WEATHER

Weather Extremes: Assessment of Impacts on Transport Systems and Hazards for European Regions

---

Workshop 2

Organising emergency management strategies for the transport sector with the use of innovative IT systems

Summary Report of the WEATHER Workshop 2, Brussels, February 28th, 2011.

Status: Public

Version: 1.0 (final)

Date: 11.07.2011

Authors: Vangelis Mitsakis (CERTH), Anestis Papanikolaou (CERTH)

Study funded under the 7th framework program
of the European Commission

Document details

This document should be cited as:

V. Mitsakis , A. Papanikolaou (2011): “Organising emergency management strategies for the transport sector with the use of innovative IT systems. Summary Report of the WEATHER Workshop 2, Brussels, February 28th, 2011”. Research project WEATHER (Weather Extremes: Impacts on Transport Systems and Hazards for European Regions) funded under the 7th framework program of the European Commission. Project co-ordinator: Fraunhofer-ISI.

Document title:	Organising emergency management strategies for the transport sector with the use of innovative IT systems. Summary Report of the WEATHER Workshop 2, Brussels, February 28th, 2011
Lead Author:	V. Mitsakis, A. Papanikolaou
Version:	1.0 (final)
Date:	11.07.2011
Status:	Public
Quality review:	Claus Doll, 15.7.2011

The WEATHER project:

Full title: WEATHER – Weather Extremes: Impacts on Transport Systems and Hazards for European Regions.

Duration:	November 1st 2009 to April 30th 2012
Funding:	Call 2008-TPT-1, 7th framework program of the European Commission, Directorate General for Research and Technical Development
Contract.:	Grant Agreement no. 233 783
Consortium:	Fraunhofer-Institute for Systems and Innovation Research (ISI), Karlsruhe – project co-ordinator Fraunhofer-Institute for Transportation and Infrastructure Systems (IVI), Dresden Centre for Research and Technology Hellas (CERTH), Helenic Institute for Transport (HIT), Thessaloniki Société de Mathématiques Appliquées et de Sciences Humaines - International research Center on Environment and Development (SMASH-CIRED), Paris Karlsruhe Institute for Technology (KIT), Institute for Industrial Production (IIP), Karlsruhe Institute of Studies for the Integration of Systems (ISIS), Rome HERRY Consult GmbH, Vienna Agenzia Regionale Prevenzione e Ambiente dell'Emilia Romagna (ARPA-ER), Servizio Idro-Meteo-Clima (SIMC), Bologna NEA Transport Research and Training, Zoetermeer
Internet:	www.weather-project.eu
Contact:	Dr. Claus Doll Fraunhofer-Institute for Systems and Innovation Research (ISI), Breslauer Str. 48, 76139 Karlsruhe, Germany, T: +49 721 6809-354, E: claus.doll@isi.fraunhofer.de

TABLE OF CONTENTS

1 Preliminaries

1.1 Workshop 2 general information

The second workshop of the WEATHER project has been carried out in the framework of WP3 'Crisis management and emergency strategies', aiming at pointing out the interconnections and interrelationships between emergency management procedures in the transport sector with their technological advances and organisational challenges. The Workshop entitled *'Organising Emergency Management strategies for the transport sector with the use of innovative IT systems*', was carried out on February 28th, 2011, at the premises of ECTRI (European Conference of Transport Research Institutes) in Brussels.

Invited external experts:

- Mr. Vangelis Katsaros - University of Thessaly & Greek Railways (TRAINOSE)
- Mr. Horst Hanke - German Road Administration
- Prof. Giampiero Beroggi - Statistical Office Canton Zürich
- Mrs. Gerlinde Angerhöfer - Weather Forecast Service (Deutscher Wetterdienst).

The following paragraphs provide a brief overview of the contents of the workshop. The respective presentations may be accessed through the weather website at www.weather-project.eu/weather/inhalte/proj-events.php.

1.2 The WEATHER project

The WEATHER project aims at adding to the current state of knowledge on the impacts of extreme weather events on economy and society in total and on European transport systems in particular. The project starts from the broad picture of climate scenarios and breaks them down to specific regions. Economic growth models are applied to study the impacts on economy and society and the inter-relations between transport and other sectors. The vulnerability of transport is assessed mode by mode including infrastructures, operations and intermodal issues. Best practices in emergency management are identified by studying the numerous damage cases worldwide and options for adapting to more frequent and/or more extreme weather events are assessed. A particular focal point of the project is to quantify expected damage, emergency and adaptation costs and the benefits of improved emergency management and adaptation. Moreover, the project will identify policy options to implement the recommended measures and demonstrate the competitive potential and the innovation power of European lead market for adaptation and emergency management technologies and policies. The toolbox of the project consists of literature review, targeted interviews, workshops, cost accounting models and case studies. The project will last for 27 months. The team consists of 8 leading transportation research institutes, all having well founded expertise in the core research fields of the WEATHER project.

1.3 Brief description of the Workshop concept

The rationale behind the second WEATHER workshop was to constitute a ‘closed’, targeted workshop with a restricted number of selected experts, who would present their know-how on the research topics of the project as well as validate and complement the initial research endeavours of WP3.

The Workshop was comprised of two phases; in the first phase each of the selected key experts gave a presentation on a specific, predetermined thematic area, while in the second phase a “Round Table” session was conducted with the participation of the key experts and the WEATHER researchers of WP3.

Four key experts were selected to participate in the Workshop: Mr. Vangelis Katsaros from the University of Thessaly and the Greek train operator (TRAINOSE), Mr. Horst Hanke of the German Road Administration, Prof. Giampiero Beroggi from the Statis-

tical Office Canton Zürich and Mrs. Gerlinde Angerhöfer from the Weather Forecast Service (Deutscher Wetterdienst).

The first phase of the Workshop included the following three research domains and thematologies:

1. Emergency management planning and operation
2. Organisational and administrative issues of EM in transport sector
3. Intelligent Transport Systems for coping with emergencies in the transport sector

These research domains corresponded to the distinct research directions of the different Tasks of WP3 of the WEATHER Project -concerning emergency management (EM), organisational issues in EM and technological issues in EM respectively-. The initial idea concerning the organisation of the Workshop was to address all research aspects of WP3 and specifically each research domain to be represented by one (or maximum 2) key expert(s), who would give a presentation related to their expertise.

The second phase of the Workshop, the “Round Table” session, provided the chance for an ‘open dialogue’ among the WEATHER researchers and the experts. Each WEATHER researcher as well as key expert had the opportunity to raise important issues - questions to the other key experts regarding their research interests. The overall objective of this phase was to crosscheck the research directions and validate the initial results of the WP with the key experts, as well as decide and resolve on certain key methodological issues based on the experience and advice of the key experts.

A short summary of the presentations of the first phase along with the main discussions and conclusions of the second phase of the Workshop is provided in the next paragraph.

2 Presentations and discussions

2.1 Phase I: Presentations

The first presentation entitled ‘Emergency planning and operation’ made by **Mr. Katsaros**, highlighted the main issues emerged from past disasters/ extreme events from the point of view of civil protection authorities and namely previous experiences from the Central Macedonia Region in Greece.

The key issues that were discussed concerned the following topics:

- Emergency facilities missing: The problem is often located in the lack of soft emergency measures, such as the emergency run pikes for emergency vehicles, emergency plans, and not in the lack of sufficient infrastructure.
- Weather Prediction: The need for having reliable, locally focused and real time information was underlined, in order to inform travelers as well as plan and implement the suitable measures/ actions. E.g. in special locations like high altitudes, snow forecasts should be provided.
- Emergency number calls (112 for Greece): The need for a wider awareness campaign was pointed out, which could lead to saving lives (finding location of people lost)
- Clear chain of responsibilities and sequence of actions: Need for focusing efforts on the most vulnerable areas and also to keep tracking the sequence of events; sometimes secondary impacts of an event affect neighbouring areas (e.g. the tornado in Chakidiki –holiday resort near Thessaloniki- was handled well, however the reaction of the drivers created traffic jam in the network of Thessaloniki).
- Informing Citizens/Tourists/Visitors: The issue of information provision to non natives highlighted as one of the most challenging since there is lack of adequate channels for spreading news and updates
- The role of Media was pointed out, underlining the fact that even though media could be used for information purposes, however the lack of responsibility concerning this cooperation from the authorities side entails irresolution.
- Educating Citizens / Professionals/ Volunteers: Sometimes ignorance and bad attitude leads to accidents, e.g. people ignoring public advice; signs and barriers of police in case of flooding or other events. Thus education on safety and security issues should be promoted.
- Local Risk Assessment/ Plans: Risk assessment and integrated local planning are totally missing in Greece. Single entities (police, fire brigades) operate well, but without any coordination or cooperation. There is the need to strengthen the organisational linkages and structures for enhancing cooperation among different entities.

In the framework of the research domain ‘Organisational and administrative issues of EM in the transport sector’, **Prof. Beroggi** made the second key expert presentation entitled ‘Organisational Decision Making in Crisis Management’. The presentation explored the distinct roles and interrelationships of the involved organisations in emergency management operations and pointed out the key issues for enhancing the cooperation and reaching consensus concerning the responsibility sharing. Prof.

Beroggi considered three distinct organisational levels in EM, the response, the strategic and the policy level. Through the examination of three case studies, key strategies for each of these levels were identified for the improvement of crisis management decision making.

For the response level, the Port of Rotterdam was examined as a case study of emergency management operations. The involved organisations in EM operations in the Port of Rotterdam are the Police Department (PD), the Fire Department (FD), the Chemical Advisor (CA), the Medical Officer (MO), and the Port Management (PM). The most crucial organisational issue acknowledged as the main challenge is the achievement of efficient cooperation between all these actors, which have different Standard Operation Procedures (SOP), support means, culture and hierarchical structure. In order to overcome the organisational and institutional restrictions, the concept of improvisation between the organisations was promoted by using groups' dynamics exercises and implementing the actors into group decision support systems. The key conclusions that emerged from these training exercises are the need to complement SOP with improvisation techniques, the need for strict definition of improvisation when deviating from SOP and continuous promotion through common training exercises and trust building between the organisations, as well as the fact that certain legal issues must be addressed and resolved prior to deviating from SOP.

The second case study referred to the strategic level and dealt with the achievement of consensus among safety experts concerning emergency management along transportation routes (during the transport planning phase). Specifically, the main challenge in this case is that safety experts from the involved organisations come to an agreement (consensus) concerning the introduction of emergency planning into the transportation planning process and the exact role and liabilities of each stakeholder in the planning process. The involved organisations (decision makers) in this case were the Fire Brigade, as well as authorities dealing with spatial planning, infrastructure planning and environmental planning. In order to come to a final decision for the selection of the most suitable alternative plan, multi-criteria techniques were used in which each organisation representative has evaluated the alternative plans using qualitative scores to a certain set of predefined criteria/indicators (e.g. response time and needs, risks, life quality, costs). The alternative with the highest aggregated score constituted the optimal. The main conclusion emerged referred to the need that experts should only address aspects of safety for which they are qualified for and be free to propose and choose the safety indicators based on their experience and expertise. This way the overall objective of the process is served, which is to adopt an integral approach comprising multiple safety indicators and stakeholders, and thus contributing to a shared view of safety aspects for alternative line infrastructure plans.

At the policy level, it was mentioned that many difficulties and problems arise when many actors are disputing over multiple issues concerning the 'exchanging of power and control'. The case here was how to reach 'Control-Equilibrium' when planning Emergency Management for Regional Transportation. The main issues at stake regard the combination of economic viability of the investments together with environmental protection and social sustainability and safety issues and as a result the organisations involved are national/regional public transportation authorities, the Police Department, associations representing small businesses and service providers, the Local Fire Department (in charge of approving construction permits), Local planning authority as well as the Environmental and Spatial Planning Department. In this case, an IT system was utilised to compute 'Equilibrium Control' status, by modeling the Interests, the Control and the Dependencies of each organisation (as identified and proposed by them), using game theory and social choice exchange theory. The main conclusions drawn from this case are that trust between actors is a crucial factor and is built in small step negotiations/procedures in order to approach a stable solution. Moreover 'Equilibrium control' is a dynamic goal that changes as the process goes on and so one must keep track of shifting goals throughout the process.

The overall conclusions and key issues concerning IT-based Org-DM are that decision makers and group dynamics should not be under (or over-) estimated (models make suggestions, people make decisions), model results are mere suggestions and leave space for improvisation, wrong models can be good stimulators for communication and consensus reaching and finally Numerical & model sensitivity analysis is required.

The third research domain of the Workshop 'Intelligent Transport Systems for coping with emergencies in the transport sector' included the presentations of Dr. Hanke entitled 'Emergency Traffic Management In the Case of Severe Winter Conditions' and of Mrs. Angerhöfer entitled 'The Weather Information Systems (WIS) of the German Weather Service Provider (DWD): the Road WIS (SWIS) and the Fire brigade WIS (FeWIS)'.

Dr. Hanke discussed about the use and benefits of IT systems for optimizing the provided services of the Winter Maintenance Organisation in Germany. Firstly he pointed out the major implications of the climate for the national road network in Germany, relating it with economic figures. The main problem of the German climate constitutes the alternating temperatures around zero as well as the strong variations of temperatures and precipitations over the years. The main effects of the weather conditions are the high reductions of the road network's capacity (around 50%), significant increase of accident rates and injuries (6 times higher) and other important economical costs such as travel costs (fuel consumption), delay costs, accident costs (insurances) and other costs related to problems with the supply of the population and the industry (production costs).

Then, the role of German Winter Maintenance Organisation was described and its means and capabilities for coping with heavy winter events. Winter maintenance (WM) Organisation is equipped with modern truck and machinery equipment and maintains a Winter Maintenance Management System which is connected to 750 local Maintenance Units for providing real time 24h the day strategic operational control (strategic optimised route planning, strategic salt stock provision) in cooperation with the regional Winter Maintenance Centres and the Road Weather Information Systems.

Considering the fact that most likely the winter problems in the transport network will increase, the role of Winter Maintenance (WM) is to identify the most cost-efficient ways for coping with the impacts of winter events in the national level, such as creating economies of scale with central disposition of machinery, having central salt stock provision and management and exploiting the capabilities of IT systems in the transport sector. Especially the role of IT systems was emphasised, which is considered to be the key solution to overcome the lack (or scarcity) of resources as well as the optimal way for the management and control of available resources. As a conclusion, three main areas were stressed for which IT systems support the German Road Administration and in particular the Winter Maintenance (WM) Unit by providing the respective services:

- Weather Forecast and Detection: Through the use of ice warning and road monitoring systems, WM is in position to conduct weather forecasts as well as micro-road weather forecasts (local level), informing and supporting the work of local authorities (winter road service, police, local ITS Traffic Centres, meteorological authority).

- WM Planning and Operation Control: IT systems provide support concerning the operation planning and on line recording, the monitoring of road surface conditions, the controlling of winter maintenance operations, the alerting staff and contractors. The example of winter 2010/2011 was discussed, in which the support of IT systems was underlined, mainly focusing on the distribution optimization and management of the salt stock capacity.

- Traffic Guidance: In cooperation with Traffic Centres, IT systems support WM providing traffic guidance through Variable Message Signs on the roads (VMS), lane blocking, speed limits, warning signs, route guidance, traffic Information by radio (TMC) and pre-trip information by internet and teletext.

Finally, the presentation of **Mrs. Angerhöfer** focused on the capabilities and services of two IT systems of the Weather Forecast Service (Deutscher Wetterdienst - DWD), namely the SWIS (Road Weather Information System) and the FeWIS (Fire brigades Weather Information System).

The main objective of the Road Weather Information System 'SWIS' is to provide weather information to maintenance staff. The utility of SWIS is that operates as a central system, collecting information from 120 Road Weather Systems (RWS) located in 16 Federal States all over Germany, and providing this information to DWD in a structured format. By elaborating this information, DWD is in position to deliver a number of services such as:

- Special road weather forecasts -at a macroscopic (city) as well microscopic (point) level for all the RWS locations
- General weather information (weather reports, forecast charts)
- Data archive and exchange

The specific information that DWD (through SWIS) is capable of providing includes indicators for cloud amount, precipitation, wind as well as for road surface temperature and road conditions for major and minor roads and bridges in Germany. It is noteworthy that this information is provided to the road maintenance staff of the Federal States but not to the public. Conclusively, the role and contribution of SWIS to the Federal States (responsible for the Road Maintenance) involves the following attributes:

- Optimization procedures for maintenance staff
- Faster road clearing and gritting
- Less reduction of traffic in case of wintry conditions
- Better planning for transport companies (time needed, alternative routes)
- Reduction in costs of winter service

The second IT system described (FeWIS), aims at providing information to fire brigades for disaster management purposes. FeWIS supports a multi-level warning system, in which all spatial and temporal scales of warning information are closely connected. Following the German Disaster Management organisational structure, FeWIS provides information to local level (12 to 0 h ahead), regional level (24 h ahead) and national level (7 to 2 days ahead). Weather warnings are correlated to certain predefined and established criteria and thresholds, resulted from past weather experiences and operations. FeWIS has 27 different types of warnings, which are well defined and regularly evaluated in cooperation with disaster management. FeWIS services include among other the following:

- Individual composition of warning information
- Current weather and forecasts
- Webkonrad - Thunderstorm identification and prediction

- Forest fire danger index
- HEARTS - dispersion of toxic substances
- Flooding information (link)
- Basic climate information for regional risk analyses

The aforementioned services are provided to the interesting cooperating authorities (Fire Brigades, Relief Organisations, Police and Regional Emergency Centres) as well as to the public (through the internet). Conclusively, the role and contribution of SWIS to the Federal States (responsible for the Road Maintenance) involves the following functionalities:

- Supports optimizing disaster management operations
- Provides detailed storm warnings for rural districts
- Facilitates quick operational decisions
- Leads to the better organisation of operations (in terms of time needed, alternative routes identification etc)
- Entails the reduction in costs of operation

2.2 Phase II: Round Table

The objective of this phase was to encourage an 'open dialogue' between the WEATHER Project researchers and the key experts as well as to clarify and validate certain methodological approaches and assumptions of WP3. The discussion was driven by a series of questions set by the participants, on which all experts had the chance to express and describe their personal view. In the following paragraphs, the main points of the discussion are summarised.

To begin with, it was mentioned that two important aspects of emergency operations are addressed in the framework of WP3: the holistic approach (all-hazards) of emergency management extended to the policy level, as well as the incorporation of risk analysis into emergency management as part of the operational strategy definition procedure. These two issues give room for further developments in EM operations, both in technological and organisational level.

Concerning the technological dimension of Emergency management in the transport sector, it was underlined that even though technological investments often prove their added value in terms of EM operational readiness, yet they are often rejected for political reasons. Emphasis was given to the fact that willingness to pay from the side of politicians is highly related to the community's (people) perception of the respective risks. A representative case constitutes the nuclear accident in Japan; it has

changed people's perception concerning the risk of having nuclear plants near their location and thus a future investment of this type would require more controls and safety measures.

Another issue is that there are many costs even in cases of no risks (e.g. due to traffic delays because of snow-need for maintenance) and that these costs should be also taken into account if one is willing to invest in ITS. The main issues discussed concerning innovative components or procedures that could enhance current emergency management practice are:

- Standard messages via mobile phones before travelling (tourists - where to find them).
- Linking of data from different sources and companies / organisations. Example: open-gov by US government. Open source technology and data exchange via gateways and interfaces, standard protocols could be an option.
- Different formats for different target groups. Customised information is important for acceptance of services. Innovation: integration of various different systems / data sources in a single user interface. Integration and customisation of systems. Problem: transfer of different formats.
- Develop and further connect existing systems. Good practice: truck-info from Switzerland. System includes road weather plus rail timetable. Maybe more easy there as drivers can be forced to use the rolling motorway.

Although there are certain difficulties for defining and investing in the optimal technological solutions for copying with EWE, it seems that the organisational issues are even greater. A main problem is the denial of different organisations to adopt a unified approach (guidelines) concerning operational procedures. The problem is intensified when moving from regional to national, cross border and international (e.g. European) level. An additional dissolving parameter towards this direction is the differentiation on cultural issues - different perception of risk between the different countries in a macro-level and between the different organisations in the micro-level.

Thus as a result, organisational issues surpass the technological barriers (given the availability and existence of technology). Main organisational issues are the culture (what we think is important as an organisation) and the power (responsibility sharing) among the involved parties when cooperating (e.g. civil protection in Greece versus fire fighters in the Netherlands).

Additional organisational issues that were raised concerned:

- Cooperation problem concerning information exchange: Cooperating authorities maintain different information systems with distinct demands and outputs. In case of good cooperation (German Road Administration), each system de-

livers exactly the information required (e.g. weather information system to road maintenance and fire brigade platform).

- EM Organisations is important to work under emergency (and not normal) conditions, in order to be able to surpass the difficulty to move from day-to-day procedures to emergency case procedures. It was also stated that it would be useful to have a distinct (trained) body assigned only with the operational part of EM. Another argument towards this direction is the fact that many bodies (e.g. national rail carriers) do not have or operate under any risk management system and thus in these cases an external operational organisation should be designated to step in and take over decision in emergency cases.

- There are certain cases in transport systems failures which could constitute win-win cases for all the actors involved (different transport systems as well as passengers). However, lack of responsibility as well as lack of a dedicated person creates operational and cooperation gaps because nobody is willing to take decisions and move the procedure. E.g. even though the Italian railways could earn money from stranded air passengers during the volcano ash crises in April 2010, they did not increase their capacity.

- Regarding best practices in EM: IT-Based information is one of the most innovative and rapidly changing fields. It was argued that there is no point at looking back to technological best practices of the past 2 years, as they are already outdated. The value of IT systems and platforms in EM is in their use and not only their technology.

- Intermodality: Intermodality is an important aspect and would be useful in cases of emergency. However, it is purely an organisational issue which the different involved parties (or the state) have to promote and resolve it in order to work and support EM operations. An important issue (barrier) that arises is the responsibility of coordination in joined operations.

- Participation of the Private sector in EM operations: In cases where private companies operate in competitive environment could efficiently support (or replace) public bodies in emergency operations. On the other hand, where monopolistic private companies are in charge, do not provide the desired level of services.

- Methodological focus in the road sector: The most dominant and challenging sector of EM operations is the road sector since it is self-organised and thus presents more necessity for direction. Air and maritime transport are naturally dealing with safety due to excessive air safety instructions. On the contrary the road sector is self-responsible for safety and furthermore what differentiates road is the number and type of users. Although in all other transport sec-

tors professionals / experts are in charge of the navigation, in the road sector all users decide and operate on their own. Thus, the road transport system is expected to receive the attention when dealing with organising and optimizing emergency management operations.

3 Follow-Up

The results of the workshop contribute to Deliverable 3 “Innovative emergency management and policy guidelines”, due in April 2011 and accessible via the WEATHER website. This deliverable addresses the way, on which the negative impacts of extreme weather events can be eased by installing suitable crisis and emergency management systems and system recovery mechanisms. One more workshop is foreseen within the WEATHER project by mid May 2011, concerned with the adaptation measures

Information on further project deadlines and activities can be obtained via the WEATHER project website at www.weather-project.eu

Comments on the workshop and all project deliverables are welcomed. Please address either specific project partners or the project coordinator:

Centre for Research and Technology Hellas (CERTH), Helenic Institute for Transport (HIT), Thessaloniki, Greece

Evangelos Mitsakis (+30 2310 498 459, emit@certh.gr)

Anestis Papanikolaou (+30.2310.498.434, anepapanik@certh.gr)

Karlsruhe Institute for Technology (KIT), Center for Disaster Management and Risk Reduction Tech-nologies (CEDIM), Institute for Industrial Production (IIP), Karlsruhe, Germany

Christian Trinks (+49-721-608-44565, Christian.Trinks@kit.edu)

Tina Cpomes (+49 (0) 721 608 44410, comes@kit.edu)

Fraunhofer-Institute for Transportation and Infra-structure Systems (IVI), Dresden, Germany

Georg Förster (+49 (0) 3 51 / 46 40-682, georg.foerster@ivi.fraunhofer.de)

Ina Partzsch (+49 351 4640-631, ina.partzsch@ivi.fraunhofer.de)