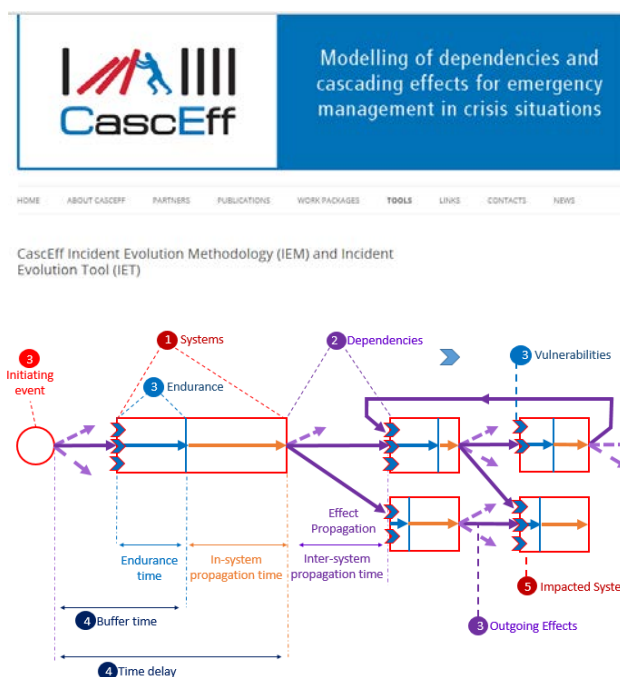


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Website with the Incident Evolution Methodology and the Incident Evolution Tool



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Executive Summary

This deliverable report describes the web site presenting the Incident Evolution Methodology (IEM) and the Incident Evolution Tool (IET) developed within the Casceff project. The public Casceff web site (www.casceff.eu) is linked to the web page on the IEM and IET.

The IEM and IET web page contain a brief description of the methodology and the tool, respectively. The web page also contains links to further, more detailed information on the IEM and the IET, and guidance on where to find more information.

The IET is a web based tool and is accessed via a link on the IEM and IET web page. There is instruction on the web site about how to access and register to use the IET. This deliverable also contains a short description of the structure of the IET. For more detailed information, the reader/user is referred to the Casceff IET User Manual.

As indicated above, the detailed descriptions of the IEM and IET are presented in other reports and not repeated in this deliverable. This is also true for training material etc. Information on and references to different sources of additional information are, however, given.



Nomenclature

IEM	Incident Evolution Methodology
IET	Incident Evolution Tool
IMT	Incident Management Tool



1 Introduction

One of the main objectives of the CascEff project has been to develop an Incident Evolution Methodology (IEM) to provide support for modelling of cascading effects to emergency responders, competent authorities, critical infrastructures operators, and others needing to determine dependencies, vulnerabilities and the risk for cascading effects. The IEM was developed to be used in different phases (planning, preparation, response, recovery) of emergency management of small and large incidents having cascading effects in a specific region (case area).

The six-step IEM process is summarized in Chapter 3 of this report. For details about the IEM the reader is referred to deliverable D4.2. Similarly, for details about the CascEff Incident Evolution Tool (IET), which is based on the IEM, the reader is referred to the IET User Manual.

The aim of this report is to describe the pages of the web site where the IEM and IET are presented to the public. Other sources of information about the IEM and IET are also described in this deliverable.

The web site and how to find it is described in Chapter 2. References to additional information about the IEM and IET can also be found in Chapter 2, although in some cases this information may not be available yet.

The IEM is briefly presented in Chapter 3 and a brief description of the IET is given in Chapter 4.



2 Introduction to the web site

The information on the IEM and the IET can actually be found in two web site sources:

1. A web page, as part of the CascEff web site, where the IEM and IET are presented and described. This web page will also include links to some useful material as it becomes available.
2. The IET, which is a web based tool having its own set of pages. The web page described under point 1 above also includes a link to the IET and a description of how to register as user.

These two sources of information are described in the following subchapters.

2.1 The CascEff web site

The CascEff project has an external web site (www.casceff.eu) where the project, the consortium and results (in the form of deliverable reports) are presented. Figure 2.1 presents the upper part of the main page of the CascEff web site. There is a list of menus containing links to information in different parts of the project and on the partners in the consortium. The link to the IEM and IET web page is activated by clicking the Tools menu.

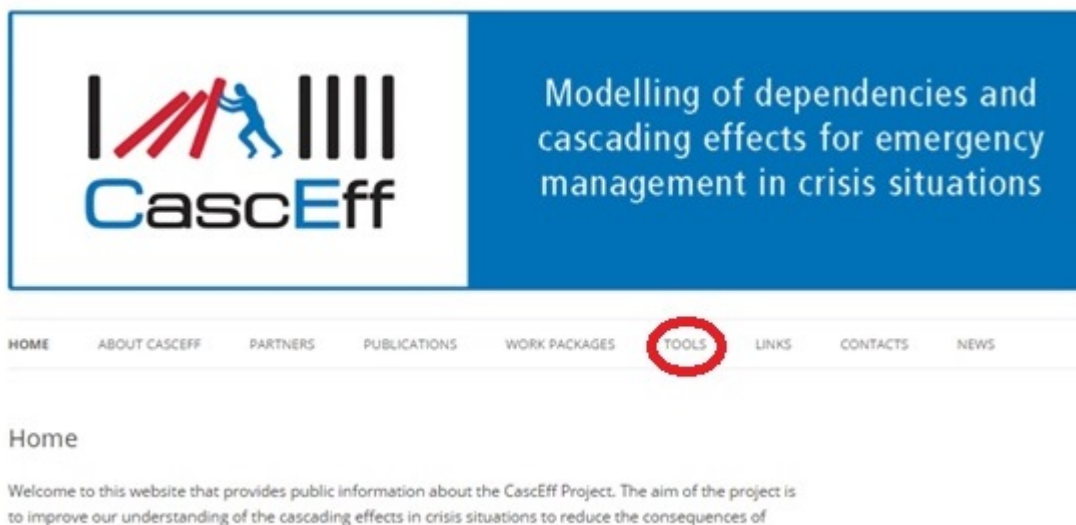


Figure 2.1 The upper part of the main page of the CascEff web site (www.casceff.eu).

The IEM and IET web page briefly describes the methodology and the tool. Figure 2.2 shows the first part of the description of the IEM. The plan is to keep the descriptions of the IEM and IET short to make it easier to read and to guide the visitors of the web site to places where further information can be found. Examples of additional information that could be linked to this web page (when these other deliverables etc are finalized) are:

IEM

- Deliverable D4.2, which contains a detailed description of the IEM. This will be made available when the deliverable has become public. A process of making it public is ongoing.

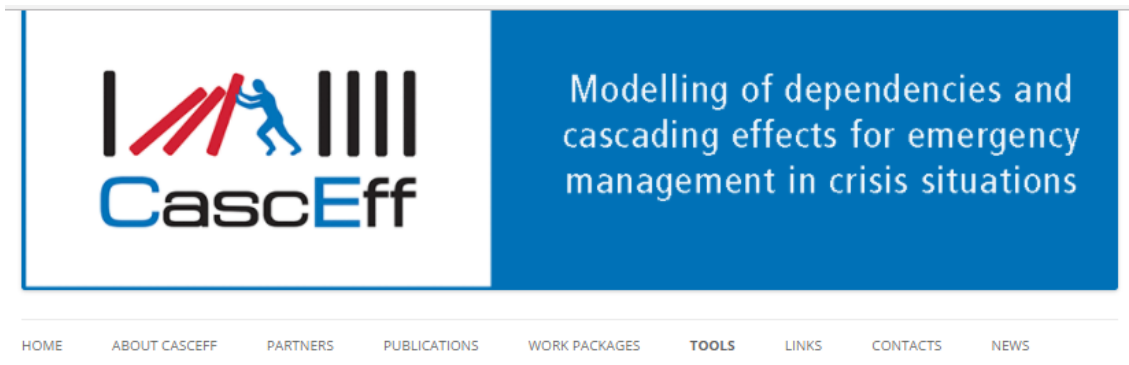


- Training material for the IEM. As part of Task 6.5 (deliverable D6.6), training material for the IEM is developed. This will be made available on the CascEff web site together with training material for other topics (e.g. Cascading effects; Improved incident management; Crisis communication; and Exercise methodology). Links will be made to the parts relevant for the IEM.
- Deliverable D5.4 will contain the description of the validation sessions performed at University of Lorraine and Campus Vesta to show the added value and applicability of using the IEM during different phases of management of incidents involving cascading effects.

IET

- A user manual for the IET is under development and will be uploaded on the web site.
- Deliverable D4.5 will contain information about how the IET could be used together with different Incident Management Tools (IMTs) in the future. This will be made available when finalized.
- Deliverable D5.2 will contain information on the IMTs, and simulation and training tools available within the CascEff consortium. This deliverable also contains a description of the views of some users about the possibility of using the existing tools together with the IET and what would be the most significant advantages of such integration.





Casceff Incident Evolution Methodology (IEM) and Incident Evolution Tool (IET)

Casceff Incident Evolution Methodology (IEM)

One of the main objectives of Casceff has been to develop an Incident Evolution Methodology (Casceff IEM) to support the understanding and modelling of cascading effects, i.e. dynamically spreading of disturbances between dependent systems within a given territory.

The Incident Evolution Methodology offers a decision support tool for crisis managers, critical infrastructure providers and other stakeholders at regional level. This methodology can be used in different phases (planning, preparation, response, recovery) of emergency management of small and large incidents with cascading effects in a specific region (case).

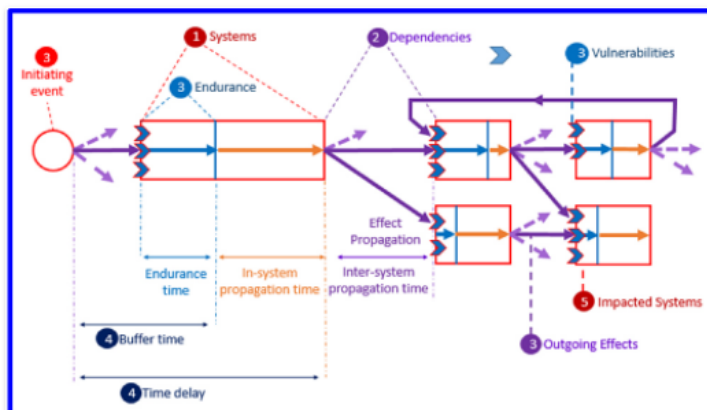


Figure 2.2 Parts of the description of the IEM on the Casceff web site.

In connection with the description of the IET, there is also a link to the IET and information about how to access the IET. The IET itself is summarized in Section 2.2.

2.2 The web based IET

The IET is a web based tool in which a user connected to the internet can reach and use the IET after having registered as a user.

A (potential) user can reach and access the IET via the link:



<https://casceff.forskningsdata.se>

To be able to use the IET, the user needs to first register as user. This is done via the registration form shown in Figure 2.3. This form is reached via the link above, if the user has not yet registered and logged in. Registered users can sign in at the bottom of the form. When later using the same link, the user will automatically reach the IET, if not logged out.

Please sign up

Already a member? [Sign in here](#)

Figure 2.3 Registration form for the IET.

When a user runs the IET for the first time, the user will see a page with some menu options, but otherwise little information (see Figure 4.1). This is described in the summary of the IET in Chapter 134.



3 Summary of the Incident Evolution Methodology (IEM)

One of the main objectives of the CascEff project has been to develop an IEM to provide support for modelling of cascading effects to emergency responders, competent authorities, critical infrastructures operators, and others needing to determine dependencies, vulnerabilities and the risk for cascading effects. The IEM was developed to be used in different phases (planning, preparation, response, recovery) of emergency management of small and large incidents having cascading effects in a specific region (case area).

The focus of the IEM is on determining which systems have potential cascading effects, the dependencies between those systems, and the results of systems being affected by the incident. This approach allows users to identify, as a final step, key moments to influence the cascade, either by stopping it or by limiting its consequences. A schematic of the IEM is shown on Figure 3.1, which presents the main concepts of cascading effects.

The methodological framework of the IEM constitutes of six steps, from selecting the case area and defining the included system to identification of key decision points. The six steps are summarized below:

1. *set the case area and the individual systems in a given territory*: all the systems are described in terms of functionality/provision services, vulnerability and potential outgoing effects;
2. *identify dependencies between systems*: dependencies are identified in regards to systems' proximity and functionality;
3. *propagate the effects between systems*: an initiating event is set in the case area, threatening the systems which can be impacted and which can impact, through cascading effects, other dependent systems;
4. *determine temporal aspects*: buffer time, time-delay and overviews of timeline and tree-view are assessed in order to evaluate the potential time interval emergency responders have for mitigating effects;
5. *assess the impacts*: social, human, economic, environmental and infrastructure impacts are evaluated for each impacted system in order for the emergency responder to compare impacts of cascading effects;
6. *identify the key decision points*: the combined assessment of timeline (step 4) and impacts (step 5) help the emergency responders to prioritize mitigation actions.

The numbers to the different steps of the methodology are shown in Figure 3.1 where they are introduced, explained and used.



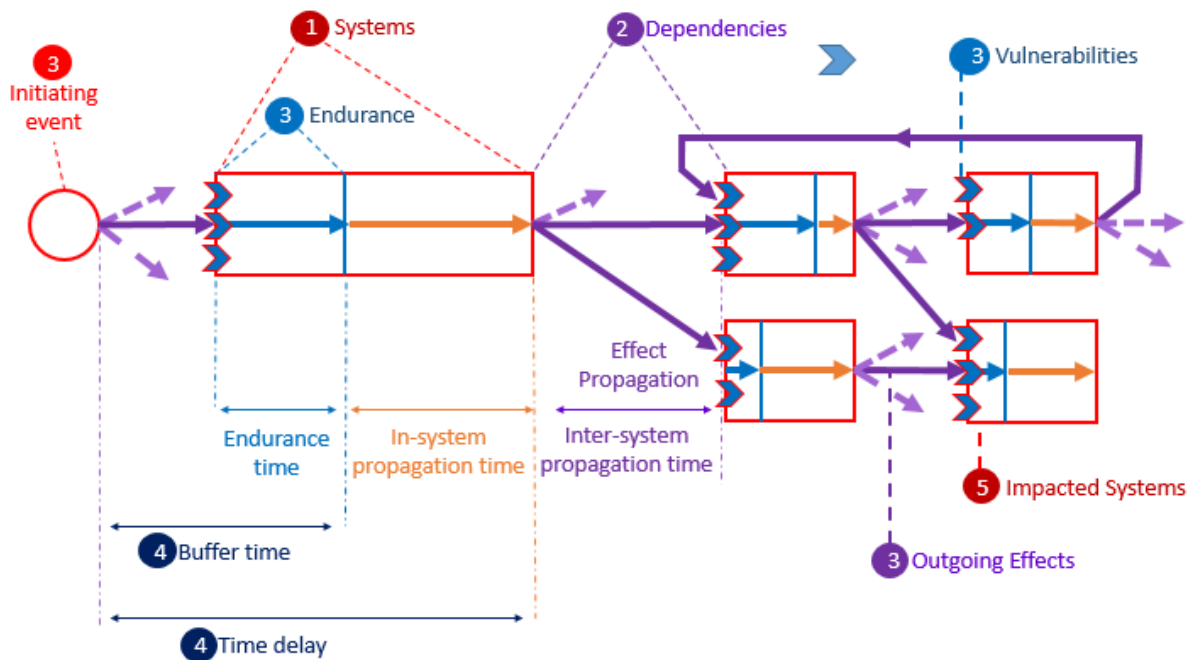


Figure 3.1 Conceptual figure specifying the terminology and the sections where the terms are explained. The numbers in the figure refer to the steps of the methodology.

The terms represented in Figure 3.1 are defined in deliverable D1.6. We recall their definitions below. More details on these terms and potential ways to assess them are specified in deliverable D4.2.

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.

Dependency: Mechanism whereby a state change in one system can affect the state of another system.

Effect (propagation): (Propagation of) result of a cause in the presence of a hazardous situation (ISO 22559:2014)

Endurance time: Time a system can resist incoming effects before they start to create impact on the system.

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

Initiating event: 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.

In-system propagation (time): (time of) propagation of effects between sub-systems within the same system.

Inter-system propagation time: Propagation of effects between two different systems.



Originating system: A system in which a failure propagates to another system.

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.

System: A distinct societal unit (such as a sector, operational activity, infrastructure, human community or natural resource) where a regularly interacting or interdependent group of items forming a unified whole.

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.

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)

The main parts of the methodology are determining the systems within the selected case area and defining the properties of these systems, e.g. their vulnerability to different types of effects. Examples of such effects are flood, landslide, fire, energy service degradation and road transport degradation. A longer list of effects and a description of how to use them are included in deliverable D4.2.

The IEM was used and validated during the validation sessions performed within WP5. Potential end users (having different roles within emergency and crisis management) were invited to take part in table top exercises with and without the IEM. The performance of and results from validation sessions are presented in deliverable D5.4.

The methodology can be used “manually” (as was done during the validation sessions), but implementing it in a web based tool makes it much easier to save different findings and to automate some tasks and processes. In CascEff, the IEM has been implemented in the IET (see Chapter 4).



4 Summary of the Incident Evolution Tool

The IET is built on systems within a case area and the main part is the menus with lists of cases and systems. When first starting the IET these lists are empty as shown in Figure 4.1. It is possible to make cases and systems public and, if other users have done so, it is possible to find these cases and systems to copy and use.



Figure 4.1 Part of the front page of the IET, when entering the first time.

Although the IEM starts with defining the case area, the procedure in the IET is to start with defining the different systems that later should be included in the case.

For each system the vulnerabilities for different incoming effects must be defined. This is done by editing the system and then clicking the menu item “System effects” on the system page (see Figure 4.2). Another menu item “System maximum effects” leads to a form where the impacts can be registered; they are divided into five impact categories (Economical, Social, Infrastructure, Environmental and Human) and many impact subcategories. More information about how to add the information is given in the IET User Manual.



Figure 4.2 Example of the main view of a system.



After the systems are created, they can be added to a specific case. The Case page has four menu items shown along the left side of Figure 4.3: Systems, Dependencies; Initiating Event and Simulation. Under Systems it is possible to add systems to the case if at least parts of the geographical area of the system overlaps the case area.

Using the vulnerability properties of a system together with geographical coordinates, it is possible for the IET to calculate the geographical dependencies. However, there might also be other types of dependencies, e.g. a system might be dependent on power from another system. This kind of functional dependency can be added manually under the menu item Dependencies.

The final item to define is the Initiating Event, i.e. the event that starts the cascading effects. When this is done a simulation can be run on the case and the effects from and on the included systems can be calculated.

The screenshot displays the CascEff web application interface. At the top, there is a navigation bar with the CascEff logo, 'Home', 'About', and a user profile 'CascEffIET (CascEff.IET@gmail.com)'. On the left, a vertical menu lists 'General' (highlighted), 'Systems', 'Dependencies', 'Initiating Event', and 'Simulation'. The main content area is titled 'Case Sweden Skatås wildfire'. It contains a 'Name' field with the text 'Sweden Skatås wildfire' and a 'Description' field. Below the description is a map titled 'Case region' showing a green polygon over a map of the Göteborg area in Sweden. A red star on the map is labeled 'initiating event'. At the bottom of the map area, there is a 'Draw polygon' button and a tooltip that says 'Double click to stop after edit of region'.

Figure 4.3 Example of case main page.



When a simulation is run, the results are presented in several ways: Timeline (see Figure 4.4); Tree view (see Figure 4.5); Map view (see Figure 4.6) and as a table with calculated impacts per system and impact category (see Figure 4.7).

Timeline

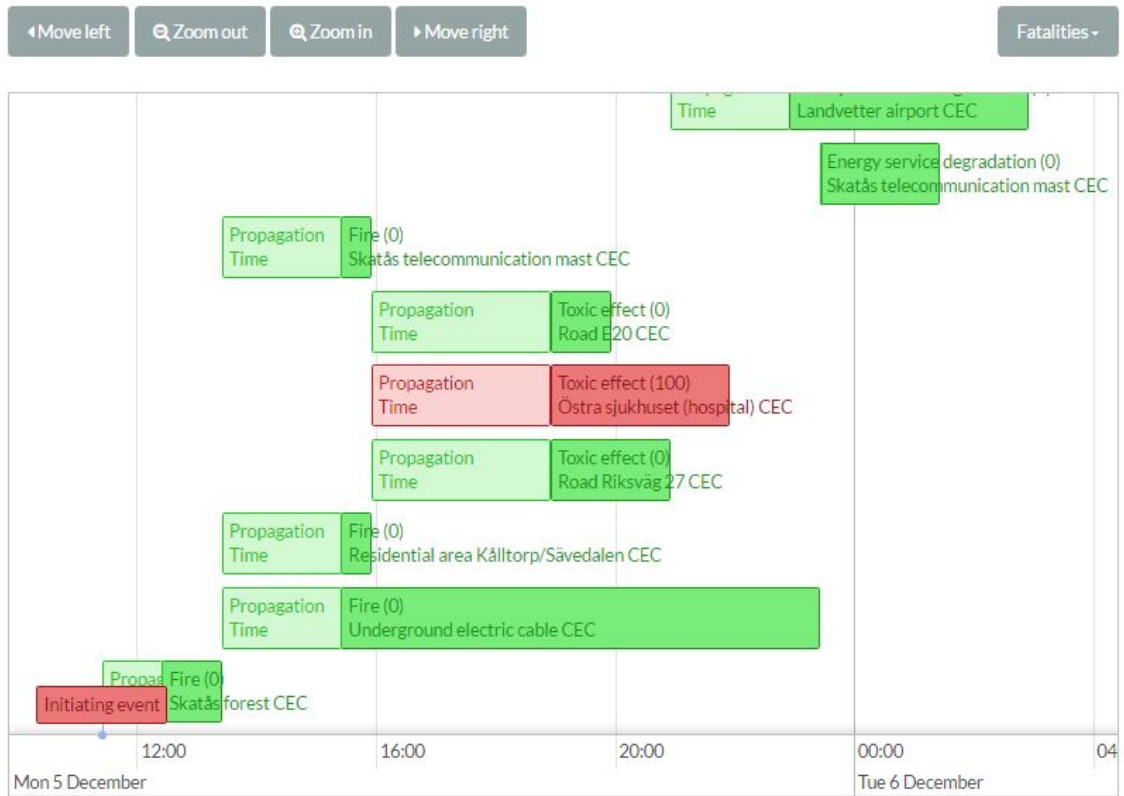


Figure 4.4 Example of timeline view.



Figure 4.5 Example of tree view.



Affected systems

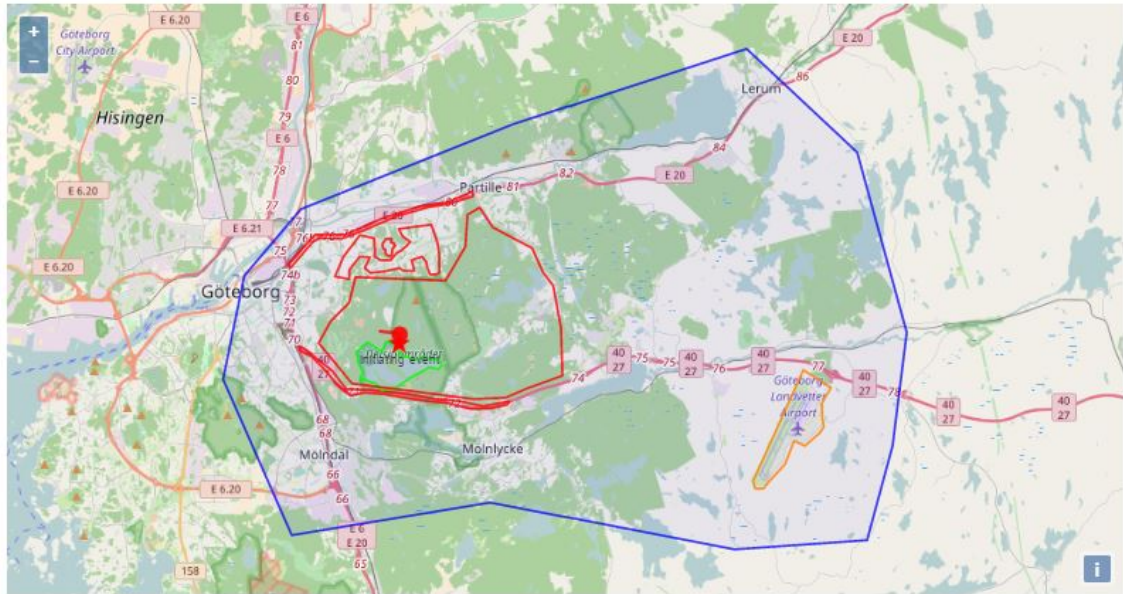


Figure 4.6 Example of map view.



Total impact

Select systems (5/9) -

	Östra sjukhuset (hospital) CEC	Underground electric cable CEC	Skatås forest CEC
ECONOMICAL			
Direct economic cost	1,000,000 € 27%	10,000 € <1%	1,000,000 € 27%
SOCIAL			
People affected by social unrest	0	0	0
People mistrusting authority	0	0	0
INFRASTRUCTURE			
Number of users	0 0%	0 0%	0 0%
Available make up capacity	0 % 0%	25 % 100%	0 % 0%
Expected repair time	0 months 0%	0 months 0%	0 months 0%
Expected repair cost	0 € 0%	10,000 € <1%	0 € 0%
Life/property losses	0	0	0
ENVIRONMENTAL			
Polluted land	0 km ²	0 km ²	0 km ²
Polluted forest	0 km ² 0%	0 km ² 0%	5 km ² 100%
Polluted sea	0 km ² 0%	0 km ² 0%	1 km ² 100%
Dead animals	0	0	0
HUMAN			
Fatalities	100 100%	0 0%	0 0%
Injuries	1,000 >99%	0 0%	2 <1%
People that has lost critical services	0 0%	15 100%	0 0%
Mental health injuries	0	0	0
Evacuated	2,000 >99%	0 0%	10 <1%
Homeless	0	0	0

Figure 4.7 Example of table with impacts.

For more details on the IET, how to use it and what the different parameters mean, the reader is referred to the IET User Manual. More information on the IEM and on the terminology used can be found in deliverable D4.2.



5 Conclusions

In the Casceff project, an Incident Evolution Methodology (IEM) was developed. The IEM was also implemented in an Incident Evolution Tool (IET) which is a web based tool available for users on the internet.

Both the IEM and IET are described on the Casceff public web site (www.casceff.eu). The specific part of the web site describing the tools (IEM and IET) is linked through the “Tools” menu. There is instruction on the web site about how to access and register to use the IET.

Both IEM and IET have been experienced by users external to the project. The main conclusions are that they are perceived as being practicable, credible and as bring added-value as mainly shown in Deliverables D5.3 and D5.4.

