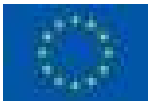


*Driv*ing Innovation in Crisis Management for *E*uropean *R*esilience

D43.21 – Airborne Sensor Processing Experimentation Report (Initial Inventory of SP4 tools)

Dissemination level: Public

Grant agreement number:	**607798**	
Start date of the project:	**2014-05-01**	**Due date of deliverable: M10**
Duration:	**54 months**	**Actual submission date: 2015-02-28**
Lead Beneficiary: DLR		

Keywords:
Tools, SP4 Initial Inventory of Tools, Experimentation, Airborne Sensor Processing

Dissemination level:	
PU	☒
PP	☐
RE	☐
CO	☐

Release History

Version	Date	Description	Release by
V0.1	16 January 2015	Draft	Julia Zillies, Gunnar Schwoch, Carsten Dalaff (DLR)
V0.2	22 January 2015	Final Draft	Julia Zillies, Gunnar Schwoch (DLR), José Luis (GMV)
V0.3	15 February 2015	Revision	FRQ, WWU
V1	27 February 2015	Released for Submission	Julia Zillies, Gunnar Schwoch, Konstanze Lechner (DLR)

Table of Contents

List of Tables

List of Figures

List of Acronyms

Abbreviation / acronym	Description
ACRIMAS	Aftermath Crisis Management System-of-systems Demonstration (FP7 project)
COP	Common Operational Picture
DOW	Description of Work
EmerT	Emergency Mobility of Rescue Forces and Regular Traffic
GCS	Ground Control Station
RPV	Remotely Piloted Vehicle
SoS	System of Systems
SP4	DRIVER Subproject 4 “Strengthened Responders”
SUMO	Simulation of urban mobility
TRL	Technical Readiness Level
WP	Work Package
ZKI	Center for Satellite Based Crisis Information

Executive Summary

The overall goal of WP 43 is to improve the capabilities of the responders' community in terms of situations assessment, prediction and early warning on different levels of command (operative, tactical, and strategic) in various dimensions of CM (equipment, society, health, security, transport) within and across member states. Existing (legacy) systems, procedures and prototypes within other research projects have been analysed according to their possible contributions in fulfilling the overall goal of WP 43. This work is supported by the outcomes of several other WPs. For example, the findings in the WP 22 were that several technical tools exist that use data and information from different sources to conduct various analyses. The extracted information is presented and visualized in several ways to provide the required information on, e.g., crisis dynamics, or demand and assessment needs.

Airborne collected data can be an important source for such tools, as the provided imagery data contains not only the most up-to-date information on areas with limited access, but is also an efficient way to assess, e.g., the area extent of the disaster.

In this context, the sub task 43.2 "Airborne Sensor Assessment" addresses the need for improved airborne sensing capabilities. The desired outcome of the task is to ensure that it is possible to conduct a situation assessment, prediction and early warning within and across member states based on airborne sensors in order to facilitate data-downlink and information processing (geo-referencing, generation of map-overlays, analysis, interface to higher level systems e.g. COP).

Several tools, namely EmerT, U-Fly, ZKI-Portal, SUMO, and ESS, have been presented to a selected group within the Driver SP4 *Initial Inventory of Tools* **held in Aix-en-Provence in November 2015. The objective was to evaluate the usability of the tools in the context of the Driver project with members of the driver project and tool providers. This report gives a summary of the conducted evaluation method and the outcomes of the evaluation related to Task 43.2** *Airborne Sensor Processing***. The general procedures, outcomes and conclusions drawn from the Initial Inventory of Tools are summarized in document** *D41.1.1 Initial Inventory of Tools SP4 Level Experimentation Report.*

1 Introduction

1.1 Scope

The purpose of this document is to report on the experiment related activities lead by SP4 and more specifically by Task 43.2 Airborne Sensor Processing during the first period (before MS1). During the *Initial Inventory of Tools* **conducted in November 2015, a specific session has taken place to present all tools that are related to Task 43.2. Selected tool features have been evaluated by a group consisting of project partners and end-users. The purpose of this methodology was not only the validation and presentation of tool related features, but also to develop ideas and concepts that enable interworking of different tools.**

1.2 Document overview

This document contains the following chapters:

- **A first chapter gives a short introduction into the scope of the document.**
- **Chapter 2 refers to the outcomes of the initial experimentation activities on SP4 level.**
- **Chapter 3 introduces Task 43.2 and explains the methodology used for the** *Initial Inventory of Tools*. **Afterwards, all tools that have been presented during the Task 43.2 related session are presented. The chapter concludes with the description of the results from the** *Initial Inventory of Tools*.
- **Chapter 4 contains conclusions that have been drawn from the evaluation results and further discussions that took place during the** *Initial Inventory of Tools*.

1.3 Reference Documents and Standards

This report refers to the following documents:

D41.1.1 Initial Inventory of Tools - SP4 level report

Tool descriptions: see DRIVER Space
→ SP4 → _SP4 Tools very short descriptions:
https://driver.atosresearch.eu/index.jsp?uuid=fb8f9121-45cd-47cc-927d-ce7f37be2881
→ SP4 → SP4 1st Initial Inventory of Tools (Aix) → Tool Descriptions
https://driver.atosresearch.eu/index.jsp?uuid=0f36372a-56d1-4c1c-82f4-e58d26e47da7

2 SP4 Initial Inventory of tools

A representative set of tools available in SP4 were presented and evaluated during the 1st SP4 experimentation week (also referred to as *Initial Inventory of Tools***) in Aix-en-Provence (at POLE Risque) from Nov. 24th – 28th, 2014.**

A summary of this week and general conclusions are factored out and summarized into a common document D41.1.1 *Initial Inventory of Tools SP4 Level Experimentation Report***. That general chapter belongs to all deliverables D4x.y1 describing further on the particular results per task.**

3 Task experiment report

3.1 Introduction

The task "Airborne sensor processing" first of all requires the collection of airborne imagery data. This demands the deployment of different technical means and, in preparation for the final demonstration, the conduction of several simulations and flight experiments.

Figure 1: DLR Research Aircraft, D-CODE[1]

The features of these tools are difficult to map directly to crisis management related features. Therefore, not each tool involved in the task presentation was subject to a following evaluation. This applies to DLR's research aircraft D-CODE (Dornier 228) and DLR's 3K camera system.

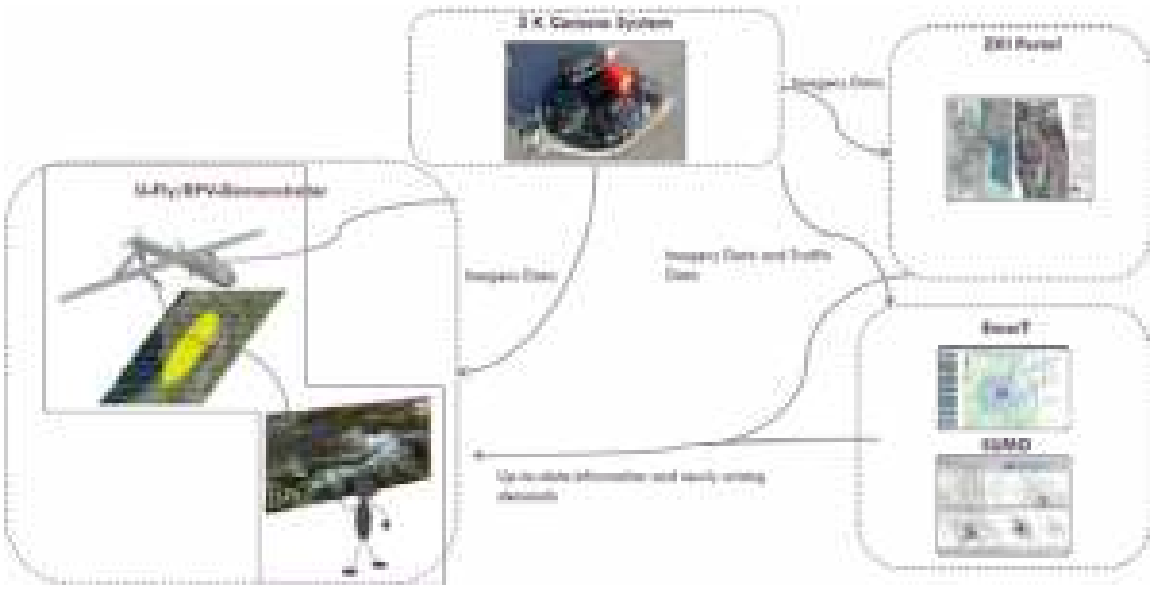


Figure 2: DLR System Architecture

During the session, the simulation of a reconnaissance mission based on data of a past campaign was shown. The output in terms of flight paths and collected imagery data was made visible to the audience through DLR's ground control station (GCS) U-Fly.

[1] The DRIVER logo has been added to the plane by image editing

The remaining tools presented in the session deal with information processing, analysis and visualisation, as well as traffic simulation. The demonstrated tools provide a large range of features, which are related to other tasks, but since these systems will work together during future DRIVER experiments, it was decided to present the whole system of DLR tools in the session of Task 43.2. Various analysis capabilities include the use of aerial data. The demonstration during the initial inventory of tools has illustrated in which way airborne collected data can be utilised to support disaster management. The existing interworking capabilities will be the foundation to allow a seamless integration into the DRIVER System of Systems (SoS).

3.1.1 Task description

According to the Description of Work (DOW), this task is described as follows:

This task addresses the need for improved airborne sensing capabilities and involves:

- *Assessment based on airborne sensors (Optionally Piloted Aircraft –OPA-)*
- *Flight planning/operation, data-downlink and information processing (geo-referencing, generation of map-overlays, analysis, interface to higher level systems e.g. COP)*

Planned Experiments:

- *Usage of mobile sensors (SAT, OPA and robots) within a flood scenario*

DLR as the task leader provides all tools located in this task itself. The DOW describes the role of DLR as follows:

DLR will provide airborne sensor suites for real time information gathering and Optionally Piloted Aircrafts mission planning and furthermore a tool for analysing the traffic situation including decision support.

As part of Phase II of the EU's Aftermath Crisis Management SoS Demonstration Programme, DRIVER is built on the needs and findings of the previous projects ACRIMAS and CRISYS. Tasks within DRIVER are mostly related to validated topics with identified need for improvement. The project ACRIMAS has given a comprehensive analysis of critical areas and topics within the current CM "system-of-systems". Identified gaps and needs have been summarized within the ACRIMAS "Gap Analysis". According to this analysis, the discussions about the use of space and aerial means in support of disaster management have been controversial. While certain stakeholders have mentioned such assets as a priority need, others have argued strongly against this. However, several needs regarding situation assessment and sense-making as well as information gathering, logistics, and infrastructure have been validated and will be supported by airborne and satellite imagery data.

The DRIVER initial inventory of tools has shown several technical tools that use data and information from different sources to conduct various analyses. The extracted information is presented and visualized in several ways to provide the required information on, e.g., crisis dynamics or demand and needs assessment. Airborne collected data can be an important source for such tools, as the provided imagery data contains not only the most up-to-date information on areas with limited access, but is also an efficient way to assess, e.g., the area extent of the disaster. The ACRIMAS "Gap Analysis" has claimed, that tools which support visualization of information, modelling and simulation, support topics like "Understanding specific crisis dynamics", or "Demand and needs assessment". The demonstrated Task 43.2 related tools provide such functionalities with focus on crisis mapping and risk assessment as well as analysis and simulation of the traffic situation for decision support. In this way, the presented tools can contribute to relevant ACRIMAS topics.

3.1.2 Evaluation sheet structure

Task 43.2 is of a rather technical nature. Since it involves aircraft operation, it is subject to several constraints. Therefore, the task internal feature description against the background of disaster management is of limited extend, but the output will be supportive to many other SP4 tasks.

The task related features are summarized in the following table:

Table 1 : Evaluation Sheet Structure

Task	Feature	Sub-feature	Tool specific implementation
T43.2 Airborne sensor processing	Assessment based on airborne sensors		
	Flight planning/ operation	Large radius of action	
		Sensor-adaptive Flight Planning	

3.2 Tools involved

Table 2 : Tool Description

Tool	Provider	Session	Evaluators
U-Fly/RPV-Demonstrator +3K Camera System	DLR	T43.2	MSB, THW, WWU, Pole and Marseille Fire Department
U-FLY is a ground control station (GCS) for Remotely Piloted Aircraft (RPV). The capabilities include mission planning and evaluation for single RPAS or swarm formations. U-Fly receives aerial sensor data, processes and evaluates sensor data, and dynamically adapts RPAS missions to newly received information. The research aircraft D-CODE, a modified Dornier 228 with digital autopilot and control/payload data link, can be controlled via the GCS and be used as RPV-demonstrator in DRIVER experiments. Equipped with the 3K Camera System, the RPV will gather and provide aerial images of a disaster area in real time.			
ZKI	DLR	T43.2	MSB, THW, WWU, Pole and Marseille Fire Department
The Center for Satellite Based Crisis Information (ZKI) presents a service at DLR. It provides a 24/7 service for the rapid provision, processing and analysis of satellite and airborne imagery during natural and environmental disasters, for humanitarian relief activities and civil security issues worldwide. The resulting satellite and airborne based information products are provided to relief organisations and public authorities and are mainly freely available on the ZKI website. According to the requirements of the user, the information products are delivered in the form of maps, GIS-ready geodata or dossiers which are then used to support disaster management operations, humanitarian relief activities or civil security issues. The ZKI is ISO 9001 certified.			

Tool	Provider	Session	Evaluators
SUMO Simulation of urban mobility	**DLR**	**T43.2**	**MSB, THW, WWU, Pole and Marseille Fire Department**
SUMO is a microscopic and open source road traffic simulation. In SUMO it is possible to simulate vehicles, pedestrians, traffic lights and multimodal mobility. In principle, SUMO requires a road network that includes road-side infrastructure, such as traffic lights, and a traffic demand for performing a simulation. Given both, the simulation SUMO moves the vehicles from the start position of their route to their end position. SUMO is a development of the Institute of Transportation Systems at the German Aerospace Center. The first concepts were developed in the year 2000 and the first public release was done in the year 2002.			
EmerT - Emergency Mobility of Rescue Forces and Regular Traffic	**DLR**	**T43.2**	**MSB, THW, WWU, Pole and Marseille Fire Department**
The EmerT- Portal is a web-portal developed within the Delphi and VABENE projects of the German Aerospace Center (DLR). With EmerT it is possible to visualize the current traffic situation using different traffic sources (aerial images, inductive loops, Floating-Car-Data etc.). The traffic data can be used as basis to simulate and predict traffic and for supporting the decision process for traffic management actions in case of an incident or planning a big event.			
ESS	**GMV**	**T43.2**	**AIT 1, TNO, AIT 2**
The Emergency Support System (ESS) is a suite of real-time data-centric technologies which will provide actionable information to crisis managers during abnormal events. This information will enable improved control and management, resulting in real-time synchronization between forces on the ground (police, rescue, firefighters) and out-of-theatre command and control centres (C&C).			

3.3 Inventory results

3.3.1 Tools feature coverage overview

The tool feature coverage was compiled from the evaluation sheets and is visualised in the following table.

Table 3 : Tool Feature Coverage

dark green=FULLY COVERED and DEMONSTRATED; light green=COVERED ACCORDING TOOL PROVIDER BUT NOT DEMONSTRATED, yellow=PARTLY COVERED, white=NOT COVERED		Task Session	T43.2: Airborne Sensor Processing				
		Tool Supplier	DLR	DLR	DLR	DLR	GMV
		Tool name	EmerT	U-Fly	ZKI-Portal	SUMO	ESS
Task	**Feature**	**Sub-feature**					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Fully	Fully	Fully		Fully
	Flight planning/ operation	Large radius of action		Partly			
		Sensor-adaptive flight planning		Fully			

3.3.2 U-Fly

3.3.2.1 Explicit feedback tables

Table 4 : U-Fly Evaluation

Feature	Sub-feature	U-Fly (DLR)	relevance	maturity	potential	Suggested improvements / comments			
						WWU	MSB	Pole, Marseille Fire Department	THW
Assessment based on airborne sensors		Aerial images are acquired from RPAS (remotely piloted aircraft system). The automatic real-time processing includes orthoprojection into map coordinates, mosaicing, automatic traffic data extraction and downlink of data to the control station.	3	6,5	3				
Flight Planning/Operation	Large radius of action	RPAS+3K tool can cover wide areas for regional and national disasters.	3				Limited by the range of the data link. If downlink fails it will be downlinked later which is good		
	Sensor-adaptive Flight Planning	Areas of interest can be defined by the end users. Re-planning of the flight path based on already collected sensor data	3	5					In terms of radius; The bigger the better

General remarks to the tool					
		WWU	**MSB**	**Pole, Marseille Fire Department**	**THW**
Overall impression		**Highly relevant and mature tool for DRIVER purposes. No concrete TRL is mentioned in the tool details, but only "prototype", however the impression is that some features seem to have even a TRL of 9. Coming from a different field an average of 8 was estimated to the overall tool.**	**Very valuable to have a "tool" that can be rapidly deployed to provide aerial images and very good that the images can be provided fast.**		**- Interesting in order to get an overview - Monitoring of units by a plane is less interesting (pumps do not move frequently) - Could be interesting in order to see which streets are affected -> which route should a team take**
Usability	**3**	**Although coming from another domain the usability seems to be very high thanks to the well-structured presentation**	**The tool for flight planning seemed user friendly but to us, the usability for the end user of the images is more relevant perhaps.**		**- Big issue: cost vs. benefit**
Position within the DRIVER System of Systems		**The integration seems to be very high, although it should be done partly automated and partly manually.**	**The plane may not be able to fly during the actual experiment.**		

3.3.2.2 Statement of the tool provider

As DLR's Research Ground Control Station (GCS) "U-Fly" and the connected Remotely Piloted Vehicle (RPV) demonstrator come from a different research field for most of the evaluators, it was difficult for the evaluators to assess all features comprehensively. However, the evaluation was well done and valuable to tool providers and task lead.

The estimated Technical Readiness Level (TRL) varies from 5 to 8, while DLR would set the TRL level between 4 and 5, as this technology is currently only deployed in DLR's experimental environment. All evaluators express their good overall impression of the tool with emphasis on the usability of collected imagery data within the DRIVER SoS. Beside the two main advantages of using unmanned systems, the ability to operate up to 30 hours and the ability to

operate in inhospitable environments, the tool provider has attempted to outline the benefit of using advanced mission and path planning capabilities for aerial reconnaissance missions. Even though the path planning capabilities have been mentioned as rather mature features in the evaluation, the advantages of using unmanned systems in crisis management should be demonstrated in further experiments from the tool provider's perspective. This will outline and strengthen the role of remotely piloted aircraft systems within the crisis management community.

During evaluation, the limited range of the datalink that connects the aircraft with the ground station is considered as a critical point. The current datalink range is dependent on the flight level and reaches theoretically up to 200 km. Future datalink connections will make use of satellite technology to overcome such limitations. Within the DRIVER context, the used datalink connection is considered as sufficient to demonstrate the relevant features.

It was also mentioned that monitoring of selected units may not be important (e.g., in flooding scenarios). This might apply to certain scenarios, but in the past, constant airborne monitoring of fire-fighting operations during large forest fires in the US, or the monitoring of cooling efforts in the nuclear plant of Fukushima, has been of great support to the disaster management mission.[2][3] The relatively high costs of a flight manoeuvre have been considered as a big issue. While the benefit of such an operation certainly has to be considered, many disaster scenarios require airborne imagery data.

3.3.3 ZKI

3.3.3.1 Explicit feedback tables

Table 5: ZKI Evaluation

Feature	Sub-feature	ZKI (DLR)	relevance	maturity	potential	Suggested improvements / comments			
						WWU	MSB	Pole, Marseille Fire Department	THW
Assessment based on airborne sensors		Imagery from optical and radar satellite as well as aerial imagery can be used for mapping purposes, products include simple image information maps, or more complex impact and damage assessments	3	8,6	3				

[2] http://www.australiansecuritymagazine.com.au/2014/04/unmanned-vehicles-enhancing-security-rescue-and-natural-disaster-management-capability-part-ii/
[3] http://www.ga-asi.com/news_events/index.php?read=1&id=424

General remarks to the tool					
		WWU	**MSB**	**Pole, Marseille Fire Department**	**THW**
Overall impression		**ZKI is a very useful and established tool to fulfil the mentioned features.**	**My limited experience is that maps with processed satellite data are from Copernicus activations.** **It takes a very long time from satellite image requested and taken until the product is finally delivered.** **As a user I may want a less "prepared" format such as a vector file instead of a map product if that data may be available quicker than the final product.**		
Usability	**2,6**		**Maps and presented product seem very usable**		**Satellite imagery is a useful tool if:** **a) Satellite is available** **b) Cost are reasonable** **c) Time between request and fulfilment is not too large**
Position within the DRIVER System of Systems		**Relevant to the most other tools as the provided information have a very high bandwidth and quality**	**The tool can provide imagery and geodata for emergency management and disaster assessment for the Driver experiments. Information should be integrated into the common operational picture tools.**		

3.3.3.2 Statement of the tool provider

The evaluation of ZKI reflects the usability and maturity of the service. Most features have been assessed with TLR 8 or 9, which corresponds to the TLR given by DLR, as this service is already operational. Furthermore, most features have been marked as fully usable by the evaluators. The possibility to create different map formats has been positively perceived with an emphasis on the importance of vector formats which ensure reusability by other tool providers. The use of satellite imagery is very much appreciated, but it is also outlined that the acquisition of such images may take a long time. The evaluators point out the importance of the data and maps provided by ZKI, and it was highlighted that the information should be integrated in the common operational picture.

When working with satellite data, time is indeed the limiting factor. The analysis and preparation of maps play minor roles. The time consuming part is the satellite acquisition and satellite delivery to the ZKI. For this reason vector data derived by satellite imagery is not faster than delivering the map product. The time frames can be discussed to decide on a case by case basis which information product would suit. The advantage of airborne imagery like demonstrated in DRIVER is the faster availability of the images.

3.3.4 EmerT

3.3.4.1 Explicit feedback tables

Table 6: EmerT Evaluation

Feature	Sub-feature	EmerT DLR	relevance	maturity	potential	Suggested improvements / comments			
						WWU	MSB	Pole, Marseille Fire Department	THW
Assessment based on airborne sensors		Automated traffic detection from images. Demonstration of the further processing of the collected data. Traffic visualization and prognosis. Traffic prediction and situation support	3	7	3				

General Remarks to the tool					
		WWU	MSB	Pole, Marseille Fire Department	THW
Overall impression		Very promising, useful and mature tool that could be used for various transportation planning tasks in the logistics domain, the set up time has to be considered	This tool seems very mature and rich in functionality.		- interesting tool primary for planning events - seems difficult to use in an ad hoc crisis, as people will behave in an un-/ less predictable or hard to predict manner - also good for evacuation forecast and evaluation of evacuation strategies
Usability	3				
Position within the DRIVER System of Systems		The output is of high interest for all logistics related tasks, many other tools can benefit from EmerT results.	I think it will be very central in Driver especially if its information content can be shared with other tools. All "other common operational picture" / "situation assessment" type of tools would benefit from integrating data from EmerT.		

3.3.4.2 Statement of the tool provider

Most of the evaluators do not have a detailed traffic research background and come from different research fields. Therefore the evaluators focused on the practical applications. All evaluators expressed their good overall impression of the tool and emphasized the tool as very mature and rich in functionality. The usability is voted with 3 (the highest value). The evaluators underlined that the tool is able to provide many information and tools for the planning of big events and other critical events. The tool additionally opens the opportunity to evaluate crisis management strategies, e.g., evacuation scenarios. The output is ranked as 'of high interest' and 'very central in DRIVER'. The evaluators see the sharing of information with other common operational picture and situation assessment tools as a very important constraint for this tool. The integration of the tool output in the DRIVER common operational picture is one of the tool provider's aims.

3.3.5 SUMO

3.3.5.1 Explicit feedback tables

Table 7: SUMO Evaluation

General remarks to the tool					
		WWU	MSB	Pole, Marseille Fire Department	THW
Overall impression		As mentioned also by the audience SUMO seems to have a high maturity level (the estimation of the evaluator is based on the information of the tool provider in the evaluation sheet, i.e. 7, although some features seems higher than this) but especially a very high relevance for many other tools. Both network planning and operational tools can benefit from SUMO output.	Seems very useful to most cases where traffic simulation is needed.		- Very useful tool - If you can obtain info on the change in f. ex. the stability/load capacity of bridges, it would be very beneficial. - Ex.: normally a bridge can handle 8t, after 5 hours of flood exposure it can handle 3t.
Usability	2-3	The only limitation to be considered is the required setup time in terms of new data (esp. transportation network).			
Position within the DRIVER System of Systems		As mentioned above SUMO can be understood as a tool that can both process data/results from (e.g. EvacuAid) and to other DRIVER tools (e.g. anylogic).	Useful as a service to other tools that need to complement with traffic simulation.		If you can get info on the status of gas stations (do they still have gas, do the pumps function, are they flooded etc.) that would help.

3.3.5.2 Statement of the tool provider

Most of the evaluators come from a different research field, so it was not easy for them to assess all features comprehensively. The evaluators focused on the practical applications. Nevertheless, the evaluation was well done and valuable for the tool provider and task lead. All evaluators express their good overall impression of the tool and see the usefulness for most cases where traffic simulation is needed. The required set up time and input data (like transportation network, traffic demand) was considered as a limiting factor for a quick transfer to a different area. An additional demand was to check if this tool can be used as a service to other tools that may require traffic simulation. Further comments apply to very specific and detailed first responder tasks which could be supported by the tool.

3.3.6 ESS

3.3.6.1 Explicit feedback tables

Table 8: ESS Evaluation

Feature	Sub-feature	ESS (GMV)	relevance	maturity	potential	Suggested improvements / comments		
						AIT 1	TNO	AIT 2
Assessment based on airborne sensors		Cameras and sensors integrated in UAV and balloons.	2,5	5	2	Integration of airborne cameras seems to work well, nice to have. There is no support for assessment, the tool simply shows the view from airborne camera		Not so clear what the tool can do with airborne sensors.

General remarks to the tool				
		AIT 1	TNO	AIT 2
Overall impression		This tool appears to be well done and my impression is that it's either already at the "operative" level or pretty near to being operative. Main functionalities it offers are in my opinion: - middleware for gathering and sharing of information from various sources. - mass-informing functionality through several channels. Most interesting appears to be a feature which allows sending of SMSs to everyone in an area even if the network is down. - modelling sub-system which can be used to assess and predict the risk development for certain types of events (e.g. fire)		Appears to be a very mature tool with a lot of possible use cases in CDM and in the environmental domain.
Usability	2,5-3			Remarks: Is it only for COP during the crises or also in all other phases?
Position within the DRIVER System of Systems		See "overall impression". In my opinion, the tool could be used as a part of the complete crisis management support infrastructure and provide one or more of the three main functions listed above. From AIT point of view (CrowdTasker), incorporating a map of danger areas resulting from model runs in local situation shown to volunteers would be nice. Also the possibility to send some tasks to "everyone" - even in situation when the network is down sounds interesting.	Technical promising Non-technical part should be improved, e.g. in relation with SP3 (wr[t?] communication with citizens) How to deal with N (N > 100) messages in a short period.	Could be used as a general crisis management supporting tool in DRIVER or as middleware to combine input from other tools. Depending on the use cases, this could be e.g. social media monitoring or crowd tasking.

3.3.6.2 Statement of the tool provider

As the evaluators point out in their conclusions, the main goal of ESS is to present crisis managers with the COP of a crisis to improve their situational awareness. In this sense, ESS represents the perfect way to integrate the information gathered through airborne sensors into the COP. ESS shows the location of the sensors, gives access to their feedback, like pictures or videos, and could be easily adapted to allow the ESS operators to send simple commands to the other tools, all of this through an intuitive GIS interface.

4 Conclusion

4.1 SP4 Inventory of tools

Please refer to document D41.1.1 Initial Inventory of Tools SP4 Level Experimentation Report for the more general conclusions drawn from the initial inventory of tools.

4.2 Task 43.2 Inventory of tools

During the initial inventory of tools, the different tools related to Task 43.2 were successfully presented to the audience. The evaluation reflects that each tool was presented in a structured way, which enabled the evaluators and the audience to understand the different functionalities and the contribution to the DRIVER SoS. Most importantly, the initial inventory of tools revealed different opportunities for interworking with other systems. Many partners were interested in accessing the airborne sensor data in order to incorporate them into their tools. The evaluators stressed the need to clarify how the data interoperability can be guaranteed. In future events, this data can be made accessible for other partners via a network drive. The data can be provided in different formats and contains additional meta-information on quality and recording time.

The tool presentations have also opened up opportunities for interworking. For example, data from different sources on disaster extend and destroyed infrastructure could be included in the modelling and simulation process. In accordance to Tasks 43.1, 43.3, and 43.5, it has to be decided which data should be exchanged and how this will be done on a technical level. Especially SUMO has shown several possible connections with other tools. For example, data from different sources on disaster extend and destroyed infrastructure could be included in the modelling and simulation process. Moreover, the output of SUMO in terms of traffic prediction could be used in other tools that deal with logistics.

With respect to the objectives of WP43, the recorded comments of the evaluators during the structured interviews gave very fruitful hints. The evaluators stressed that the capabilities of the responders' community can be improved in terms of situation assessment, prediction and early warning on different levels of command in the various dimensions of CM within and across member states. Furthermore, the evaluators emphasised to focus on the task how the received data from the presented tools have to be processed (aggregation, combination, etc.) to facilitate the different tasks of the assisting parties in CM.

Since the presented tools were considerably diverse, the next section contains a few conclusive remarks of each tool provider.

U-Fly/3K Camera System: Using remotely piloted systems in crisis management is a new concept. While these systems have been used in disaster management missions by e.g. US authorities quite often, these novel systems have not been used very often by the European responders. Formally known for their military use, the deployment of such systems is part of a critical societal discussion. However, using these systems in civil applications is becoming more and more popular, as they have certain advantages in terms of mission range, advanced sensor deployment, protection of human

health, and effective flight planning. It is therefore of significant interest to demonstrate the benefits of these systems during the DRIVER experimentation campaigns.

The evaluation has reflected a positive attitude towards the use of remotely piloted systems, but has also shown that the advantages of using such systems need to be further highlighted during the next steps. To enable efficient flight path planning and thereby sensor data collection, as many information as possible are included into the planning process. Successfully collected images are displayed to the RPAS operator to provide the operator with enhanced situational awareness. In addition, advanced optimization strategies support the operator during the planning process. Within the DRIVER context, an important objective is to enable interworking between the different CM tools. To that aim, further information from different resources should be included in the planning process. This could e.g. include geographical areas or landmarks that need to be examined. The next step is to identify authorities, consortium partners and/or end-users that could benefit from such information and that will have permission to request such information and thereby influence the flight path during the upcoming DRIVER experiments.

ZKI: The service of ZKI has been operational for several years and it was possible to present its strength and usability during the presentation. Satellite and airborne based ZKI information can be integrated into the DRIVER system and be provided to the partners using existing web service functionalities. Several ZKI procedures, particularly regarding image analysis, are implemented semi-automatically and, depending on the request, require a high amount of effort. Therefore, only a part of ZKI's product portfolio was demonstrated within the presentation. Information from other sources in the DRIVER SoS can be additionally included in the ZKI products, which offers the opportunity to create for example cases novel, individual maps, GIS-ready geodata, or dossiers, tailored to the needs arising in the upcoming experimentation campaigns. Focus of the ZKI service will be on the 3D visualization of satellite and airborne imagery as well as DRIVER relevant information.

As partners were asking for satellite imagery to be included in the next experiments, the ZKI staff will help to provide available archive satellite data for these experiments and demonstrate the benefits and limitations of satellite imagery in examples.

EmerT: Up to now, it is not common that modern approaches of traffic management are adapted to crisis management. Different functionalities of EmerT offer the opportunity to easily provide partners with traffic information using existing web service functionalities. The integration of traffic information, routing optimization and further decision support information to the common operational picture could be realized within the project. By doing so, EmerT is able to provide an additional component to crisis management.

The evaluation has reflected a positive attitude towards the integration of traffic information and management approaches into crisis management, which has to be investigated in detail during the next steps.

SUMO: The traffic simulation tool SUMO has been in use for several years and was able to show its strength and usability. The traffic simulation can be integrated into the DRIVER SoS and can provide additional information to the partners easily. During the evaluation, SUMO has shown its potential to

complement other tools concerning traffic information. For example, SUMO could be used for the evaluation of the different evacuation scenarios.

The evaluation has reflected a positive attitude towards the integration of traffic aspects into crisis management, which has to be investigated in detail during the next steps.

ESS: The tools described in this document provide different types of information coming from airborne sensors and ESS is ready to provide a common interface where all this information is presented to the crisis managers along with any other information that conform the COP. Furthermore, a deeper collaboration with these tools will allow the sending of commands using simple interfaces within ESS, for example an area to be analysed, and so forth.

Annexes

Table 9: U-Fly, Evaluator WWU

Date	Evaluator org.	Evaluator name	DLR					
			U-Fly/RPV-Demonstrator	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Machine readable info	Airborne sensor data collection and data-downlink	Yes	3	8		3 (*not being an expert in the area of aerial imagery the estimation of the evaluator is really limited)
	Information preparation	Map view	Map overlays for areas, in which sensor data have successfully been collected	Yes	3	8		3
	Decision support	Information processing for decision making purposes	The displayed sensor data will help the operator to plan/re-plan the mission	Yes	3	8		3
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Aerial images are acquired from RPAS (remotely piloted aircraft system). The automatic real-time processing includes orthoprojection into map coordinates, mosaicing, automatic traffic data extraction and downlink of data to the control station.	Yes	3	8		3
	Flight planning/ operation	Large radius of action	RPAS+3K tool can cover wide areas for regional and national disasters.					
		Sensor-adaptive Flight Planning	Areas of interest can be defined by the end users. Re-planning of the flight path based on already collected sensor data					
T43.5 Shared situation awareness	Acquisition	Acquisition (manual / automatic)	Real time information gathering	Yes	3	8		3
	COP Production	Fusion / Aggregation	Single camera frames are aggregated to georeferenced tiles	Yes	3	8		3
		Visualization	Processed pictures (tiles) are displayed in					

		/filtering / Querying of common operational picture	form of map overlays in U-Fly's geographical environment					
	Equipment/ Deployment	Control centers	U-Fly has an advanced HCI, with design focus set on intuitive and efficient human-machine interaction concepts	Yes	3	8		3
T44.1 Capacity Building and Capacity Mapping Tools	Deployment of Resources	Decision Support	Planning and re-planning of the RPV mission (sensor suite deployment)	Yes	3	8		3
		Mapping to different Crisis types and levels	Due to generic map formats U-Fly can be utilized in different crisis scenarios The RPV can be used in inhospitable environments to collect sensor data (cf. Fukushima)					
		Monitoring of current status of deployed resources	Monitoring of RPV position and status Monitoring of the mission status and mission progress					
	Selection of Resources Level	Monitoring of current resource level	The RPV can be assigned to permanently monitor the deployment of certain resources	Yes	3	8		3
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning	The RPV can be assigned to permanently track certain recourses	Yes	3	8		3
		Information (availability, status, resource level...)	Recourse status in terms of movement, or action can be monitored					
	Assignment of Resources to Tasks	Monitoring	U-Fly enables the deployment of multiple RPAS at the same time Optimal RPV task assignment Point of interests, areas of interest can be added manually by the operator	Yes	3	8		3
		Decision Support	RPV routing based on the most-up-to-date information					
	Tasks Management	Task Creation	Reconnaissance Tasks	Unclear	-	-	Due to background of the evaluator the meaning of "task" seems to be different compared to the aviation terminology, thus an estimation of the feature task management cannot be given.	3
		Task Prioritization	Operator has to weight tasks					
		Task Tracking, Reporting, Monitoring	Task progress can be monitored by the RPV					
	Information Sharing	Manually	Optionally information sharing through traditional communication channels	Yes	3	8		3
		Automatically	Sharing through image displaying					

Name		U-Fly	**General remarks to the tool**
Description		Research Ground Control Station	**Overall impression: Highly relevant and mature tool for DRIVER purposes. No concrete TRL is mentioned in the tool details, but only "prototype", however the impression is that some features seem to have even a TRL of 9. Coming from a different field an average of 8 was estimated to the overall tool.**
Main functionalities		Mission Planning and Operation Sensor Data Visualization Mission status and mission progress monitoring	
Provider		DLR	
Origin	Internal		
DRIVER Task		T43.2 Airborne Sensor Processing	
CM Phasis	Preparedness & Planning		**Usability (1=none ... 3=fully): 3** **remarks: Although coming from another domain the usability seems to be very high thanks to the well-structured presentation**
	Response	yes	
	Recovery	yes	
	all phases (Generic)	no	
Target Body			
	Public health	no	
	Civil security	yes	**Position within the DRIVER System of Systems (potential integration with..., complementary to...)** **The integration seems to be very high, although it should be done partly automated and partly manually.**
	Law enforcement	no	
	Fire brigade	yes	
	All bodies (generic)	no	
Licensing	Commercial	DLR Prototype	
	Free	yes in DRIVER's context	
	Open-source	no	

Table 10: U-Fly, Evaluator MSB

Date	**Evaluator org.**	**Evaluator name**	**DLR**					
			U-Fly/RPV-Demonstrator	**Feature available**	**Feature relevance**	**Feature maturity**	**Suggested improvements / additional considerations (positive/negative)**	**Future potential of the feature? Taking trends into consideration**
Task	**Feature**	**Sub-feature**		**Yes / No / Partly**	**0=none 3=fully**	**1=basic 9=proven**	**free text**	**0=not at all ... 3=fully + free text**
T43.1 Damage and Needs Assessment	**Gathering data from the field**	**Machine readable info**	**Airborne sensor data collection and data-downlink**	**Yes**	**2**	**5**		
	Information preparation	**Map view**	**Map overlays for areas, in which sensor data have successfully been collected**	**Yes**	**3**	**5**		
	Decision support	**Information processing for decision making purposes**	**The displayed sensor data will help the operator to plan/re-plan the mission**				**Not really decision support for the responders.**	
T43.2	**Assessment**		**Aerial images are acquired from RPAS**	**Yes**	**3**	**5**		

Airborne sensor processing	based on airborne sensors		(remotely piloted aircraft system). The automatic real-time processing includes orthoprojection into map coordinates, mosaicing, automatic traffic data extraction and downlink of data to the control station.					
	Flight planning/ operation	Large radius of action	RPAS+3K tool can cover wide areas for regional and national disasters.	Partly	3		Limited by the range of the data link. If downlink fails it will be downlinked later which is good	
		Sensor-adaptive Flight Planning	Areas of interest can be defined by the end users. Re-planning of the flight path based on already collected sensor data	Yes	3	5		
T43.5 Shared situation awareness	Acquisition	Acquisition (manual / automatic)	Real time information gathering	Yes	3	5		
	COP Production	Fusion / Aggregation	Single camera frames are aggregated to georeferenced tiles	Yes	3	5		
		Visualization /filtering / Querying of common operational picture	Processed pictures (tiles) are displayed in form of map overlays in U-Fly's geographical environment	Yes	3	5		
	Equipment/ Deployment	Control centers	U-Fly has an advanced HCI, with design focus set on intuitive and efficient human-machine interaction concepts	Yes	2	5		
T44.1 Capacity Building and Capacity Mapping Tools	Deployment of Resources	Decision Support	Planning and re-planning of the RPV mission (sensor suite deployment)	Yes	3	5		
		Mapping to different Crisis types and levels	Due to generic map formats U-Fly can be utilized in different crisis scenarios The RPV can be used in inhospitable environments to collect sensor data (cf. Fukushima)	Yes	3	5		
		Monitoring of current status of deployed resources	Monitoring of RPV position and status Monitoring of the mission status and mission progress	---	---	---	I didn't catch that during presentation	
	Selection of Resources Level	Monitoring of current resource level	The RPV can be assigned to permanently monitor the deployment of certain resources	Yes	3	5		
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning	The RPV can be assigned to permanently track certain recourses	Yes	3	5		
		Information (availability, status, resource level...)	Recourse status in terms of movement, or action can be monitored				I didn't catch that during presentation	
	Assignment of	Monitoring	U-Fly enables the deployment of multiple	Yes	3	5	Monitoring flood progress is very	

	Resources to Tasks		RPAS at the same time Optimal RPV task assignment Point of interests, areas of interest can be added manually by the operator				important!	
		Decision Support	RPV routing based on the most-up-to-date information					
	Tasks Management	Task Creation	Reconnaissance Tasks				?	
		Task Prioritization	Operator has to weight tasks				?	
		Task Tracking, Reporting, Monitoring	Task progress can be monitored by the RPV				?	
	Information Sharing	Manually	Optionally information sharing through traditional communication channels	Yes	3	5		
		Automatically	Sharing through image displaying	Yes	3	5		

Name		U-Fly	**General remarks to the tool**
Description		Research Ground Control Station	**Overall impression:** **Very valuable to have a "tool" that can be rapidly deployed to provide aerial images and very good that the images can be provided fast.**
Main functionalities		Mission Planning and Operation Sensor Data Visualization Mission status and mission progress monitoring	
Provider		DLR	
Origin	Internal		
DRIVER Task		T43.2 Airborne Sensor Processing	
CM Phasis	Preparedness & Planning		**Usability (1=none ... 3=fully):** **remarks:** **3. The tool for flight planning seemed user friendly but to us, the usability for the end user of the images is more relevant perhaps.**
	Response	yes	
	Recovery	yes	
	all phases (Generic)	no	
Target Body			
	Public health	no	
	Civil security	yes	**Position within the DRIVER System of Systems (potential integration with..., complementary to...)** **The plane may not be able to fly during the actual experiment.**
	Law enforcement	no	
	Fire brigade	yes	
	All bodies (generic)	no	
Licensing	Commercial	DLR Prototype	
	Free	yes in DRIVER's context	
	Open-source	no	

Table 11: ZKI, Evaluator WWU

Date	Evaluator org.	Evaluator name	ZKI					
27.11.2014	WWU			Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	ZKI tool is tailored to the integration of georeferenced data from satellites and aerial imagery, vector data and is principally open for field data which need to be delivered by end users or by other portals	Yes		9		3 (*not being an expert in the area of aerial imagery the estimation of the evaluator is really limited)
		Machine readable info	Map products as image files, GeoPDF or OGC web services and ESRI REST Services	Yes				3
		Statistics and trend analysis	- Quantification of exposed and affected population / infrastructure assets in case of emergency situations, - Trend analysis in a sense of monitoring and quantifying changes in the spatial extent of different features (e.g. water extent).	Yes		9		3
	Assessment of risks	Risk catalogue	Risk can be addressed via the mapping of exposed or/and affected critical infrastructure, exposed assets & people	Partly	3	-	Not sure about how risks are identified, but this might be only a matter further explanations (time frame of presentations).	3
	Information preparation	Map view	Usually, a current or archived satellite or aerial image is used as map backdrop. Different thematic layers in vector format are used as map overlay: e.g., infrastructure, damage information, hazard information. Tables, map labels and map frame information (legend, interpretation texts...) complement the map view.	Yes		9		3
		List view	Lists or tables can be part of map products or information dossiers	Yes				
		Report generation	Technical and information dossiers which are delivered as PDF	Yes				
T43.2 Airborne sensor	Assessment based on airborne sensors		Imagery from optical and radar satellite as well as aerial imagery can be used for mapping purposes, products include simple	Yes		9		3

processing			**image information maps, or more complex impact and damage assessments**					
T43.3 Crisis dynamics & early warning	**Translation of info into actionable info for EM users**	**Monitoring information**	**Terms, items, symbols and layout used in map products are adjusted to users' needs and standardized facilitating map interpretation /usage**	**Yes**		**9**		**3**
	Dissemination	**Dissemination (manual automatic)/**	**Users will be announced via RSS or email whenever new information is made available on the Web-portal**	**Yes**		**9**		**3**

Name		ZKI	**General remarks to the tool**
Description		24/7 service to provide satellite and airborne crisis mapping products and thematic monitoring.	**Overall impression: ZKI is a very useful and established tool to fulfil the mentioned features.**
Main functionalities		Remote Sensing data ingestion, processing, analysis and information extraction. ISO standardized workflow for mapping, map production, delivery, display and archiving.	
Provider		DLR	
Origin	Internal	Internal	
DRIVER Task			
CM Phasis	Preparedness & Planning	yes	**Usability (1=none ... 3=fully): 3** **remarks:**
	Response	yes	
	Recovery	yes	
	all phases (Generic)	yes	
Target Body			
	Public health	yes	
	Civil security	yes	**Position within the DRIVER System of Systems (potential integration with..., complementary to...) relevant to the most other tools as the provided information have a very high bandwidth and quality.**
	Law enforcement	yes	
	Fire brigade	yes	
	All bodies (generic)	yes	
Licensing	Commercial	commercial software products are used within the service (e.g., ESRI products)	
	Free		
	Open-source		
Maturity	Technology Readiness Level	9, full operational service (ww.zki.dlr.de)	

Table 12: ZKI, Evaluator MSB

Date	Evaluator org.	Evaluator name	ZKI					
				Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	ZKI tool is tailored to the integration of georeferenced data from satellites and aerial imagery, vector data and is principally open for field data which need to be delivered by end users or by other portals	Yes	2	9		
		Machine readable info	Map products as image files, GeoPDF or OGC web services and ESRI REST Services	Yes	3	9	Support of vector formats are much appreciated to enable reuse of the information for crisis managers in their own tools.	
		Statistics and trend analysis	- Quantification of exposed and affected population / infrastructure assets in case of emergency situations, - Trend analysis in a sense of monitoring and quantifying changes in the spatial extent of different features (e.g. water extent).	Yes	3	9		
	Assessment of risks	Risk catalogue	Risk can be addressed via the mapping of exposed or/and affected critical infrastructure, exposed assets & people	---	---	---		
	Information preparation	Map view	Usually, a current or archived satellite or aerial image is used as map backdrop. Different thematic layers in vector format are used as map overlay: e.g., infrastructure, damage information, hazard information. Tables, map labels and map frame information (legend, interpretation texts...) complement the map view.	Yes	3	9		
		List view	Lists or tables can be part of map products or information dossiers	---	---	---		
		Report generation	Technical and information dossiers which are delivered as PDF	Yes	2	9		
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Imagery from optical and radar satellite as well as aerial imagery can be used for mapping purposes, products include simple image information maps, or more complex impact and damage assessments	Yes	3	9		
T43.3 Crisis dynamics & early	Translation of info into actionable info for EM	Monitoring information	Terms, items, symbols and layout used in map products are adjusted to users' needs and standardized facilitating map interpretation /usage	Yes				

warning	**users**							
	Dissemination	**Dissemination (manual automatic)/**	**Users will be announced via RSS or email whenever new information is made available on the Web-portal**					

Name		ZKI	**General remarks to the tool**
Description		24/7 service to provide satellite and airborne crisis mapping products and thematic monitoring.	**Overall impression:** **My limited experience is that maps with processed satellite data are from Copernicus activations.** **It takes a very long time from satellite image requested and taken until the product is finally delivered.** **As a user I may want a less "prepared" format such as a vector file instead of a map product if that data may be available quicker than the final product.**
Main functionalities		Remote Sensing data ingestion, processing, analysis and information extraction. ISO standardized workflow for mapping, map production, delivery, display and archiving.	
Provider		DLR	
Origin	Internal	Internal	
DRIVER Task			
CM Phasis	Preparedness & Planning	yes	**Usability (1=none ... 3=fully):** **remarks:** **3 - Maps and presented product seem very usable**
	Response	yes	
	Recovery	yes	
	all phases (Generic)	yes	
Target Body			
	Public health	yes	
	Civil security	yes	**Position within the DRIVER System of Systems (potential integration with..., complementary to...)** **The tool can provide imagery and geodata for emergency management and disaster assessment for the Driver experiments. Information should be integrated into the common operational picture tools.**
	Law enforcement	yes	
	Fire brigade	yes	
	All bodies (generic)	yes	
Licensing	Commercial	commercial software products are used within the service (e.g., ESRI products)	
	Free		
	Open-source		
Maturity	Technology Readiness Level	9, full operational service (ww.zki.dlr.de)	

Table 13: EmerT, Evaluator WWU

Date	Evaluator org.	Evaluator name	DLR					
			EmerT - Emergency Mobility of Rescue Forces and Regular Traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	- Up-to-date aerial image maps are a valuable information source for situation assessment (3K Sensor) - Up-to-date mobile traffic data information (floating *emergency* car data, indirect traffic detection of mobile devices (DYNAMIC), portable traffic-cams) - traffic data information (floating car data, induction loop, stationary Bluetooth detection, traffic cams, Munich, Cologne, Brunswick) - Traffic-data fusion and prediction	Yes	3	6 (although TRL seems higher, evaluator follows the tool provider estimation)		3
		Machine readable info	- data as image files, KML, OGC web services and REST Services					
	Situation analysis	Alerting	- Aerial images and traffic data to support the analysis of situation	Yes	3	6 (s.a.)		3
		Statistics and trend analysis						
	Assessment of risks	Risk catalogue		Yes	3	6 (s.a.)		3
		Simulation tools	Simulated view of current traffic situation showing possible traffic bottlenecks is generated from DLR SUMO tool					
	Information preparation	Map view	road network from NAVTEQ is used, rendered maps as map backdrop, different thematic layers are used as map overlay.	Yes	3	6 (s.a.)		3
		List view						
		Report generation						
	Decision support	Information processing for decision making purposes	Isochrone-map can be used, further more we have a risk routing which includes likelihoods of risks for possible routes	Yes	3	6 (s.a.)		3
		Automatic decision modelling						
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Automated traffic detection from images. Demonstration of the further processing of the collected data. Traffic visualization and prognosis. Traffic prediction and situation support	Yes	3	6 (s.a.)		3
	Flight planning/ operation							
T43.3	Translation of	Monitoring	- Aerial images and traffic data provides information as input for other	Yes	3	6 (s.a.)		3

Crisis dynamics & early warning	info into actionable info for EM users	information	tools. Aerial images (orthoprojected and mosaiced) give general overview about the disaster situation. - merged traffic situation und prediction give also an overview, shows bottlenecks, and are input for maintain supplies					
		Modelling, simulation and scientific advice	- Output of the 3K camera system can be used as input for other modelling, simulation and scientific advice tools. - Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions [see DLR SUMO Tool]					
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning	floating emergency car data and the indirect traffic detection of mobile devices (DYNAMIC) allows to monitoring the action force as well as the movement of civilian population in the affected area.	Yes	3	6 (s.a.)		3
		Information (availability, status, resource level...)	Information are provided as map layer or OGC web services and REST Services					
	Assignment of Resources to Tasks	Monitoring	Information are provided as map layer or OGC web services and REST Services	Yes	3	6 (s.a.)		3
		Decision Support	Isochrone-map can be used, further more we have a risk routing which includes likelihoods of risks for possible routes					
T44.4 Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	[see DLR SUMO]					
		Simulation	[see DLR SUMO]					
	Bottlenecks Analysis	Characterization	Journey/Trip time analyses for blue light driving operations	Yes	3	6 (s.a.)		
		Decision Support	[see DLR SUMO]					
	Cascade Effects Analysis	Characterization	[see DLR SUMO]					
		Decision Support	[see DLR SUMO]					

Name		EmerT - Emergency Mobility of Rescue Forces and Regular Traffic	General remarks to the tool
Overall impression: Very promising, useful and mature tool that could be used for various transportation planning tasks in the logistics domain, the set up time has to be considered			
Usability (1=none ... 3=fully): 3 remarks:			
Position within the DRIVER System of Systems (potential integration with..., complementary to...) The output is of high interest for all logistics related tasks, many other tools can benefit from EmerT results			

Table 14: EmerT, Evaluator MSB

Date	Evaluator org.	Evaluator name	DLR					
			EmerT - Emergency Mobility of Rescue Forces and Regular Traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	- Up-to-date aerial image maps are a valuable information source for situation assessment (3K Sensor) - Up-to-date mobile traffic data information (floating *emergency* car data, indirect traffic detection of mobile devices (DYNAMIC), portable traffic-cams) - traffic data information (floating car data, induction loop, stationary Bluetooth detection, traffic cams, Munich, Cologne, Brunswick) - Traffic-data fusion and prediction	Y	3	7		
		Machine readable info	- data as image files, KML, OGC web services and REST Services	?	3	7		
	Situation analysis	Alerting	- Aerial images and traffic data to support the analysis of situation	Y	3	7		
	Assessment of risks	Simulation tools	Simulated view of current traffic situation showing possible traffic bottlenecks is generated from DLR SUMO tool	Y	3	7		
	Information preparation	Map view	road network from NAVTEQ is used, rendered maps as map backdrop, different thematic layers are used as map overlay.	Y	3			
	Decision support	Information processing for decision making purposes	Isochrone-map can be used, further more we have a risk routing which includes likelihoods of risks for possible routes	Y	3	7	Very relevant with a dynamic isochrone map	
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Automated traffic detection from images. Demonstration of the further processing of the collected data. Traffic visualization and prognosis. Traffic prediction and situation support	Y	3	7		
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information	- Aerial images and traffic data provides information as input for other tools. Aerial images (orthoprojected and mosaiked) give general overview about the disaster situation. - merged traffic situation und prediction give also an overview, shows bottlenecks, and are					It would be very useful to be able to use information from EmerT in other situation assessment tools, rescue services own operational tools.

			input for maintain supplies					
		Modelling, simulation and scientific advice	- Output of the 3K camera system can be used as input for other modelling, simulation and scientific advice tools. - Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions [see DLR SUMO Tool]	Y	3	7		
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning	floating emergency car data and the indirect traffic detection of mobile devices (DYNAMIC) allows to monitoring the action force as well as the movement of civilian population in the affected area.					
		Information (availability, status, resource level...)	Information are provided as map layer or OGC web services and REST Services					
	Assignment of Resources to Tasks	Monitoring	Information are provided as map layer or OGC web services and REST Services		3		I can't recall seeing this at the demo but in any case this is a very interesting feature to exploit in Driver	
		Decission Support	Isochrone-map can be used, further more we have a risk routing which includes likelihoods of risks for possible routes	Y	3	7		It would be very useful to be able to use information from EmerT in other situation assessment tools, rescue services own operational tools.
T44.4 Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	[see DLR SUMO]					
		Simulation	[see DLR SUMO]					
	Bottlenecks Analysis	Characterization	Journey/Trip time analyses for blue light driving operations					
		Decision Support	[see DLR SUMO]					
	Cascade Effects Analysis	Characterization	[see DLR SUMO]					
		Decision Support	[see DLR SUMO]					

Name		EmerT - Emergency Mobility of Rescue Forces and Regular Traffic	General remarks to the tool
Overall impression: This tool seems very mature and rich in functionality.			
Usability (1=none ... 3=fully): 3 remarks:			
Position within the DRIVER System of Systems (potential integration with..., complementary to...) I think it will be very central in Driver especially if its information content can be shared with other tools. All "other common operational picture" / "situation assessment" type of tools would benefit from integrating data from EmerT.			

Table 15: SUMO, Evaluator WWU

Date	Evaluator org.	Evaluator name	DLR					
			SUMO - Simulation of urban traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info						
		Machine readable info						
	Situation analysis	Alerting						
		Statistics and trend analysis						
	Assessment of risks	Risk catalogue		Yes	3	7		3
		Simulation tools	Generating simulated view of current traffic situation showing possible traffic bottlenecks					
		Automatic decision modelling						
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information		Yes	3	7		
		Modelling, simulation and scientific advice	Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions					
T44.1 Capacity Building and Capacity Mapping Tools	Deployment of Resources	Decision Support						
		Mapping to different Crisis types and levels						
		Monitoring of current status of deployed resources						
	Contingency Plans Definition	Mapping to different Type of Crisis						
		Mapping to different crisis levels						
	Selection of Resources Level	Monitoring of current resource level						
		Decision Support						
	Risk Assessment	Risk catalogue		Yes	3	7		3
		Simulation tools	Simulating road network capacities					
		Supply Forecast						
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning		Yes	3	7		3
		Information (availability, status, resource level...)	Feeding current travel times into reachability analysis (see EmerT)					
T44.4	Definition of	Modelling	Importing street networks and	Y	3	7		3

Bottlenecks & Cascading Effects	Scenarios		demand data to model street traffic					
		Simulation	simulating traffic jams as well as rerouting effects and changes in demand					
	Bottlenecks Analysis	Characterization	showing effects of jammed streets	Y	3	7		3
		Decision Support	scenario modelling (what happens if I block road X instead of Y)					
	Cascade Effects Analysis	Characterization	incorporating movement of special vehicles	Partly	3	7	If understood correct the consideration of special vehicles like heavy weight transports is proceeded in EmerT, but not sure here	3
		Decision Support	routing advice (see EmerT)					

Name		SUMO Simulation of Urban Mobility	General remarks to the tool
Overall impression: As mentioned also by the audience SUMO seems to have a high maturity level (the estimation of the evaluator is based on the information of the tool provider in the evaluation sheet, i.e. 7, although some features seems higher than this) but especially a very high relevance for many other tools. Both network planning and operational tools can benefit from SUMO outputs,			
Usability (1=none ... 3=fully): 2-3 remarks: The only limitation to be considered is the required setup time in terms of new data (esp. transportation network).			
Position within the DRIVER System of Systems (potential integration with..., complementary to...) As mentioned above SUMO can be understood as a tool that can both process data/results from (e.g. EvacuAid) and to other DRIVER tools (e.g. anylogic).			

Table 16: SUMO, Evaluator MSB

Date	Evaluator org.	Evaluator name	DLR					
			SUMO - Simulation of urban traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Assessment of risks	Simulation tools	Generating simulated view of current traffic situation showing possible traffic bottlenecks	Yes	3	7		
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Modelling, simulation and scientific advice	Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions	Yes	3	7		
T44.1 Capacity Building and Capacity Mapping Tools	Risk Assessment	Simulation tools	Simulating road network capacities	Yes	3	7		
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Information (availability, status, resource level...)	Feeding current travel times into reachability analysis (see EmerT)	Yes	3	7		
T44.4 Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	Importing street networks and demand data to model street traffic	Yes	3	7		
		Simulation	simulating traffic jams as well as rerouting effects and changes in demand	Yes	3	7		
	Bottlenecks Analysis	Characterization	showing effects of jammed streets	Yes	3	7		
		Decision Support	scenario modelling (what happens if I block road X instead of Y)	Yes	3	7		
	Cascade Effects Analysis	Characterization	incorporating movement of special vehicles	Yes	1	7	I cant see relevance to cascading effects.	
		Decision Support	routing advice (see EmerT)	---	---			

Name		SUMO Simulation of Urban Mobility	General remarks to the tool
Overall impression: Seems very useful to most cases where traffic simulation is needed.			
Usability (1=none ... 3=fully): 3 remarks:			
Position within the DRIVER System of Systems (potential integration with..., complementary to...) Useful as a service to other tools that need to complement with traffic simulation.			

Table 17: ESS, Evaluator AIT 1

Date	Evaluator org.	Evaluator name	GMV Sistemas					
25.11.2014	AIT		ESS	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	Text and pictures entered by responders via Android application	Yes	3		In my opinion having a middleware service which is capable of integrating different sources of observations and sharing the raw data and fused results with other tools would help us to avoid duplication of efforts in DRIVER. Maybe this application could be used as one?	3
		Machine readable info	Integration of sensors via Data Fusion and Mediation System (DFMS)					
	Assessment of risks	Simulation tools	Gas spread, flood and fire simulation.	yes	3		The simulation part of the tool (GUI) appears quite interesting to me. The question is: how much work (if any) is required to make these simulations work in a new area?	3
	Information preparation	Map view	Selectable overlays on base map; Dynamic import of geo-referenced data layers	yes	2		My impression of the GMV map view is that it's a good tool for technical users which need to figure out which sensors are out there before trying to use them in own tools. That's OK if the tool is used as a middleware, but i have doubts concerning ist usability for end users.	2
		List view	Filtered lists of items (visible in the map pane or all)					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Cameras and sensors integrated in UAV and balloons.	yes	2		Integration of airborne cameras seems to work well, nice to have. There is no support for assessment, the tool simply shows the view from airborne camera	2
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information	Traffic information from road network sensors (ITIS)					
	Distribution of warnings (public and to operators of critical infrastructure and	preparation of warnings	Alerting tool for SMS broadcasting through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)	yes	3		The tool allows mass-sending the SMS and voice messages - even in the situation where network is not available	2
		authorisation of warnings	ESS alerts are considered authorized by the broadcasting systems.					
		distribution of	Alerting tool for SMS broadcasting					

	enterprises)	warnings	through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)					
T43.4 Interaction with citizens	Usage of social media	gathering of situational awareness info	Situational awareness information can be gathered via twitter and facebook	yes	2		The tool can also send messages to twitter, or facebook and also present the responses. Not quite sure what is the advantage of doing so compared to simply using twitter/facebook application.	2
	Usage of social media	pushing warnings via social media	Publishing of information to ESS social media accounts (Twitter, Facebook)					
	Usage of crowd tasking	Info collection (citicen as a sensor)	Public can comment on information published by ESS	partial	2		Most usable for sending mass requests and messages - even in the situation where mobile network is down. Does not target specific groups or individuals. That's OK and very useful, but only partially addresses the "citizen as a sensor/volunteer" requirements.	2
		Supporting relief actions (citicen as a volunteer)	Requests for collaboration can be sent via social media and SMS (Messaging campaigns)					
T43.5 Shared situation awareness	COP Production	Visualization /filtering / Querying of common operational picture	COP can be setup in the ESS interface, stored and shared with other EM				not demonstrated?	
	Dissemination	Dissemination (manual automatic)/	COP can be shared with other ESS users				not demonstrated?	
	Equipment/ Deployment	Control centers	ESS is a portable and deployable emergency response system including a portable C3I, resilient communication system and on-field deployable sensors				not demonstrated?	
		Field devices	Multiple field devices were used in the project, including: UAV, UGV, Balloons, and ruggedized On-Board Units that can connect to a host of sensors and vehicles					
T44.1 Capacity Building and Capacity Mapping Tools	Deployment of Resources	Decision Support	List of available resources				not demonstrated?	
		Monitoring of current status of deployed resources	All resources equipped with an OBU are monitored in real time and the status and location of responders with the Android application are displayed on the map.					
	Risk Assessment	Simulation tools	Gas spread, flood and fire simulation.	yes	3		very useful if it can be used "anywhere" without much work. Even more so if we could use this as a service and thus incorporate the functionality in other tools.	3
T44.2 Tasking and	Resource Monitoring	Positioning	All resources equipped with an OBU are monitored in real time.				not demonstrated?	

Capacity Monitoring		**Information (availability, status, resource level...)**	**The status of resources including battery level is monitored in real time.**					
	Information Sharing	**Manually**	**Map layers can be shared with other ESS users. The application integrates a real time chat and a persistent mail-like message system.**	**yes**	**3**			**3**
T45.2 Collaborative tools (GMV)	**Collaborative ECM management**	**Security / Rights management**	**Possibility to invite and manage the security rights of new users**				**not demonstrated?**	

Name		ESS	**General remarks to the tool**
Description		The Emergency Support System (ESS) is a suite of real-time data-centric technologies which will provide actionable information to crisis managers during abnormal events. This information will enable improved control and management, resulting in real-time synchronization between forces on the ground (police, rescue, firefighters) and out-of-theater command and control centers (C&C).	**Overall impression: This tool appears to be well done and my impression is that it's either already at the "operative" level or pretty near to being operative. Main functionalities it offers are in my opinion:**
Main functionalities		Integrate data from various sources into a common information management and communication platform Develop portable and mobile smart communication elements for supporting the management and coordination of emergency operations Integrate ad hoc networking technology of intelligent sensors for addressing emergency and crisis management requirements	**- middleware for gathering and sharing of information from various sources.** **- mass-informing functionality through several channels. Most interesting appears to be a feature which allows sending of SMSs to everyone in an area even if the network is down.** **- modelling sub-system which can be used to assess and predict the risk development for certain types of events (e.g. fire)**
Provider		GMV SAU	
Origin	Internal	FP7 project	
DRIVER Task		T43.4, T43.5, T44.1, T44.2, T44.4, T45.2	
CM Phasis	Preparedness & Planning	no	**Usability (1=none ... 3=fully): 3** **remarks:**
	Response	yes	
	Recovery	no	
	all phases (Generic)		**Position within the DRIVER System of Systems (potential integration with..., complementary to...)** **See "overall impression". In my opinion, the tool could be used as a part of the complete crisis management support infrastructure and provide one or more of the three main functions listed above.** **From AIT point of view (CrowdTasker), incorporating a map of danger areas resulting from model runs in local situation shown to volunteers would be nice. Also the possibility to send some tasks to "everyone" - even in situation when the network is down sounds interesting.**
Target Body			
	Public health		
	Civil security		
	Law enforcement		
	Fire brigade		
	All bodies (generic)	yes	
Licensing	Commercial	no	
	Free	no	
	Open-source	no	
Maturity	Technology Readiness Level	7	

Table 18: ESS, Evaluator AIT 2

Date	Evaluator org.	Evaluator name	GMV Sistemas					
25.11.2014	AIT		ESS	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 9=proven	free text	0=not at all ... 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	Text and pictures entered by responders via Android application	Yes	3	6-7	How are observations verified?	3
		Machine readable info	Integration of sensors via Data Fusion and Mediation System (DFMS)					
	Assessment of risks	Simulation tools	Gas spread, flood and fire simulation.	yes	3	6-7	How are the events modelled?	3
	Information preparation	Map view	Selectable overlays on base map; Dynamic import of geo-referenced data layers	yes	3	6-7	Useful for COP	2
		List view	Filtered lists of items (visible in the map pane or all)					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Cameras and sensors integrated in UAV and balloons.	yes	2-3	N/A	Not so clear what the tool can do with airborne sensors.	2-3
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information	Traffic information from road network sensors (ITIS)					
	Distribution of warnings (public and to operators of critical infrastructure and enterprises)	preparation of warnings	Alerting tool for SMS broadcasting through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)	yes	3	N/A	The tool allows to send mass SMS and voice messages. Unclear if they can be distributed to specific groups only.	2
		authorisation of warnings	ESS alerts are considered authorized by the broadcasting systems.					
		distribution of warnings	Alerting tool for SMS broadcasting through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)					
T43.4 Interaction with citizens	Usage of social media	gathering of situational awareness info	Situational awareness information can be gathered via twitter and facebook	yes	3	N/A	Sends messages also to twitter and facebook	2
	Usage of social media	pushing warnings via social media	Publishing of information to ESS social media accounts (Twitter, Facebook)					
	Usage of crowd tasking	Info collection (citicen as a sensor)	Public can comment on information published by ESS	partial	2	N/A		2
		Supporting relief actions (citicen as a volunteer)	Requests for collaboration can be sent via social media and SMS (Messaging campaigns)					

T43.5 Shared situation awareness	**COP Production**	**Visualization /filtering / Querying of common operational picture**	**COP can be setup in the ESS interface, stored and shared with other EM**	**yes**	**3**			**3**
	Dissemination	**Dissemination (manual automatic)/**	**COP can be shared with other ESS users**					
	Equipment/ Deployment	**Control centers**	**ESS is a portable and deployable emergency response system including a portable C3I, resilient communication system and on-field deployable sensors**					
		Field devices	**Multiple field devices were used in the project, including: UAV, UGV, Balloons, and ruggedized On-Board Units that can connect to a host of sensors and vehicles**					
T44.1 Capacity Building and Capacity Mapping Tools	**Deployment of Resources**	**Decision Support**	**List of available resources**					
		Monitoring of current status of deployed resources	**All resources equipped with an OBU are monitored in real time and the status and location of responders with the Android application are displayed on the map.**					
	Risk Assessment	**Simulation tools**	**Gas spread, flood and fire simulation.**	**yes**	**3**			**3**
T44.2 Tasking and Capacity Monitoring	**Resource Monitoring**	**Positioning**	**All resources equipped with an OBU are monitored in real time.**					
		Information (availability, status, resource level...)	**The status of resources including battery level is monitored in real time.**					
	Information Sharing	**Manually**	**Map layers can be shared with other ESS users. The application integrates a real time chat and a persistent mail-like message system.**	**yes**	**3**			**3**
T45.2 Collaborative tools (GMV)	**Collaborative ECM management**	**Security / Rights management**	**Possibility to invite and manage the security rights of new users**					

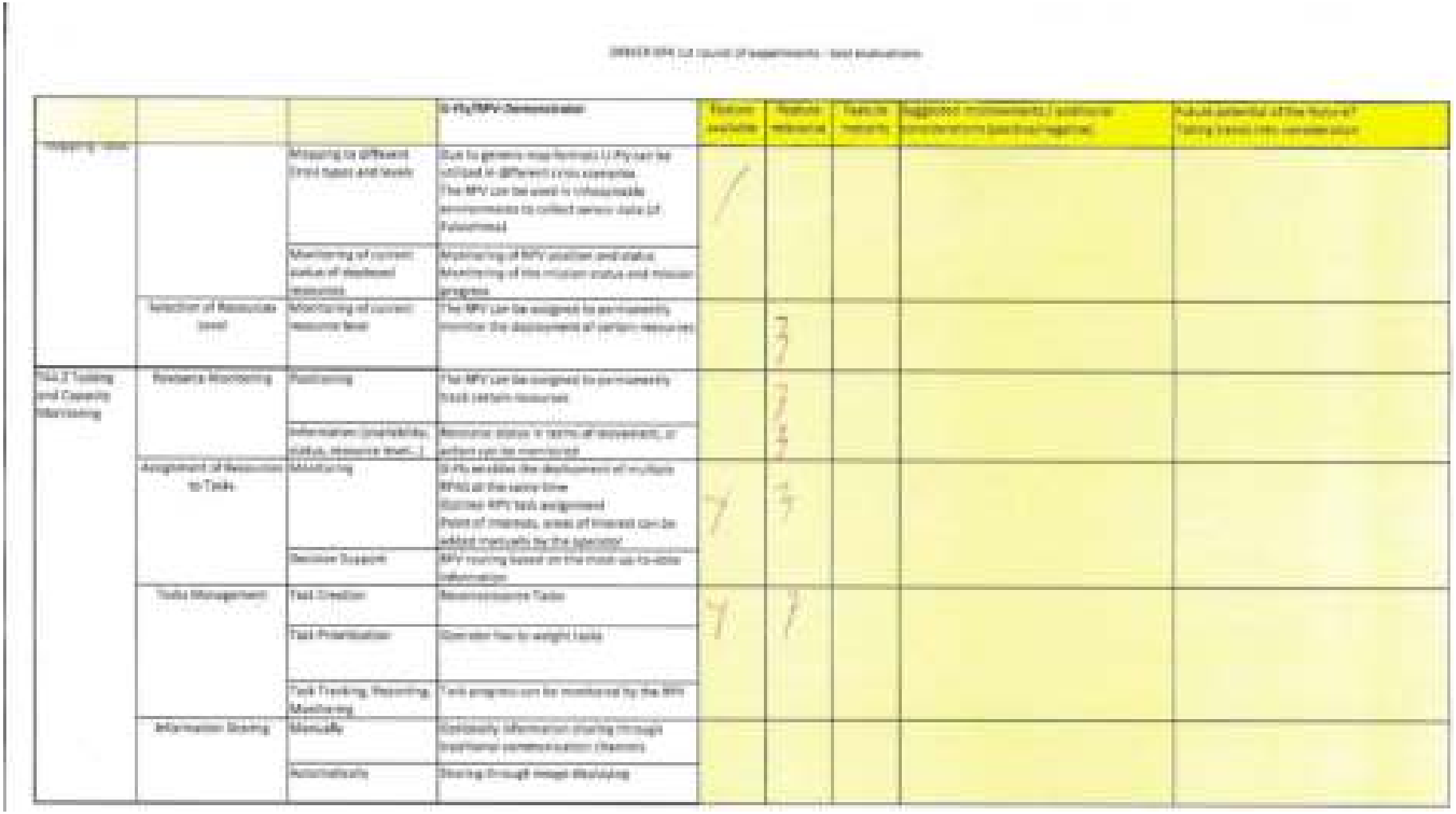
Name		ESS	**General remarks to the tool**
Description		The Emergency Support System (ESS) is a suite of real-time data-centric technologies which will provide actionable information to crisis managers during abnormal events. This information will enable improved control and management, resulting in real-time synchronization between forces on the ground (police, rescue, firefighters) and out-of-theater command and control centers (C&C).	**Overall impression: Appears to be a very mature tool with a lot of possible use cases in CDM and in the environmental domain.**
Main functionalities		Integrate data from various sources into a common information management and communication platform Develop portable and mobile smart communication elements for supporting the management and coordination of emergency operations Integrate ad hoc networking technology of intelligent sensors for addressing emergency and crisis management requirements	
Provider		GMV SAU	
Origin	Internal	FP7 project	
DRIVER Task		T43.4, T43.5, T44.1, T44.2, T44.4, T45.2	

CM Phasis	Preparedness & Planning	no	**Usability (1=none … 3=fully): 3** **remarks: Is it only for COP during the crises or also in all other phases?**
	Response	yes	
	Recovery	no	
	all phases (Generic)		
Target Body			
	Public health		
	Civil security		**Position within the DRIVER System of Systems (potential integration with…, complementary to…)** **Could be used as a general crisis management supporting tool in DRIVER or as middleware to combine input from other tools. Depending on the use cases, this could be e.g. social media monitoring or crowdtasking.**
	Law enforcement		
	Fire brigade		
	All bodies (generic)	yes	
Licensing	Commercial	no	
	Free	no	
	Open-source	no	
Maturity	Technology Readiness Level	7	

Adrian . 27 Nov

DRIVER SP4 1st round of experiments - tool evaluations

Date	Evaluator org.	Evaluator name	Tool					
			U-Fly/RPV Demonstrator	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 6=proven	Free text	0=not at all - 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Machine readable info	Airborne sensor data collection and data downlink					
	Information preparation	Map view	Map overlays for areas, in which sensor data have successfully been collected	Y	3			
	Decision support	Information processing for decision making purposes	The displayed sensor data will help the operator to plan/re-plan the mission	Y	3			
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Aerial images are acquired from BRAI (Germany) piloted aircraft systems. The automatic real-time processing includes orthoprojection into map coordinates, mosaicking and downlink of data to the control station.					
	Flight planning/ operation	Large radius of action	RPAS-38 tool can cover wide areas for regional and national disasters.	Y	3			
		Sensor adaptive Flight Planning	Areas of interest can be defined by the end users. Re-planning of the flight path based on already collected sensor data.	Y	3			
T43.3 Shared situation awareness	Acquisition	Acquisition (manual / automatic)	Real-time information gathering					
	COP Production	Fusion / Aggregation	Single camera frames are aggregated to generate mosaic tiles					
		Visualisation (filtering / querying of common operational picture)	Processed pictures (tiles) are displayed in form of map overlays in U-Fly's geographical environment					
	Equipment/ Deployment	Control centers	U-Fly has an advanced HCI with design focus set on intuitive and efficient human-machine interaction concepts	Y	3	6	2 cameras worked. Expand with 2nd UAV [illegible] management.	
T44.1 Capacity Building and Capacity [illegible]	Deployment of Resources	Decision Support	Planning and re-planning of the RPV mission (sensor suite deployment)					



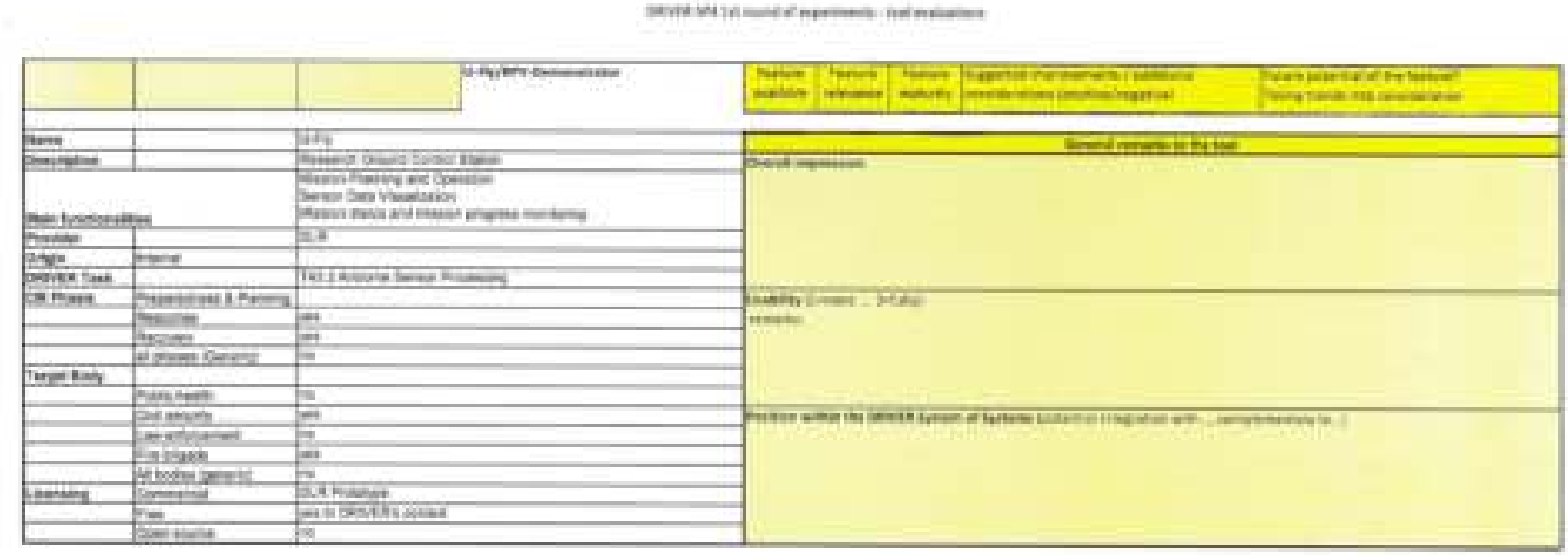
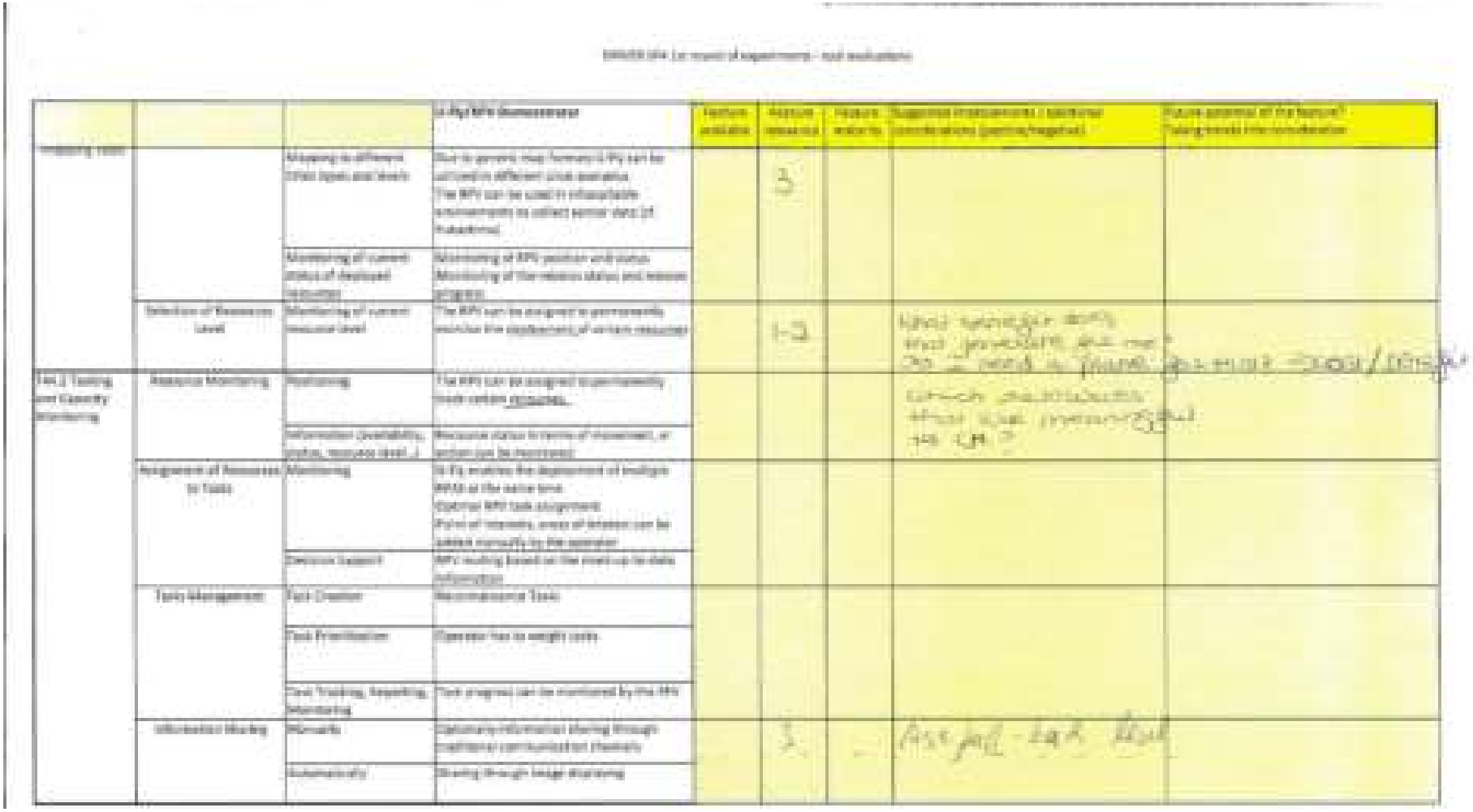


Figure 3: U-Fly, Evaluator Pole, Marseille Fire Department

(1)

DRIVER SP4 1st round of experiments – tool evaluations

Date	Evaluator org.	Evaluator name	DLR					
[illegible]	THW	[illegible]	D-Fly/RPV Demonstration	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Placing trends into consideration
Tools	Feature	Sub-feature		Yes / No / Partly	0 none – 4 fully	0 ... 4 ...	Free text	Ahead of all... 4 fully / free text
T4.1 Damage and Needs Assessment	Gathering data from the field	Machine readable info	Airborne sensor data collection and data download	yes	3			
	Information presentation	Map view	Map overlays for areas, in which sensor data have successfully been collected		2		[illegible]	[illegible]
	Decision support	Information processing for decision making purposes	The displayed sensor data will help the operator to plan/re-plan the mission					
T4.2 Airborne sensor processing	Assessment based on airborne sensors		Aerial images are acquired from RPAS (remotely piloted aircraft system). The automatic real-time processing includes orthorectification into map coordinates, mosaicking and download of data to the control station.					
	Flight planning/ operation	Large radius of action	SR4A-XE tool can cover wide areas for regional and national disasters.		3		[illegible]	
		Sensor-adaptive flight planning	Areas of interest can be defined by the end users. Re-planning of the flight path based on already collected sensor data.		3			
T4.3 Shared situation awareness	Acquisition	Acquisition (manual / automatic)	Real time information gathering		3			
	COP Production	Fusion / Aggregation	Single camera frames are aggregated to georeferenced tiles.		3			
		Visualization, filtering / querying of common operational picture	Processed pictures (tiles) are displayed in form of map overlays in D-Fly's geographical environment.					
	Deployment/ Deployment	Control centers	D-Fly has an advanced HCI, with design focus set on intuitive and efficient human-machine interaction concepts.					
T4.4 Capacity Building and Capacity [illegible]	Deployment of Resources	Decision Support	Planning and re-planning of the RPV mission (sensor suite deployment)					



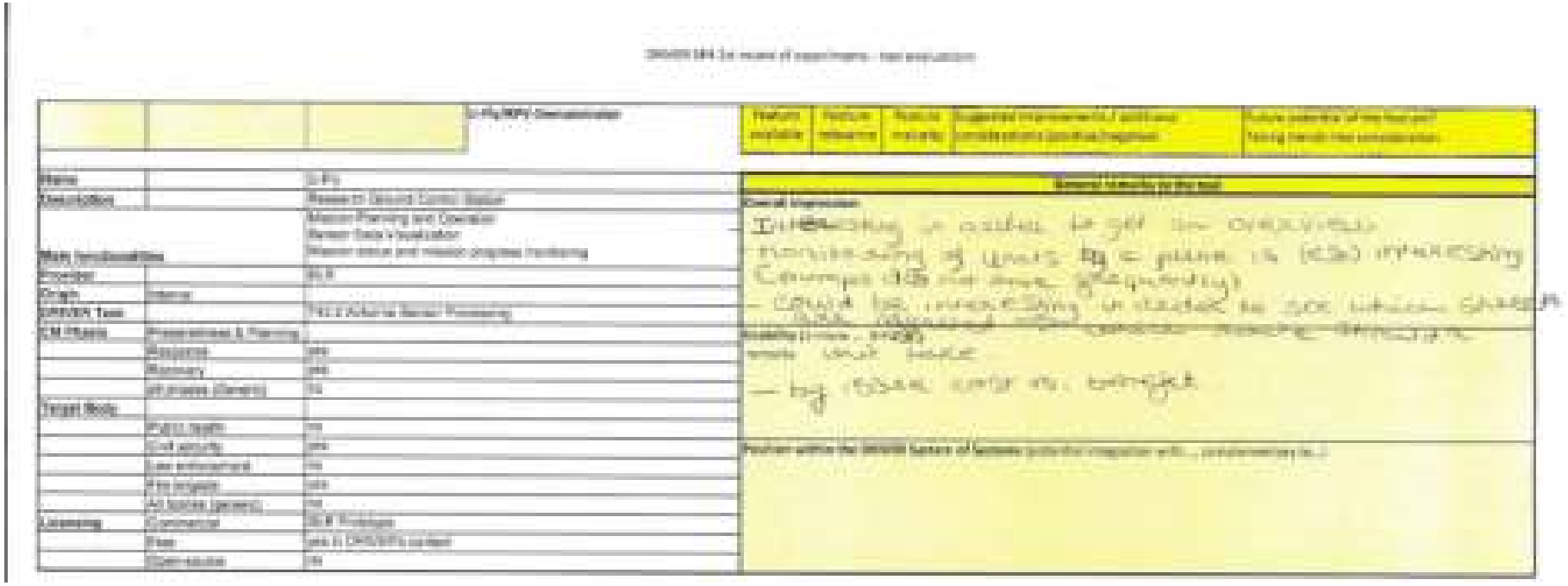


Figure 4: U-Fly, Evaluator A. THW

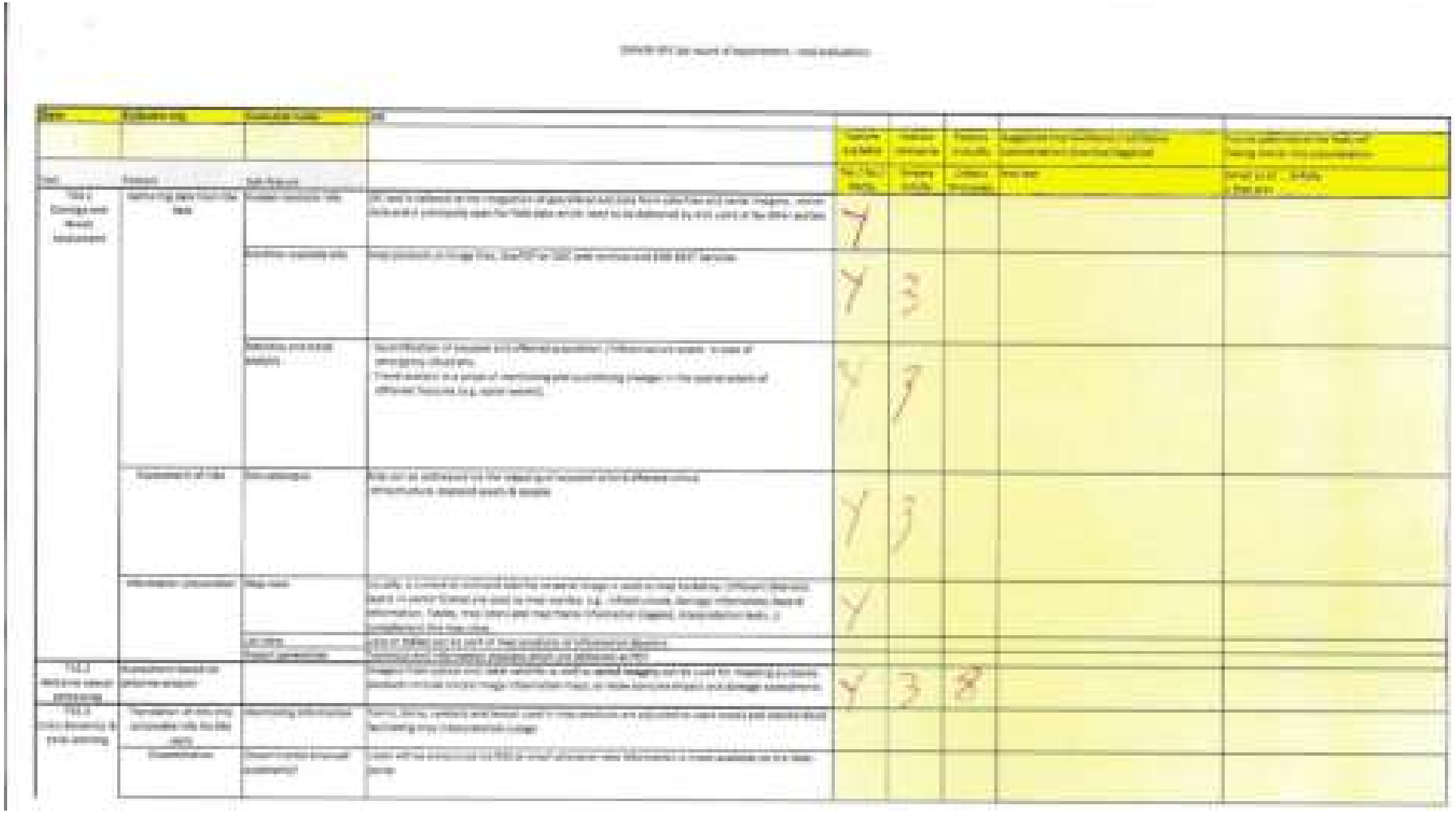


Figure 5: ZKI, Evaluator Pole, Marseille Fire Department

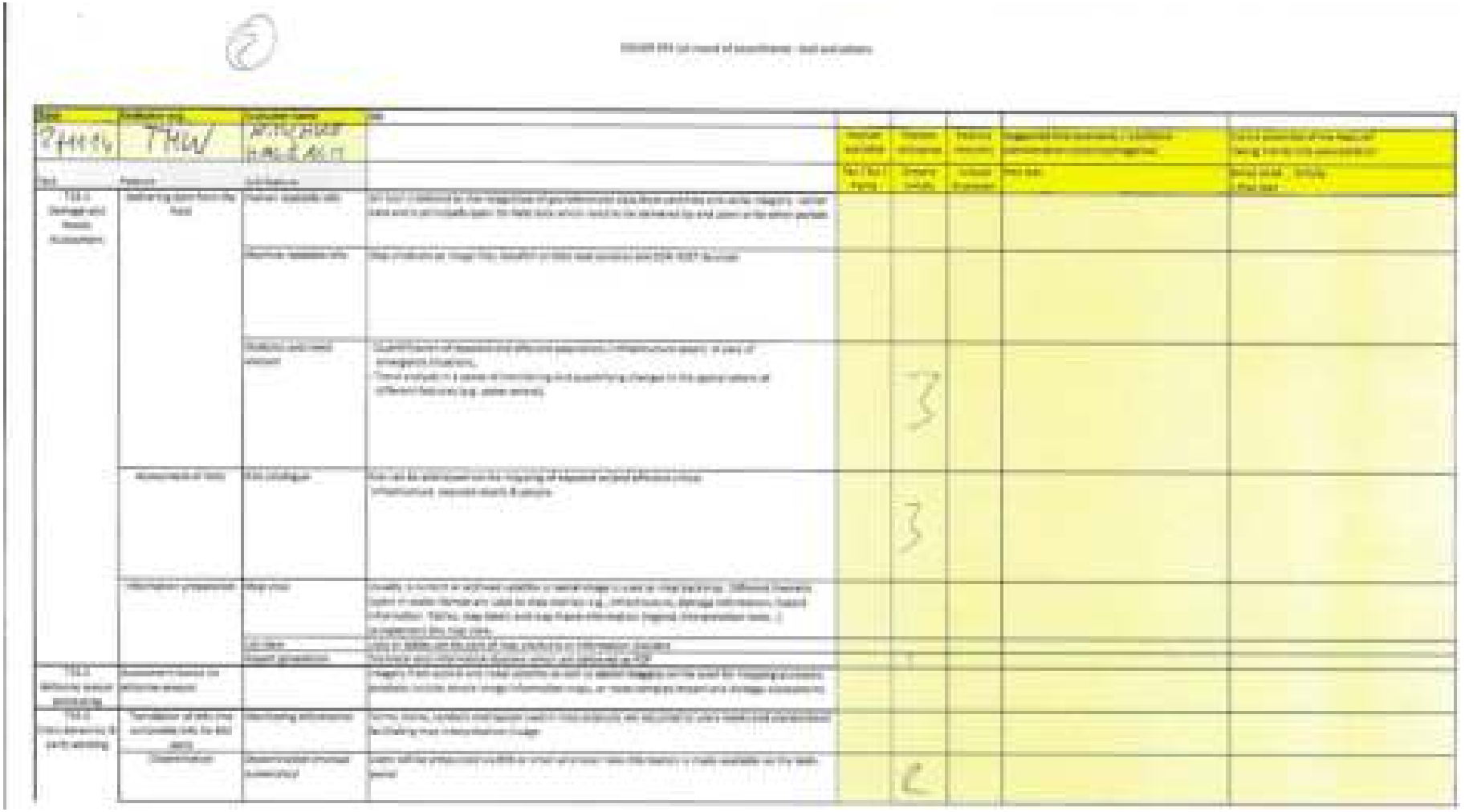


Figure 6: ZKI, Evaluator THW

Date	Evaluator org.	Evaluator name	SAA					
23.9.14	[illegible]	[illegible]	SimEF - Emergency Mobility of Rescue Forces and Regular Traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature / taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	Scale 1-10	1-10 Maturity	Free text	Great at all ... A little ... Not at all
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	Up-to-date aerial image maps are a valuable information source for situation assessment (3K Sensor) Up-to-date mobile traffic data information (floating emergency car data, indirect traffic detection of mobile devices (DYNAMIC), portable traffic cams) Traffic data information (floating car data, induction loop, stationary Bluetooth detection, traffic cams Munich, Cologne, Brunswick) Traffic data fusion and prediction					
		Machine readable info	- data as image files, XML, OGC web services and REST Services					
	Situation analysis	Alerting	- Aerial images and traffic data to support the analysis of situation	Y	7	8		
	Assessment of risks	Simulation tools	Simulated view of current traffic situation	Y	7	[illegible]		
	Information preparation	Map view	road network from NAVTEQ is used, rendered maps as map backdrop, different thematic layers are used as map overlay	Y	7			
	Decision support	Information processing for decision making purposes	Isochrone map can be used, further more we have a risk routing which includes likelihoods of risks for possible routes					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Automated traffic detection from images. Demonstration of the further processing of the collected data. Traffic visualisation and prognosis. Traffic prediction and situation support	Y	7	8		
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information	- Aerial images and traffic data provides information as input for other tools. Aerial images (orthoprojected and mosaiced) give general overview about the disaster situation - merged traffic situation and prediction give also an overview, shows bottlenecks, and are input for transport supplies	Y	3			

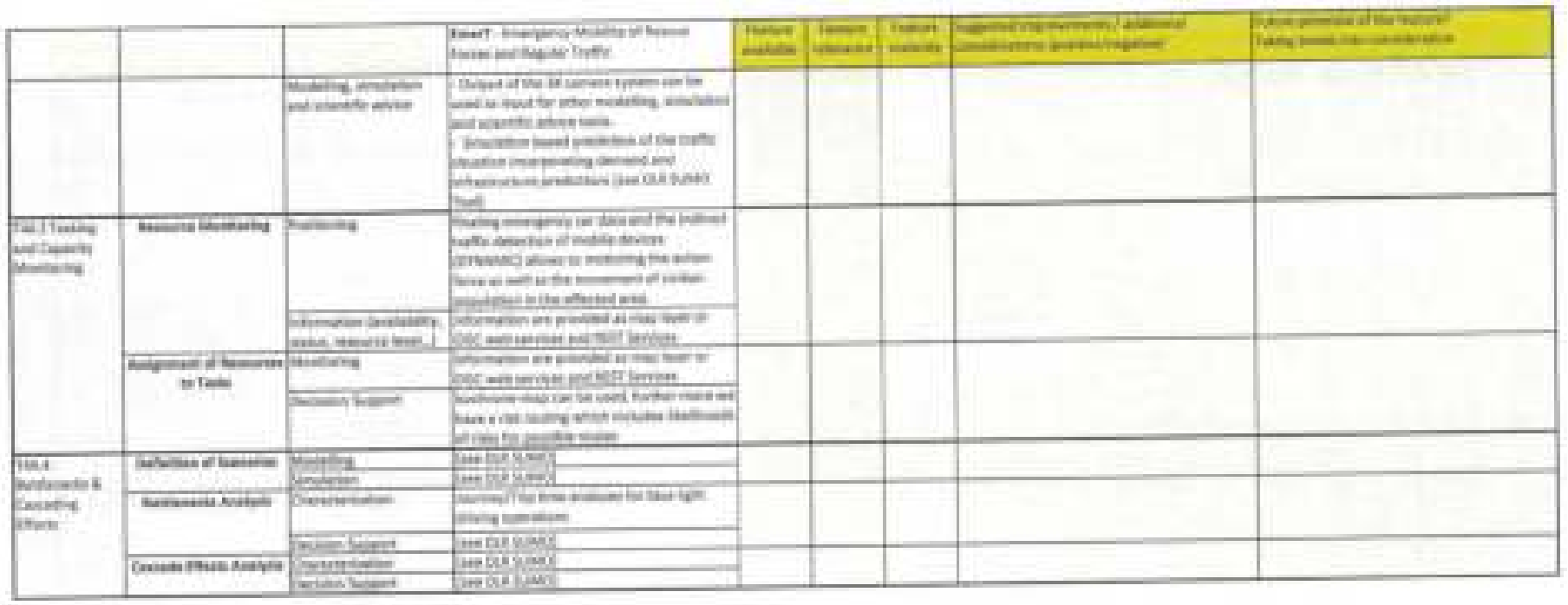
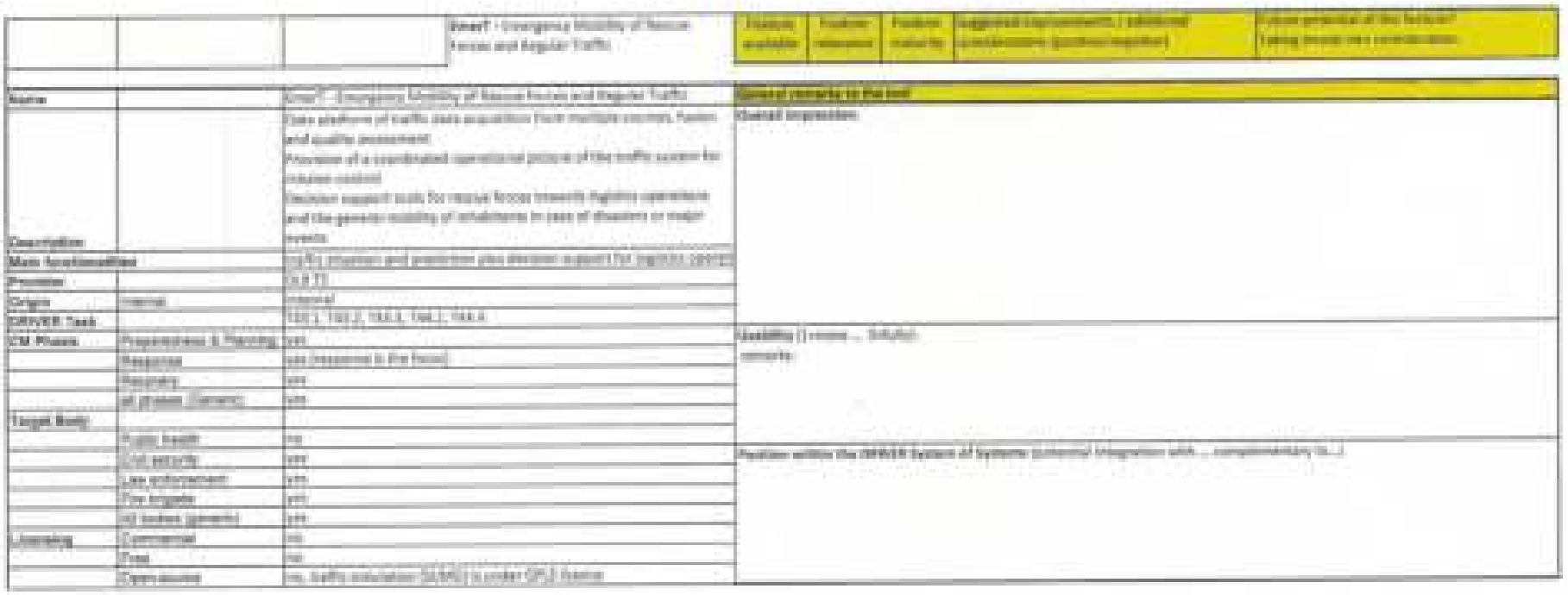


Figure 7: EmerT, Evaluator Pole, Marseille Fire Department



			Insert - Emergency Mobility of Rescue Forces and Regular Traffic	Feature available	Feature relevant	Feature maturity	suggested improvements / additional considerations (positives/negatives)	Future potential of this function? Taking broader view considerations
Name			Insert - Emergency Mobility of Rescue Forces and Regular Traffic	General remarks to the tool				
Description			Data platform of traffic data acquisition from multiple sources, fusion and quality assessment Provision of a coordinated operational picture of the traffic system for mission control Decision support tools for rescue forces towards logistics operations and the general mobility of inhabitants in case of disasters or major events	Overall impression				
Main functionalities			Traffic situation and prediction plus decision support for logistics centres					
Provider			DLR TS					
Origin	Internal		Internal					
DRIVER Task			T22.1, T22.2, T22.3, T22.4, T22.5, T22.6					
CM Phase	Preparedness & Planning		yes	Usability (1=none ... 5=fully)				
	Response		yes (mandatory for this focus)	remarks:				
	Recovery		yes					
	all phases (generic)		yes					
Target Body								
	Public health		no					
	Civil security		yes	Position within the DRIVER System of Systems (Universal integration with ... complementary to...)				
	Law enforcement		yes					
	Fire brigade		yes					
	civil society (generic)		yes					
Licensing	Commercial		no					
	Free		no					
	Open source		no, traffic simulation SUMO is under GPL2 license					

Date	Evaluator org.	Evaluator name	[illegible]					
27 May	THW	[illegible]	[illegible] – Emergency Mobility of Rescue Forces and Regular Traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0 (none) – 4 (fully)	1 (basic) – 4 (proven)	Free text	Great as-is – Totally – Free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	Up-to-date aerial image maps are a valuable information source for situation assessment (3K Sensor) Up-to-date mobile traffic data information (floating emergency car data, indirect traffic detection of mobile devices (EPHAWEC), portable traffic cams) Traffic data information (floating car data, induction loop, stationary Bluetooth detection, traffic cams, Munich, Cologne, Brunswick) Traffic data fusion and prediction					
		Machine readable info	- data as image files, WMS, OGC web services and REST Services.					
	Situation analysis	Alerting	- Aerial images and traffic data to support the analysis of situation					
	Assessment of risks	Simulation tools	Simulated view of current traffic situation					
	Information preparation	Map view	Road network from NAVTEQ is used, rendered maps as map backdrop, different thematic layers are used as map overlay					
	Decision support	Information processing for decision making purposes	Specific map can be used. Further more we have a risk routing which includes likelihoods of risks for possible routes					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Automated traffic detection from images. Demonstration of the further processing of the collected data. Traffic visualisation and prognosis. Traffic prediction and situation support.					
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for CM users	Monitoring information	- Aerial images and traffic data provides information as input for other tools. Aerial images (orthoprojected and mosaiked) give general overview about the disaster situation. - merged traffic situation and prediction give also an overview, shows bottlenecks, and are input for customer supplies					

		Modelling, simulation and assembly advice	- Output of the SA sensors system can be used as input for other modelling, simulation and assembly advice tools. - Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions (see DLR SUMO Tool)					
[illegible] Tasking and Capacity Monitoring	Resource Monitoring	Positioning	Tracking emergency car data and the realtime traffic detection of mobile devices ([illegible]) allows to monitoring the action force as well as the movement of civilian population in the affected area.					
		Infrastructure (availability, status, resource level...)	Information are provided as map layer on OGC web services and WCST Services					
	Assignment of Resources to Tasks	Monitoring	Information are provided as map layer on OGC web services and WCST Services					
		Decision Support	Incidence map can be used. Further more we have a risk routing which includes likelihoods of risks for possible routes		3			
[illegible] Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	(see DLR SUMO)					
		Simulation	(see DLR SUMO)					
	Bottlenecks Analysis	Characterization	Incoming ITSg: time analyses for close lights during operations		3			
		Decision Support	(see DLR SUMO)					
	Cascade Effects Analysis	Characterization	(see DLR SUMO)					
		Decision Support	(see DLR SUMO)					

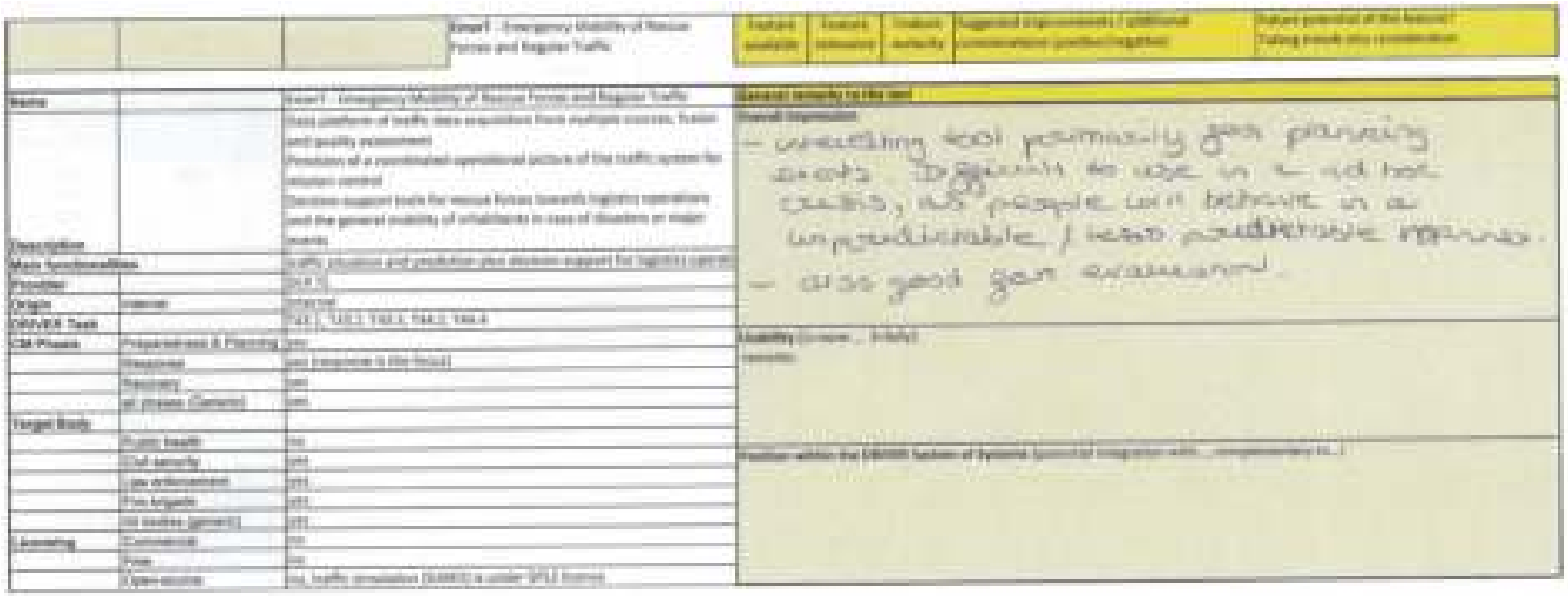


Figure 8: EmerT, Evaluator THW

Date	Evaluator sig.	Evaluator name	DLR					
[illegible]	[illegible]		SUMO - Simulation of urban traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 4=fully	1=basic 4=proven	Free text	0=not at all – 4=fully + free text
T43.1 Damage and Needs Assessment	Assessment of risks	Risk catalogue						
		Simulation tools	Generating simulated view of current traffic situation showing possible traffic bottlenecks	Y				
T43.2 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information						
		Modelling, simulation and scientific advice	Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions	Y				
T44.1 Capacity Building and Capacity Mapping Tools	Risk Assessment	Risk catalogue						
		Simulation tools	Simulating road network capacities	Y				
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning						
		Information (availability, status, resource level...)	Feeding current travel times into reachability analysis (see EmerT)	Y	3			
T44.4 Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	Importing street networks and demand data to model (road) traffic	Y	3			
		Simulation	simulating traffic jams as well as rerouting effects and changes in demand					
	Bottlenecks Analysis	Characterization	showing effects of jammed streets	Y	3			
		Decision Support	scenario modelling (what happens if I block road X instead of Y)	Y	3			
	Cascade Effects Analysis	Characterization	incorporating movement of special vehicles	Y	3			
		Decision Support	routing advice (see EmerT)					

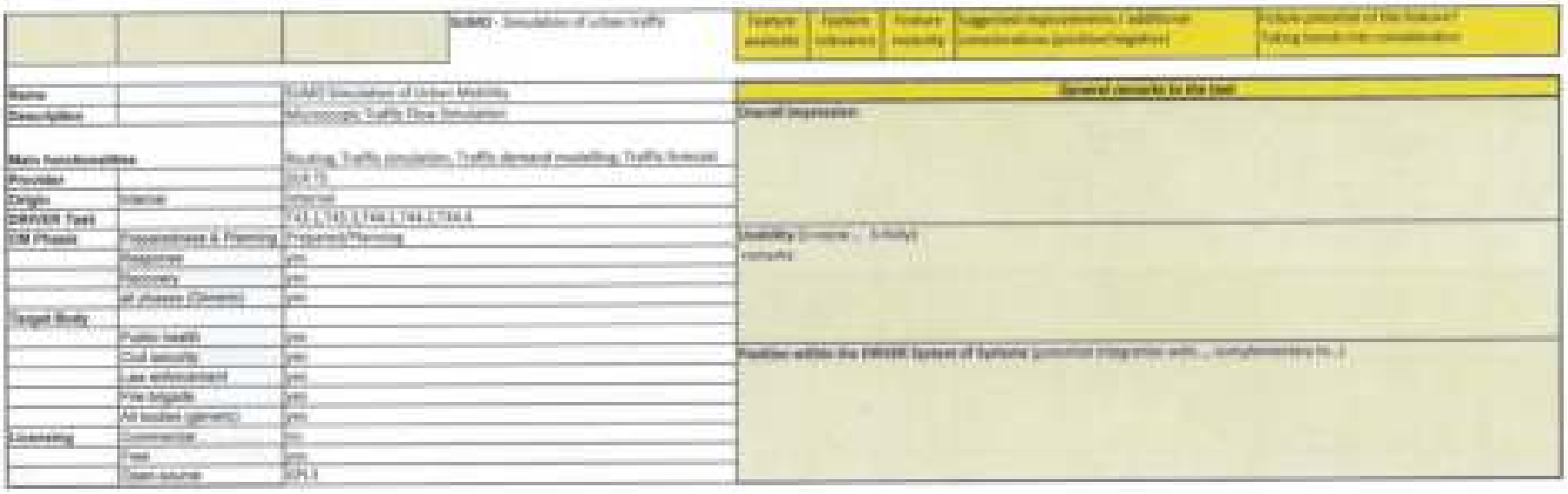


Figure 9: SUMO, Evaluator Pole, Marseille Fire Department

Date	Experiment	Evaluator name	SUB					
27 MAY	THW	A/ FECHNER HACKAUF	SUMO - Simulation of urban traffic	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
				Yes / No / Partly	[illegible]	[illegible]	Free text	[illegible]
Task	Feature	Sub-feature						
T43.1 Damage and Needs Assessment	Assessment of risks	Risk catalogue						
		Simulation tools	Generating simulated view of current traffic situation showing possible traffic bottlenecks		3			
T43.2 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information						
		Modelling, simulation and scientific advice	Simulation based prediction of the traffic situation incorporating demand and infrastructure predictions		3			
T44.1 Capacity Building and Capacity Mapping Tools	Risk Assessment	Risk catalogue						
		Simulation tools	Simulating road network capacities		3			
T44.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning						
		Information (availability, status, resource level...)	Feeding current travel times into reachability analysis (see EmerT)		3			
T44.4 Bottlenecks & Cascading Effects	Definition of Scenarios	Modelling	Importing street networks and demand data to model street traffic		3			
		Simulation	Simulating traffic jams as well as rerouting effects and changes in demand					
	Bottlenecks Analysis	Characterisation	Showing effects of jammed streets		3			
		Decision Support	Scenario modelling (what happens if I block road X instead of Y)				not good THW but good for police	
	Cascade Effects Analysis	Characterisation	Incorporating movement of special vehicles		3			
		Decision Support	Routing advice (see EmerT)				very important good THW	

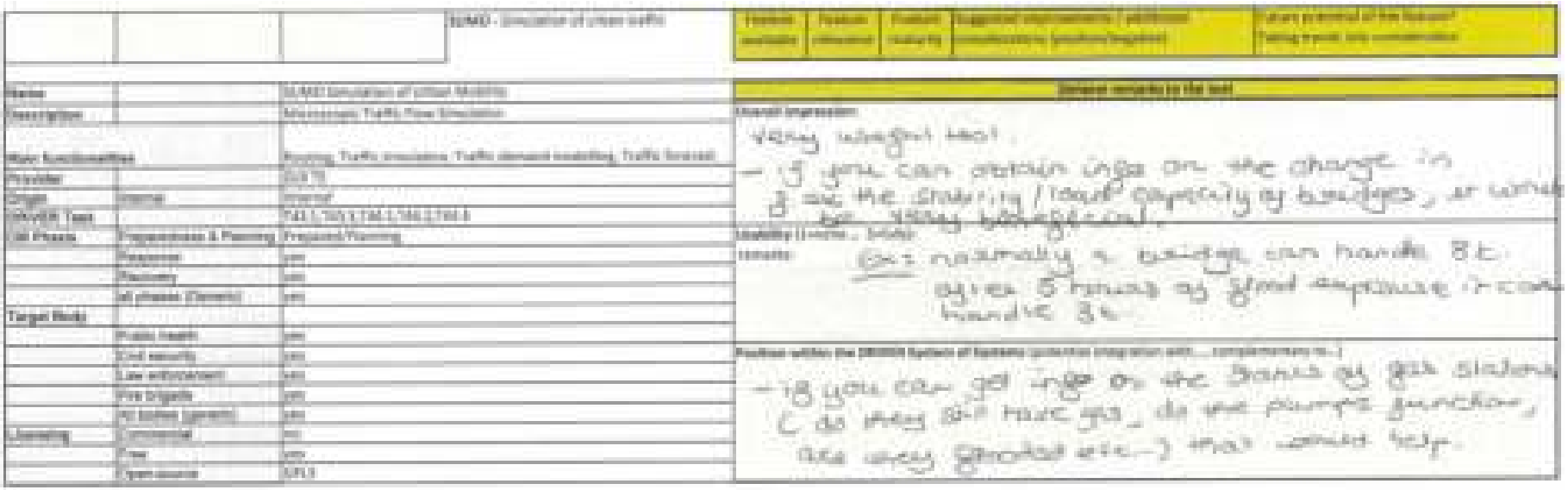


Figure 10: SUMO, Evaluator THW

Date	Evaluator org.	Evaluator name	SMx installed					
25/11	D Scott	TPO	EIS	Feature available	Feature relevance	Feature maturity	Suggested improvements / additional considerations (positive/negative)	Future potential of the feature? Taking trends into consideration
Task	Feature	Sub-feature		Yes / No / Partly	0=none 3=fully	1=basic 5=proven	free text	0=not at all – 3=fully + free text
T43.1 Damage and Needs Assessment	Gathering data from the field	Human readable info	Text and pictures entered by responders via Android application	Y	3	5		
		Machine readable info	Integration of sensors via Data Fusion and Mediation System (DFMS)					
	Assessment of loss	Simulation tools	Gas spread, flood and fire simulations	?	3	5?	Not shown	
	Information preparation	Map view	Selectable overlays on base map Dynamic import of geo referenced data layers	?	3			
		List view	Filtered lists of items (visible in the map pane or all)					
T43.2 Airborne sensor processing	Assessment based on airborne sensors		Cameras and sensors integrated in UAV and balloons	Y	3	5		
T43.3 Crisis dynamics & early warning	Translation of info into actionable info for EM users	Monitoring information	Traffic information from road network sensors (TTS)	?	2			
	Distribution of warnings (public and to operators of critical infrastructure and enterprises)	preparation of warnings	Alerting tool for SMS broadcasting through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)	Y	3	5.6	Non-technical part (how to communicate properly is not shown).	2
		authorization of warnings	EIS alerts are considered authorized by the broadcasting system.					
		distribution of warnings	Alerting tool for SMS broadcasting through regular phone network (ALCATEL) and network hijacking (IMSI Catcher)					
T43.4 Interaction with citizens	Usage of social media	gathering of situational awareness info	Situational awareness information can be gathered via twitter and facebook	Y	3	4	Verification of incoming information is not challenged	
	Usage of social media	pushing warnings via social media	Publishing of information to EIS social media accounts (Twitter, Facebook)					
	Usage of crowd tasking	Info collection (citizen as a sensor)	Public can comment on information published by EIS	Y	3	5		
		Supporting relief actions (citizen as a volunteer)	Requests for collaboration can be sent via social media and SMS (Messaging campaigns)					
T43.5 Shared situation awareness	COP Production	Visualisation (Filtering / Querying of common operational picture	COP can be setup in the EIS interface, stored and shared with other EM	?	3	5?	Not shown	

	Dissemination	Dissemination (manual/automatic)	COP can be shared with other CSI users	Y	3			
	Equipment/ Deployment	Control centers	CSI is a portable and deployable emergency response system including a portable CP, resilient comunication system and on-Field deployable sensors	Y	3			
		Field devices	Multiple field devices were used in the project, including UAV, UGV, Balloons, and ruggedized On-Board Units that can connect to a host of sensors and vehicles					
TA4.1 Capacity Building and Capacity Mapping Tools	Deployment of Resources	Decision Support	List of available resources					
		Monitoring of current status of deployed resources	All resources equipped with an OBU are monitored in real time and the status and location of responders with the Android application are displayed on the map.					(2)
	Risk Assessment	Simulation tools	Gas spread, flood and fire simulation.	?	?	?	fully in the platform	
TA4.2 Tasking and Capacity Monitoring	Resource Monitoring	Positioning	All resources equipped with an OBU are monitored in real time.	?				
		Information (availability, status, resource level...)	The status of resources including battery level is monitored in real time.					
	Information Sharing	Manually	Map layers can be shared with other CSI users. The application integrates a real time chat and a push-to-talk like message system.	Y	3	6?		\
TA5.2 Collaborative tools (GMV)	Collaborative ITM management	Security / Rights management	Possibility to create and manage the security rights of new users	?				

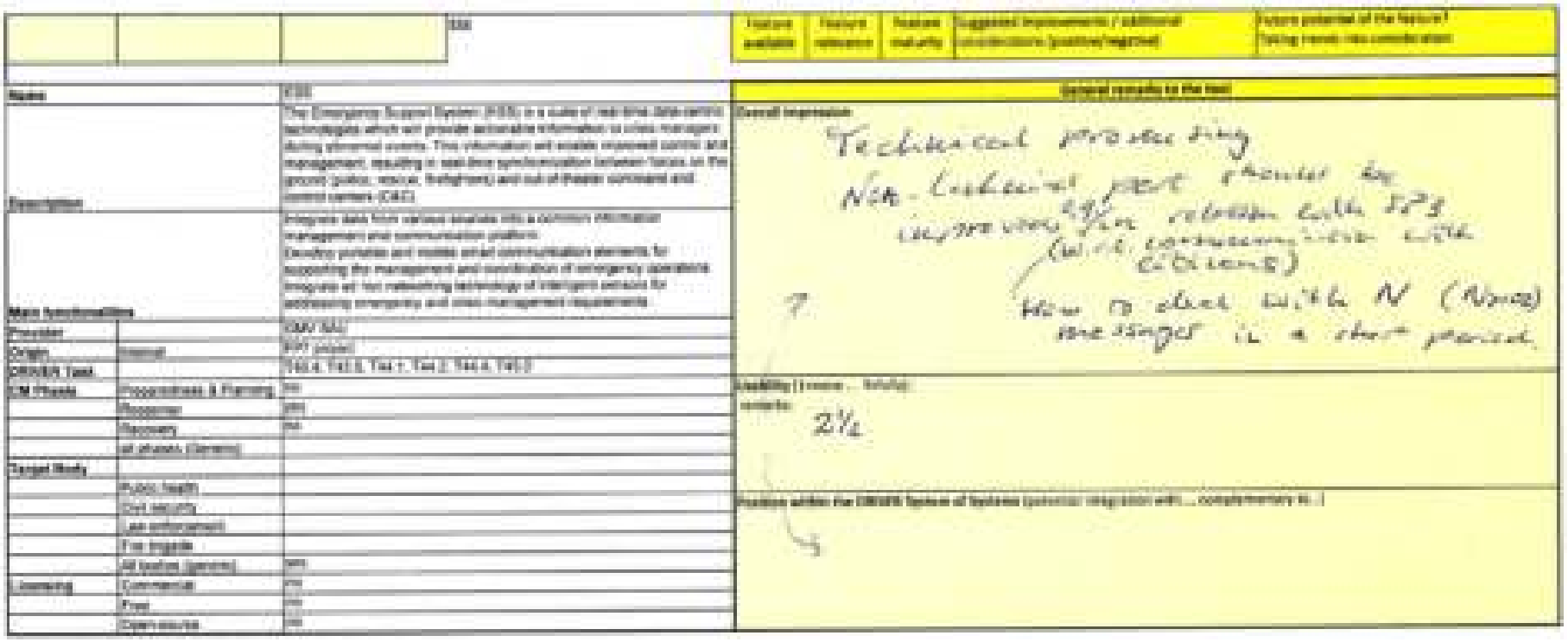


Figure 11: ESS, Evaluator TNO