpretation of an objective rather than a specific word that has been used and translated.

	CascEff, UN OCHA, FEMA	EU ^{a)}	Belgium ^{b),c)}	France	Sweden ^{d)}	The Netherlands ^{e)}	UK
Before			Proactie / Proaction	Identification du risque / Risk identification	Risk- och sårbarhetsanalys / Risk and capability assessment	Proactie / Proaction	Anticipation
				<i>Evaluation du risque / Assessment</i>			Assessment
	Mitigation	Prevention/ detection	Preventie / Prevention	Prévention / Prevention	Förebyggande / Prevention	Preventie / Prevention	Prevention
	Preparedness	preparedness	Preparatie / Preparation	<i>Préparation / Preparation</i>	Förberedelse / Preparation	Preparatie / Preparation	Preparation
During	Response	Surveillance/ response	Uitvoering / Execution	Evènement / Event	Insats / Response	Repressie / Repression	Response
After			Evaluatie / Evaluation	Retour à la normale / Recovery			
	Recovery	Recovery		Retour d'expérience / Feedback	Återställning / Recovery	Nazorg / Recovery	Recovery

a) European Commission DG Home, A Community of Users on Secure, Safe and Resilient Societies (CoU), Mapping EU policies and FP7 research for enhancing partnerships in H2020, Draft working paper May 12, 2016

b) Article 11 §2 Law of May 15th 2007 on Civil Security, O.G. 31.07.2007.



c) Belgian definitions of the different phases of the Security cycle:

- Proaction: inventory and analysis of risks
- Prevention: actions to limit risks and the possible consequences
- Preparation: preparatory actions to be able to face and manage an incident
- Intervention: deployment of actions in case of an incident
- Evaluation: lessons learnt from the previous steps

d) The information on terms in Sweden is taken and combined from several different legislative documents:

- Lag (2006:544) om kommuners och landstings åtgärder inför och vid extraordinära händelser i fredstid och höjd beredskap
- Lag (2003:778) om skydd mot olyckor
- MSBFS 2015:5 föreskrifter och allmänna råd om kommuners risk- och sårbarhetsanalyser

e) Source: Dutch Fire Brigades at <https://www.brandweer.nl/organisatie/brandweer-doet/taken/>

- Proaction: avoiding risks
- Prevention: measures to improve safety, measures to avoid incidents
- Preparation: being prepared, incl. training, adequate material, emergency planning, exercises, information to the public
- Repression: interventions on scene
- Recovery: all measures necessary to get back to a normal situation



