TAMIR – Advanced tools for pro-active management of impacts and risks induced by convective weather, heavy rain and flash floods in Europe

REPORT ON THE FIRST TAMIR END-USER WORKSHOP

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EXECUTIVE SUMMARY

This report describes the outcome and results of the first TAMIR end-user workshop on tools for management of impacts and risks induced by severe weather with special emphasis on floods. The event was organized online on 27 Oct 2020. The workshop focused on collecting end-user feedback on the envisaged new products and tools for prediction and nowcasting of hazards induced by severe weather being developed in the TAMIR project and on the technical realizations and IT aspects of integrating the services to local end-user platforms. The results of the end-user workshop will be used to guide the development of products and services in the next stages of the TAMIR project.

1 INTRODUCTION

The TAMIR project (874435 — TAMIR — UCPM-2019-PP-AG, 2020-2022), funded by the EU Civil Protection Mechanism, addresses challenges faced by civil protection that impede their ability to make active decisions when preparing for emergencies in severe weather situations. The challenges include e.g. high false alarm rates, lack of multi-hazard forecasts (e.g. combined effects of heavy rainfall, flood, lightings, wind gusts, hail), difficulties in translating hazard forecasts into impact forecasts, and inadequate risk assessments. The project addresses these challenges using innovative, state-of-the-art science, and integration of the developed tools and services into existing systems, e.g., as experimental additional products delivered via the European Flood Awareness System (EFAS) platform, part of the Copernicus Emergency Management Service, and as new information in regional civil protection systems. This way the project supports pro-active emergency management with products covering different spatial scales (regional to European) and lead times (15 minutes to 5 days). In particular, the project focuses on:

i. Improving the existing products and tools with enhanced impact assessment and preparedness capacity, e.g., considering uncertainty related to precipitation type, lead-time dependent flood warning thresholds, and combining hazard forecasts with vulnerability and exposure layers for enhanced risk management.
ii. Delivering the products to end-users through operational platforms and new web services for effective integration into existing civil protection systems.

The products and tools developed in the project will be assessed against their usefulness for decision making through case study evaluation and real-time demonstration in regional civil protection systems later in the project. Therefore, civil protection professionals and other end-users of the products are tied closely into the development process in order to maximize the effectiveness of the products.

As an integral part of involving the end-users into the project, the first end-user workshop was organized virtually by the TAMIR project members Finnish Meteorological Institute (FMI), European Centre for Medium-Range Weather Forecasts (ECMWF), Universitat Politècnica de Catalunya (UPC), and Kymenlaakso Rescue Department (KymPe) on the 27 October 2020. The workshop was targeted to experts dealing with hazards caused by storms and heavy precipitation as well as IT specialists supporting and developing related services, e.g., civil protection professionals, hydrometeorological flood modelers and/or forecasters, risk managers, web developers and service providers. The workshop was aimed to:

- Promote the envisaged new products and tools for prediction and nowcasting of hazards induced by severe weather being developed in the TAMIR project;
- Provide an opportunity to discuss the necessary features in the tools for expressing the impact and risk information to the end-users;

- Provide an opportunity to discuss the technical realizations and IT aspects of integrating the services to local end-user platforms.

The results of the end-user workshop are collected into this report, and they will be used to guide the development of products and services in the next stages of the project.

2 WORKSHOP TECHNICAL ARRANGEMENTS

2.1 PROCESS DESCRIPTION

The workshop consisted of two sessions. The first session was entitled "Impact and Risk Management" and focused on the inputs and user requirements of the products developed in the project. The second session was titled "Technical solutions and services" and focused on the information required to provide the products to the existing end-user platforms. The aim of the first session was to provide input for the project work packages 2-5 where new tools and services are being developed, whereas the second session aimed mainly to support work package 6 which focuses on integrating and demonstrating the developed tools in end-user systems. The workshop schedule is presented in Table 1.

Table 1. TAMIR end-user Workshop schedule.

Time (CET)	Session
9:30	Impact and Risk Management
11:00	Break
12:00	Technical solutions and services
14:00	End of workshop

Both sessions had a similar structure. First, the participants were invited to a plenary session with presentations related to the project and to the topics covered in the session. Afterwards, the participants were divided into three breakout rooms. Each breakout room was presented with three different interactive whiteboards one at a time. Participants had between 10 and 15 minutes to add answers and make new suggestions to pre-defined questions. In session one, the whiteboard topics were “Multi-Hazard Thunderstorm Nowcasting”, “Flash Flood Hazard Forecasting”, and “Flood Impact Assessment Product”. In session two, the whiteboard topics were “Current Platforms and Products for Severe Weather & Flood Forecasts and Warnings”, “Sharing Flood Forecast Impact Products: Including TAMIR products in Local Platforms”, and “Accessing Flash Flood Products: Local Needs and Customization”. The analysis based on the answers and comments to the whiteboard topics is presented in Section 3.

After the end of the breakout room sessions, participants returned to the plenary session and where shown a summary of each whiteboard by the TAMIR team. The participants had then an opportunity to rate and/or vote on the overall most relevant suggestions on each whiteboard. Finally, the whiteboard hosts summarized the voted and rated findings in the plenary session.

The presentations given during the plenary sessions are listed in Table 2 (session one) and Table 3 (session two). The slides for the presentations are provided in Appendix 1.

Table 2. Presentations and whiteboard topics in session one, along with the presenter of each topic.

Topic	Presenter
Introduction to the TAMIR project	Annakaisa von Lerber, FMI, TAMIR Project Coordinator
Multi-Hazard Thunderstorm Nowcasting (Whiteboard topic 1 introduction)	Tero Niemi, FMI
Flash Flood Hazard Forecasting (Whiteboard topic 2 introduction)	Marc Berenguer, UPC
Flood Impact Assessment Product (Whiteboard topic 3 introduction)	Calum Baugh, ECMWF

Table 3. Presentations and whiteboard topics in session two, along with the presenter for each topic.

Topic	Presenter
LUOVA – Natural Disaster Information System in Finland	Tero Niemi, FMI
ANYWHERE MH-EWS: Acquisition, generation and dissemination of products	Xavi Llort, HYDS
Introduction to the European Flood Awareness System – EFAS platform	Christel Prudhomme, ECMWF
Current Platforms and Products for Severe Weather & Flood Forecasts and Warnings (Whiteboard topic 1 introduction)	Tero Niemi, FMI
Sharing Flood Forecast Impact Products: Including TAMIR products in Local Platforms (Whiteboard topic 2 introduction)	Christel Prudhomme, ECMWF
Accessing Flash Flood Products: Local Needs and Customization (Whiteboard topic 3 introduction)	Anna Berruezo, UPC

The workshop was organized entirely virtually. The workshop was hosted on Zoom platform. For the whiteboards, the selected platform was padlet.com. During the workshop, Glasgows Ltd. provided technical support by controlling the Zoom event. This allowed project participants to focus solely on the content of the workshop.

2.2 PARTICIPANT STATISTICS

The workshop was advertised in several forums (e.g. direct email, websites, EFAS website) to gain as wide attendance as possible. Indeed, the positive outcome of organizing an online meeting instead of face-to-face meeting turned out to be much wider outreach that could have realistically been gained otherwise. There were 120 registered participants and 16 organizers representing 32 countries in the workshop (Figure 1). Session one had altogether 134 and session two 116 registered participants, respectively. The countries of organizing members were naturally well-represented (Finland, Spain and UK), however also Germany,

Italy, Portugal and the Netherlands all included more than five registered participants. Some joined the workshop also outside Europe. From the registered participants roughly 80 people (60%) eventually joined the zoom session during session one and 65 people (56%) during session two.

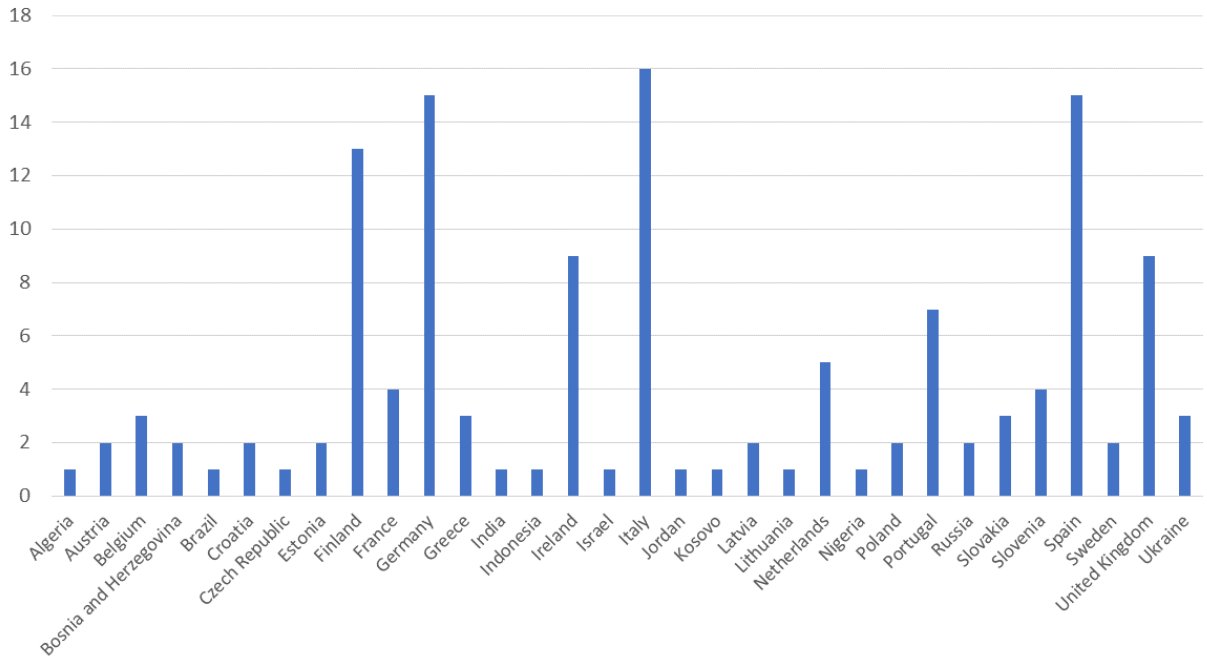

Figure 1. The workshop participant distribution from 32 different countries.

By categorizing the participants according to the information they provided in the registration form and based on institution they represented, five different fields of operation were found (Figure 2). The majority of participants belonged to the field of hydrological and meteorological forecasting (38%) and to civil protection authorities (27%). Research (17%), IT specialists (8%) and water management (8%) fields were distinguishably represented as well. In addition, class 'Other' (2%) included e.g. consultants.

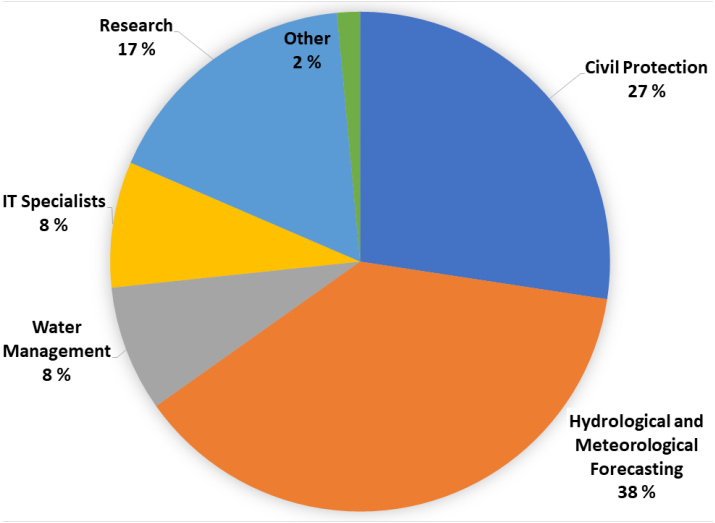

Figure 2. The categorization of the participants in different fields of operation.

3 WORKSHOP RESULTS

3.1 IMPACT AND RISK MANAGEMENT

3.1.1 Nowcasting multi-hazards from thunderstorms

In this whiteboard session the participants were asked to provide feedback on the nowcast products for hazards and risks caused by convective weather, in practice thunderstorms, which are being developed in TAMIR work package 4. The participants were asked to consider four aspects of the products to make them as valuable as possible for the end-users. Specifically, the participants were asked to provide feedback on what they consider to be the added value of such products and how they see they would improve the current situation. They were also asked to consider what kind of outputs they expect from the products, so that the products would benefit them. The participants were asked to provide examples of relevant exposure and vulnerability data that should be utilized together with the hazard nowcasts, to account for the risks caused by convective weather. Finally, the participants were asked to consider the most relevant spatial and temporal scales for the final products, i.e., at what temporal resolution (e.g. 5 min, 15 min, 1 h) and spatial level (e.g. suburb, city, municipality, 1 km grid) they would like to see the products.

The participants were asked to write their comments under the four subjects on virtual whiteboards created at https://padlet.com as if they were using post-it notes in a physical meeting (Figure 3). After all participants had been provided an opportunity to leave their feedback on virtual post-it notes, voting for those comments that the participants considered most relevant was allowed as well as commenting on previous post-it notes by others. This served as an empirical experiment to gather the wisdom of the crowd from all participants regarding the provided feedback by trying to sort them in order of importance based on the votes. However, as there was uneven distribution of people regarding both participants home countries and their field of operation, especially the voting results may be biased towards the needs of a certain country or a field. Therefore, no quantitative analysis of the results is presented here.

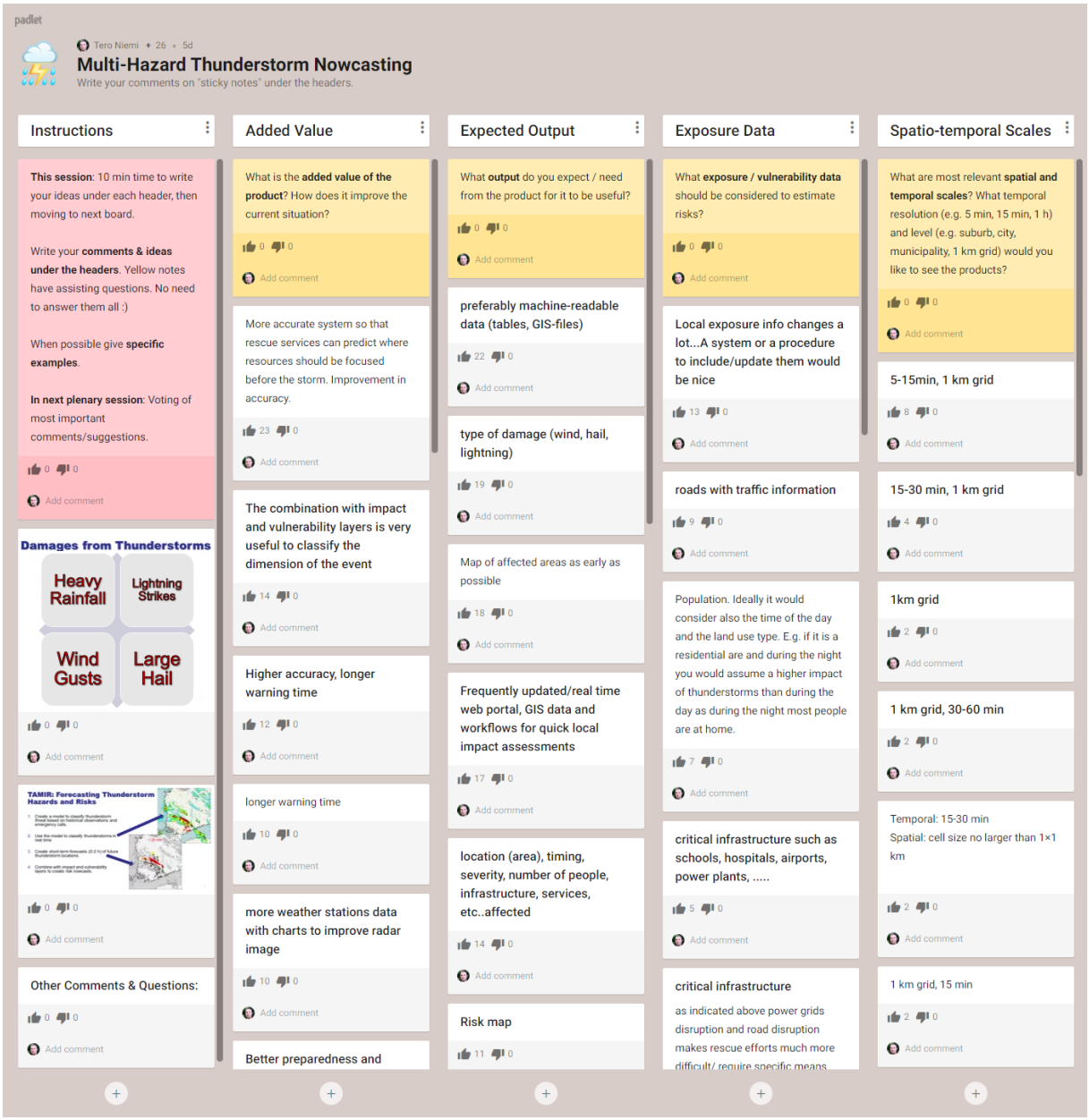

Figure 3. Whiteboard for the TAMIR product focusing on Nowcasting multi-hazards from thunderstorms. Comments are ordered based on the number of votes they received. Note that not all comments are visible.

The added value of th e product was seen especially in how it would allow improving the preparedness and response capabilities of the rescue services, by letting them consider more accurately than what is currently possible where their resources should be allocated already before thunderstorm. In other words, the longer warning time and extended lead time provided by the product was considered to be the most important added value of the product. In addition, the risk product, i.e., combining hazard forecasts with impact and vulnerability information, was seen useful in order to be able to consider the severity of the event. It would

also provide forecast information in more easily approachable format to those end-users who are not experts in reading meteorological forecasts.

The main output from the product was considered to be impact and risk maps of the affected areas and affected people, infrastructure etc. These would be preferably delivered as early as possible. Also, several participants were interested to have the data available to themselves in a machine readable format. In addition to the overall damage level caused by the convective event, there was interest in knowing specifically what phenomenon is causing the damage (wind, hail, lightning, rain). Finally, having a real time overview of current civil protection missions was considered to be helpful information that would help decision making.

A list of potential vulnerability and exposure data to be used in risk estimation was provided by the participants. The list included critical infrastructure (schools, hospitals, airports, power plants, tourist attractions, etc.), road and traffic information, population, land use type, buildings, etc. A potential source for Finnish exposure data, BEAM Finland (Basic European Assets Map), was also brought to attention by one participant. Adding own exposure/vulnerability data and updating the data was desired as the data is likely to vary a lot. Also, dynamic information, such as expected events, social gatherings and festivities, and recent events (e.g., a recent accident) that may increase the vulnerability level was considered to be important as well as taking into account the time of event, as e.g. impact is expected to be greater in residential area during night than in daytime when people are not home.

The workshop participants were rather unanimous that the suitable spatial scale for the product would be 1 km grid or higher resolution, although presentation on 3-4 km grid was also suggested. In addition to presenting the nowcasts on a grid, it could be useful to present the results without grid structure but based e.g. on municipal or administrative boundaries. On suitable temporal resolution there was more varying opinions, but scale of 15 min was the most commonly suggested, with a range from 5 min to 1 h. In addition to temporal resolution, lead time is an important aspect of a nowcasting product and lead times up to 1 h would be preferred to give enough response time for the civil protection.

3.1.2 Flash flood hazard forecasting

The aim of this padlet was collecting feedback about some aspects regarding the real-time flash forecasting products used for emergency management. The participants were asked four questions about existing systems and the requirements and expected accuracy (Figure 4).

The participants were asked to describe the systems currently used for flash flood monitoring and forecasting operations in their institutions, and to comment about their needs for detailed intermediate information by leaving post-it notes. They also voted for the requirements of flash flood forecasting products (in terms of resolution, lead time, hazard type and type of forecasts), and for the severity of errors in these products (as a function of types of errors and lead time). In this case, the participants also left their comments.

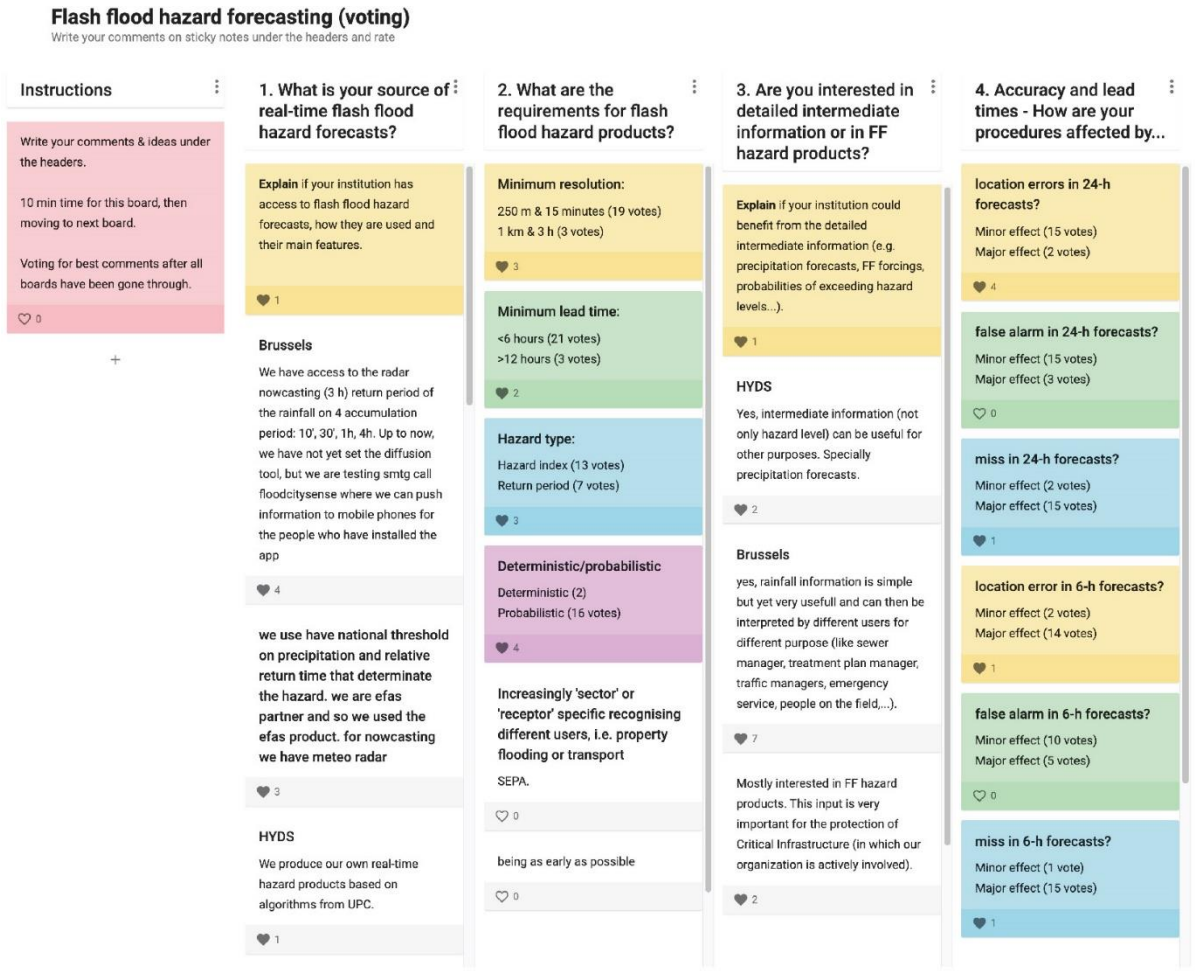

Figure 4. Whiteboard for TAMIR flash flood hazard forecasting products. The questions about flash flood hazard requirements and accuracy show the answer with the number of votes.

The survey of the operational systems used by public entities involved in emergency management showed that many (city of Brussels, IMGW, SHMU, DWD, SYKE, LfU BB) rely on radar-based rainfall observations and nowcasts, sometimes complemented with in-situ observations. Also, 2 answers mention the use of NWP forecasts, and 5 answers also report the use of EFAS flash flood hazard forecasting products.

When asked about the possibility to have access to intermediate products, such as e.g. precipitation forecasts, flash flood forcings, and probabilities of exceeding hazard levels used in the estimation of the flash flood hazard (question 3), there was some interest but the answers show that the primary interest is on the flash flood products.

The results of the votes regarding the requirements are summarized in Table 4. They show that very high-resolution probabilistic nowcasts (with lead times up to 6 hours) are strongly preferred. Also, a majority voted to express the hazard in terms of a traffic-light scheme (or hazard index) for presenting the hazard level in terms of the return period.

Table 4. Results of the voting of the Flash Flood hazard product requirements.

Requirement	Options and votes	Number of votes
Resolution	**250 m & 15 minutes** 1 km & 3 h	**19 votes** 3 votes
Lead time	**Less than 6 hours** More than 12 hours	**21 votes** 3 votes
Type of hazard	**Hazard index** Return period	**13 votes** 7 votes
Type of forecast	Deterministic **Probabilistic**	2 votes **16 votes**

The goal of the last question was collecting the end-users' opinion on the severity of different types of errors affecting flash flood hazard forecasts as a function of lead time. The results (Table 5) show that (1) misses are the worst type of errors, and (2) that errors for longer lead times (24 h) can be better dealt with than those affecting flash flood hazard nowcasts.

Table 5. Votes on the effect of accuracy of flash flood hazard forecasts and nowcasts.

Types of errors	Effect	Number of votes
Location errors in 24-h forecasts	**Minor** Major	**15 votes** 2 votes
False alarms in 24-h forecasts	**Minor** Major	**15 votes** 3 votes
Miss in 24-h forecasts	Minor **Major**	2 votes **15 votes**
Location errors in 6-h forecasts	**Minor** Major	**10 votes** 5 votes
False alarms in 6-h forecasts	**Minor** Major	**10 votes** 5 votes
Miss in 6-h forecasts	Minor **Major**	1 vote **15 votes**

3.1.3 Flood impact assessment tools

During this whiteboard session participants were asked four questions. The first question asked participants to state the purposes for which they would use the flood impact product. The aim was to understand how the product would be used by the end-users. Question two asked each participant to list by importance the different exposure and vulnerability datasets that should be included in the impact product. Questions three and four simply asked the participants to vote for their preferred spatial and temporal scales of the impact product.

After all participants had contributed to the whiteboard, a summary whiteboard was created. This summary whiteboard was used to copy in the main comments for the first two questions

(i.e. duplicates were removed). Participants were invited to view the summary whiteboard and to rate each comment for the first two questions between 1 (not important) to 5 (very important).

The results from the summary whiteboard are shown in Table 6 – Table 9. For question one, all the comments, with the exception of one, were rated at 4.0 or higher (Table 6). The most important purpose of the impact product was to improve preparedness during emergencies, for example to identify the most at-risk areas. Other purposes which were highly rated included providing additional information, informing civil protection agencies and supporting national warning systems. For question two, participants rated transport infrastructure, infrastructure (e.g. education, hospitals, power generation) and population as the most important vulnerability/exposure datasets (Table 7). Other datasets such as land use, historical information and sediment load were rated lower. For question three, participants rated the 1 km grid as their favourite spatial scale for displaying the impact product (Table 8). However, one participant raised the issue that care needs to be taken when displaying at this scale in order not to downplay any uncertainty in the product. For question four, participants voted hourly animations (25 votes) as being the preferred option for temporal resolution of the impact product (Table 9). The second most popular (19 votes) was a short-range summary of the impact over the next 6 hours.

Table 6. Summary of answers for question 1: For what purpose(s) would you use the flood impact product? (ranked by rating)

Answer	Rating	Votes
Improve preparedness during emergencies (e.g. increase incidents, prioritise responses, identify at risk areas)	4.7	15
Additional/improved flood forecast information	4.7	12
Inform official organisations (e.g. civil protection agencies, first responders)	4.6	14
Support national warning systems	4.5	12
Situation summary updates during emergencies, including overview	4.4	17
Help reduce risk and impact (e.g. network disruption)	4.4	9
Estimate flood damages	4.3	20
Improve awareness/EWS at multiple levels: local responders, municipality, regional	4.3	20
Improve evaluation of flood events	4.1	12
Improve critical infrastructure protection	4.1	11
Help issue warnings	4.0	9
Better planning: flood defence, preparedness measures, housing, road network	3.6	16

Table 7. Summary of answers for question 2: What exposure/vulnerability data should be considered? (ranked by rating)

Answer	Rating	Votes
Transport Infrastructure: -Road -Rail -Bridges	4.6	13
Infrastructure: -Private sector -Critical infrastructure (e.g. education, health) -Energy -Housing -Sub-surface	4.5	19
Population: -Structure -Density (e.g. cities, towns, sprawling villages)	4.5	15
Historically high-risk flood areas	3.9	13
Land use: -Type of terrain -Agriculture	3.9	12
Sediment or debris load in areas exposed to flood: -Source areas -Bottleneck areas (e.g. bridges)	3.8	14
Recent Disasters: -Forest fires -Famine -Drought	3.4	9
Pedestrian areas: -Footpaths	3.0	7

Table 8. Summary of answers for question 3: At what spatial scale would you like to see the product? (ranked by votes)

Answer	Votes
1 km Grid	25
Sub-Catchments	15
NUTS Administration regions	1

Table 9. Summary of answers for question 4: At what temporal resolution would you like to see the impact product? (ranked by votes)

Answer	Votes
Hourly animation	25
Short range summary e.g. maximum impact within next 6 hours	19
Medium range summary e.g. maximum impact within the next 2 days	10
Nowcast range summary e.g. maximum impact within next 30 minutes to 1 hour	7
Long range summary e.g. maximum impact within the next 5 days	4

3.2 TECHNICAL SOLUTIONS AND SERVICES

3.2.1 Current platforms and products

The session was designed to gather information on those platforms and products the end-users are currently using to get severe weather and flood forecasts and warnings. The session had three broad topics, which had assisting questions to aid collect the information (Table 10).

Table 10. Session topics (top row) and assisting questions for session "Current platforms and products".

Current Platforms	Current Products	Information Sharing
What platforms do you currently use? What are the platforms used for?	What kinds of forecast & warning products do you use?	Do you use international, national, or local platforms / products?
What is the most important platform?	Who supplies warning & forecast products?	Do other authorities use the same platforms / products (e.g. civil protection - flood forecasters - military)? Which products?
Are you using EFAS? When & how?	What is the most important product? Why?	Are the same platforms / products used on all decision-making levels (e.g. national - regional - local)? Which ones?

The first topic concerned the platforms the end-users are currently using and the use cases they have. In addition, the participants were asked which platform is the most useful to them and why. Finally, there was a separate question asking for the usage of EFAS.

Almost all participants told that they currently use local or national platforms for their weather and/or flood forecasts and warnings, but also international platforms such as EFAS, GloFAS, Meteoalarm, and FFGS were in use by many. In many cases, the local platforms utilize and combine (meteorological and hydrological) data, measurements, and (forecasting and

hydrological) models from many sources. Often the national platforms were set up to provide warnings if some predefined rainfall or water levels were exceeded. The local and national platforms were also usually considered to be the most important platform for the end-users. The results regarding use of EFAS platform were varied. On one hand it was in daily usage by some participants especially for flash flood warnings, some used it on occasion, and some did not use the platform at all. Especially in large countries, such as Russia, different platforms were used for different parts of the country and e.g. the use of EFAS varies based on area.

The second topic concerned the warning or forecast products that the end-users currently utilize. The participants were asked what the products are, who provides them and which products the participants consider to be the most important and why.

The current product catalogue used by the end-users varied immensely from end-user to end-user. Outputs from several weather forecast models (e.g. ECMWF, AROME, COSMO, ICON, ALADIN, DWD, WRF-NMM, INCA nowcasts, and national models) and hydrological simulation models (e.g. WRF-HYDRO, HEC-HMS, EFAS, and local custom model setups) were used, depending on the affiliation and the home country of the end-user. Individual products used by the end-users ranged from meteorological weather forecast products to hydrological water level simulation and forecast products as well as warning products for heavy precipitation, strong winds, high water level, high discharge, flash floods, etc. Both deterministic and probabilistic products were used by end-users.

While the range of products used by the end-users varied a lot, it was national hydrometeorological organizations that supplied the products to almost all end-users. There was also somewhat of an agreement that different precipitation or rainfall products on one hand and water level, discharge, or flood extent products on other hand were the most important products for the end-users. However, depending on the end-user, also products such as forest fire information, wind and gust speed, or coastal flood products were mentioned to be important. Some end-users also pointed out that there is no one single most important product but instead all products have their value depending on the situation.

Lastly, the third topic concerned current information sharing on different scales. The participants were asked whether they mainly rely on international, national or local products. In addition, the participants were asked how the platforms and products are shared between end-users on horizontal and vertical dimensions of governance.

Especially for this topic, in line with feedback on current platforms and products, the answers varied a lot from end-user to end-user. For the question whether the end-users mainly utilize local, national or international products/platforms the general view was again that most end-users utilize local and national products/platforms but also international platforms, especially Meteoalarm, EFAS and services by ECMWF are used. Regarding the horizontal information sharing, i.e., between various authorities on same level of governance, the end-users indicated that mostly authorities use the same information/products, especially forecast etc.

information shared by hydrometeorological services, although different authorities may use their own platforms. As with other answers, there was variety between different end-users, and while same platforms are used by many, even in some relatively small-sized countries there can be regional differences in used platforms for same tasks even though the need for uniform systems have been recognized. For the vertical information sharing, answers mostly indicated that organizations in same field (e.g. hydrological forecasting, civil protection) use the same platforms on different governance levels, although there is a lot of variety from one country to another.

3.2.2 Sharing products

3.2.2.1 Context

This session aimed to understand the technical preferences regarding data and product sharing, which could stop a user to implement TAMIR products in its own platform. In addition, it was the opportunity to collect feedback on existing flood forecasting platforms such as EFAS. During this whiteboard session participants were asked four questions.

The first question asked participants to rate the formats and standards for data and products their local system could accept. The aim was to identify formats which were popular or were not used by the community, to optimise uptake of TAMIR data and products.

Question two and three asked participants to list barriers that would prevent their organisation to use and implement TAMIR data and services. Technical and non-technical barriers were listed separately. The aim was to understand the most important challenges affecting local uptake of external forecasting data and services.

Question four asked feedback on usefulness and limitations of existing flood forecasting services such as EFAS.

After all participants had contributed to the whiteboard, a summary whiteboard was created. This summary whiteboard was used to summarise the main comments of question two to four (i.e. duplicates were removed). Participants were then invited to rate each comment between 1 (not important) to 5 (very important).

3.2.2.2 Data and products formats and standards

Answers are summarised in Figure 5. Raw data format favoured NetCDF files (4.3 rating) and .csv files (4.2 rating), with html format ranking least. This means that some users can accept both very large gridded datasets (NetCDF) but others prefer to deal with relatively small, point datasets (.csv). Geotiff (raster) and Shapefile (vector) were the preferred product formats.

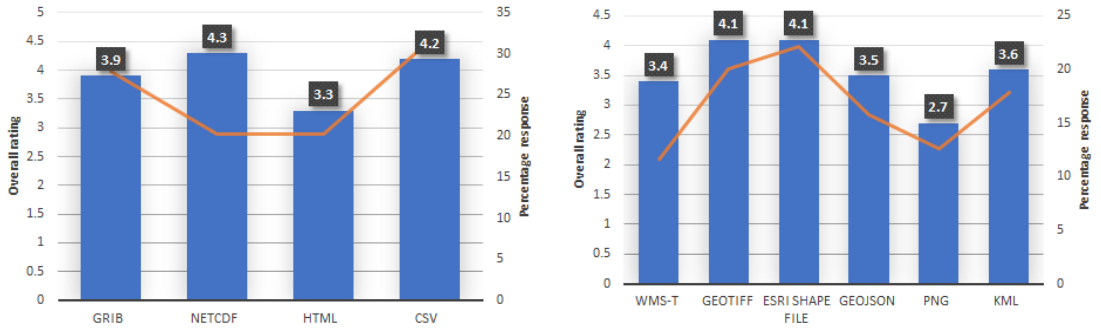

Figure 5. Rating for data (left) and product (right) shown as bars for each proposed format/ standard. Orange lines show the percentage of voting associated with each type.

3.2.2.3 Technical barriers

Four big families of technical barriers were identified (Figure 6). The first one relates to workflow and technological incompatibility such as interface, both rating 4.5. The second relates to the service quality, explicitly as service availability and insufficient metadata, also rating over 4. The third is linked with security, rated overall at 3.8 but attracting 29% of the responses. Finally, technical issues due to data volume and bandwidth rated lowest, suggesting a high level of technology amongst participants.

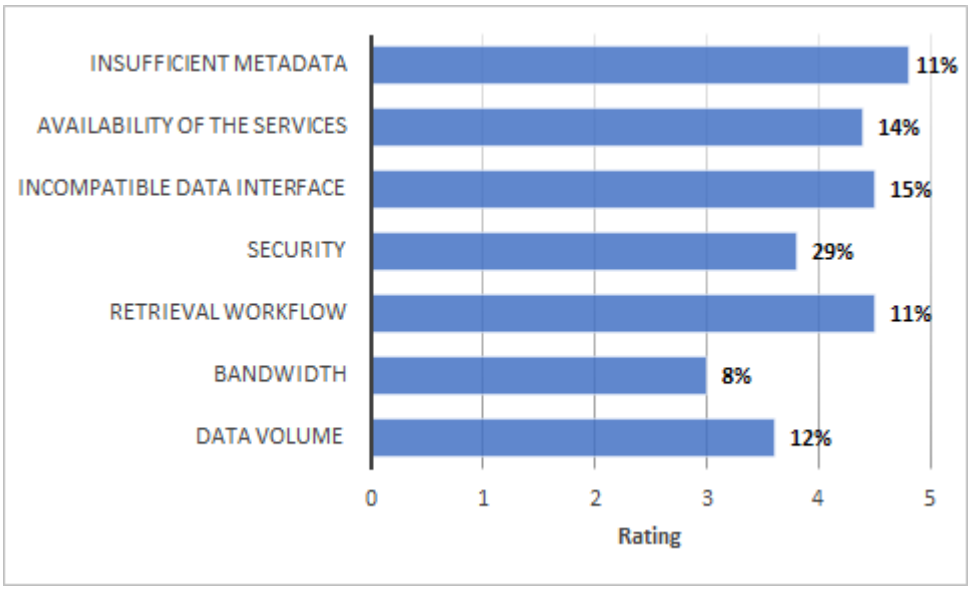

Figure 6. Identified technical barriers regarding the use of data and products from external sources such as TAMIR, rated by important (x-axis and bar length). The percentage of response for each entry is given on the right-hand side of the bars.

3.2.2.4 Non-technical barriers

Many non-technical barriers were identified (Figure 7). Financial barrier and lack of expertise received the highest proportion of responses (18% and 26%, respectively), rating 4.7 and 4.3

by importance. Issues such as training, recruitment and IT costs were identified, as well as costs linked with changes in policies. Cooperation with civil protection agencies (such as different platforms used, division of responsibilities between different agencies) were identified as important barriers (4.9 rate) by 10% of the responses. Lack of technical documentation and in-house expertise, data restrictions or overall organisational policies also were identified as important barriers (all rated greater than 4), but received each less than 10% of responses. Interestingly, scientific barriers and lack of barriers were mentioned by only a few participants.

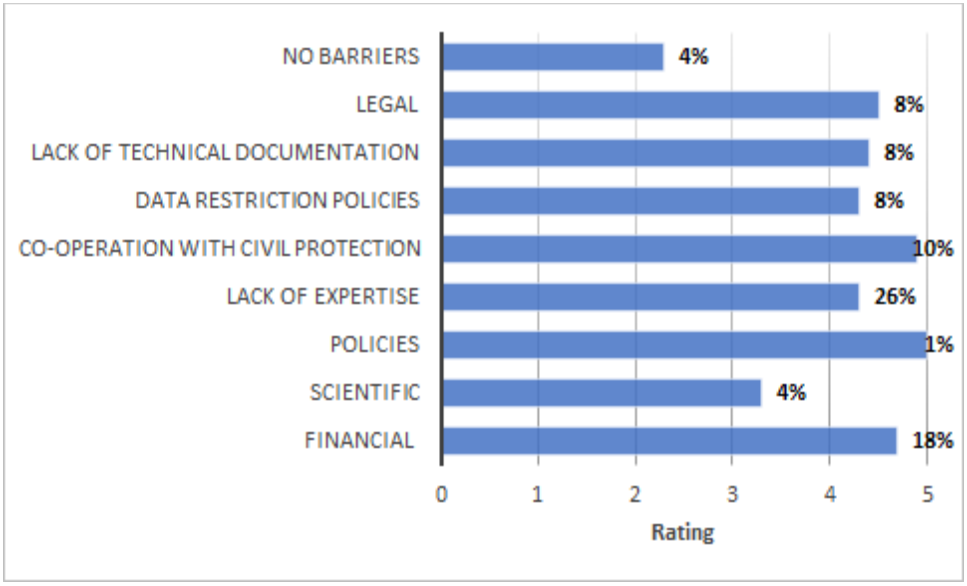

Figure 7. Identified non-technical barriers regarding the use of data and products from external sources such as TAMIR, rated by important (x-axis and bar length). The percentage of response for each entry is given on the right-hand side of the bars.

3.2.2.5 Usefulness and limitations of EFAS service

Two main limitations were identified for EFAS products related to flash flood forecasting:

- Too coarse temporal resolution (rating 4.7 from 3 participants). Currently, EFAS flash flood products are produced based on a 6 hourly simulation up to the next 5 days (ERIC layers) or as animated Flash Flood layer at a 15min time-step up to the next 6 hours. TAMIR aims to bridge this gap by blending the two forecasts to create rapidly updated flash flood forecasts with finer temporal resolution in the first 6 hours.
- Too coarse spatial resolution in mountainous areas (rating 4.3 from 7 participants). Currently, EFAS flash flood products are produced at a 1-km spatial resolution, but over a reduced spatial domain (COSMO-LEPS domain for the ERIC Flash Flood products up to 5 days; and OPERA domain for the ERCIHA Flash Flood nowcasting product). The TAMIR project will extend the spatial coverage of the domain to ensure full overlap

with the EFAS domain. This is achieved by using ECMWF ensemble precipitation forecasts which have global coverage.

Two more general EFAS limitations were also identified:

- Geographical coverage excluding large parts of Russia or small islands like the Azores (rated 4 by four participants).
- Service more adapted to hydro-met services than civil protection agencies which might not be able to make decision based on EFAS notifications (rated 5 by two participants)

Despite the limitations, EFAS was rated 4.7 by 11 participants for the flood forecast service it provides, for example thanks to its impact forecast information, severe events outlooks and more generally providing national and international briefs for ongoing civil protection missions.

3.2.3 Local needs and customization

This whiteboard session was designed to gather information about the specific local needs and customization required by the users.

The questions were divided into three areas. First, the end-users were asked about the expectations, requirements and customization of the data-providing platform. Secondly, the end-users were asked how they currently retrieve and manage the data. Lastly, it was checked if the end-users have specific policies restricting the use of data or products, such as security or language restrictions (Figure 8).

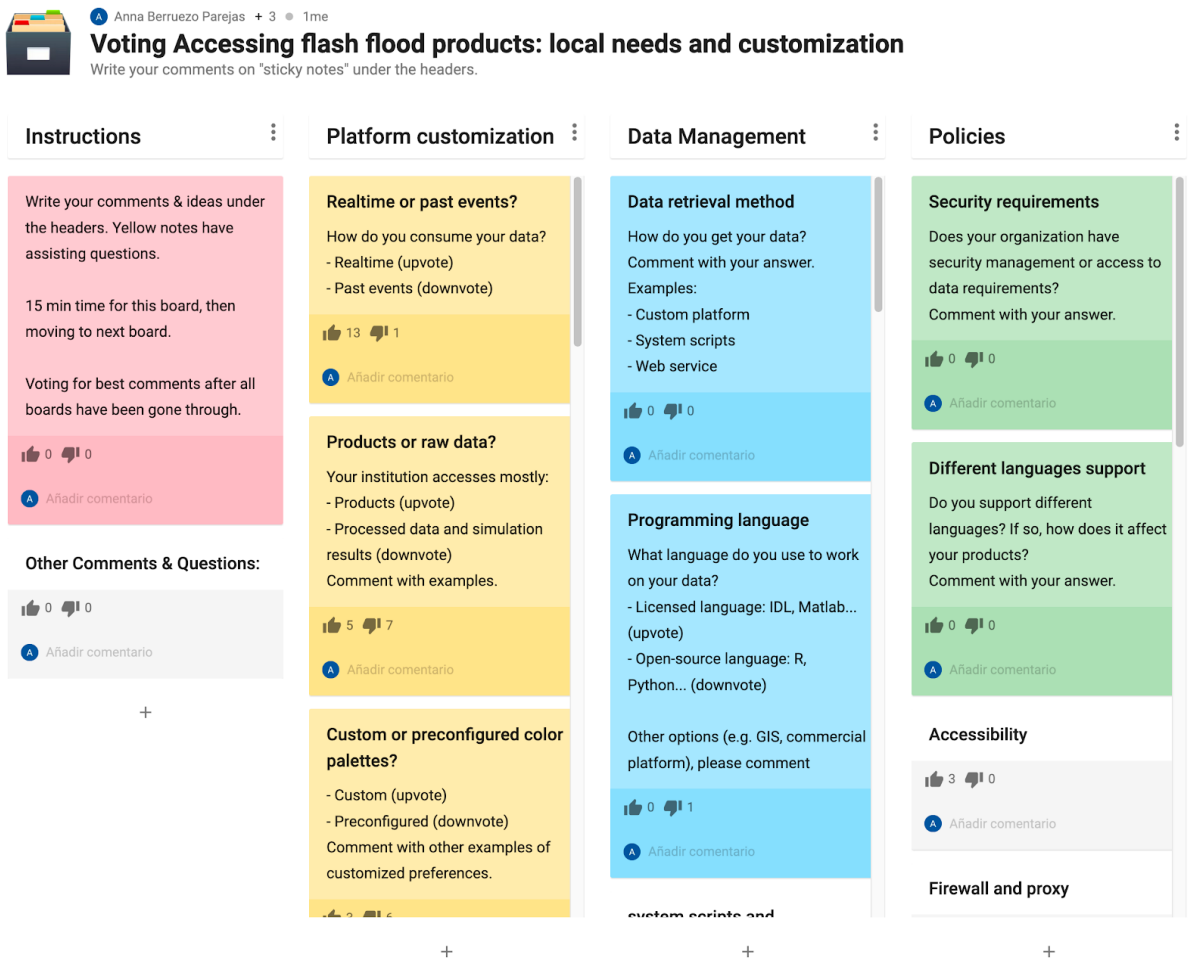

Figure 8. Local needs and customization to access flash flood products whiteboard.

The participants of this whiteboard session were asked to vote for an option and provide examples and additional feedback by creating new posts or commenting on the existing ones. After all participants were given the opportunity to provide their feedback, a new cloned padlet was created so that they could vote for the comments they found useful. This way, users could provide additional feedback they had not thought of before and facilitated filtering of broad needs from specific ones.

Starting with the platform customization topic, almost all institutions (35 vs 2) use real-time data but many find useful accessing past events to validate their models. This question was aimed to know if it makes sense to provide and maintain access to historical data. Many institutions prefer to use products instead of raw data (24 vs 12). But some products users also use raw data to generate derived products or additional processing. Many institutions use preconfigured color palettes. Some users agree that “preconfiguration is necessary to establish a common basis for communication between different end-users”.

When asked about the second topic, i.e., how the end-users access and manage data, most participants use some combination of different methods with clear involvement of web services (Table 11).

Table 11. Results of the preferred methods to retrieve the data.

Data-retrieval method	Votes
System scripts	4
Web services	18
RES-API	5
Commercial platform	2
Custom platform	9

Quoting one greatly upvoted comment: "Custom platforms can be an easier way for implementing new products and introducing them to new users. Other services are great for custom developed operational products for end-users."

When asked about what programming languages or ecosystem is used to manage the data, Python is the most used one (Figure 9).

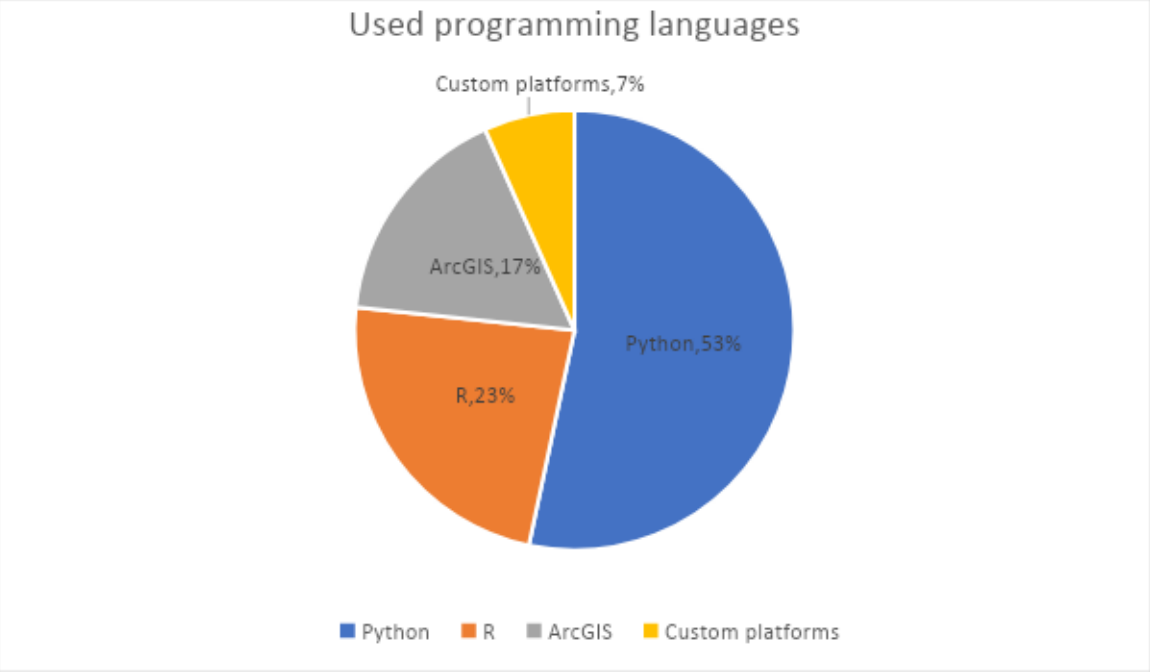

Figure 9. Languages used for managing data.

Lastly, about security and language requirements. Some participants pointed out the use of firewalls and proxies and even mentioned accessibility standards might have to be complied.

Users can work with different languages, but this does not affect products unless they have labels. Some use custom platforms (ICMLive) that don't recognize all the spatial data formats like HDF5.

Additionally, some users pointed out the importance of using standard projections. "Custom projections without EPSG codes can be problematic and difficult to detect (example, for radar data it is hard to detect a false projection)".

4 FEEDBACK SURVEY

The participants were asked to answer a feedback survey after the workshop. The survey contained questions regarding the content of the different sessions and the arrangements of the workshop. In total, 24 participants (approximately 30% of all participants) answered the survey.

Overall, the feedback for the workshop was very positive. Figure 10 and Figure 11 show the rating of the different presentations and whiteboard sessions during the workshop. For session one, most respondents considered the sessions “interesting” (48%-65% of answers) or “very interesting” (31%-48%) (Figure 10). For the whiteboard session “Flash Flood Hazard Forecasting”, all answers fell in these categories; for the other whiteboard sessions and the project introduction, 4% of respondents answered “not very interesting” or “can’t say”.

For session two, most respondent rated the sessions as “interesting” (43%-75% of answers) or “very interesting” (24%-48%) (Figure 11). The EFAS introduction presentation was rated as “not very interesting” by 9% of the respondents; some stated that since the workshop was organised in the week following an EFAS meeting, the presentation was not interesting. Additionally, 10% of respondents replied “can’t say” regarding the ANYWHERE introduction and 9% to the whiteboard session “Accessing Flash Flood Products: Local Needs and Customization”.

When asked of their overall experience of participating in the workshop, the respondents rated the experience as “excellent” (48%) or “good” (52%). The other available options “fair” and “poor” did not receive any answers. In the open answers, some participants critiqued the amount of time allocated for the whiteboard sessions, with session one having too little and session two too much time. Additionally, the technical platforms caused difficulties to some participants especially in the beginning, and some participants would have liked to receive more information and instructions before and during the workshop. However, many respondents liked the format of the workshop and found the workshop well organised compared to other online workshops.

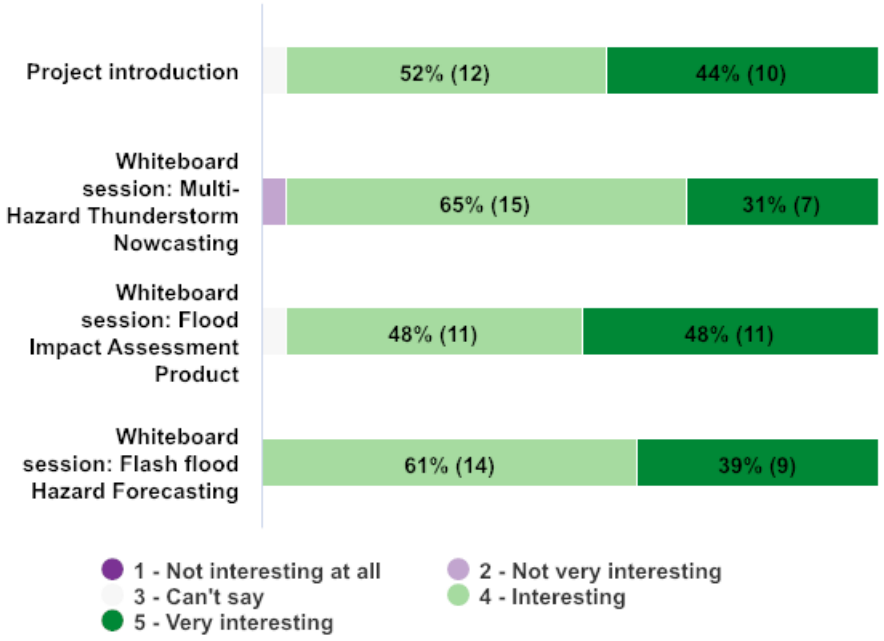

Figure 10. Feedback survey statistics for question "How interesting were the following parts of session for you?" for session one based on the received 23 answers.

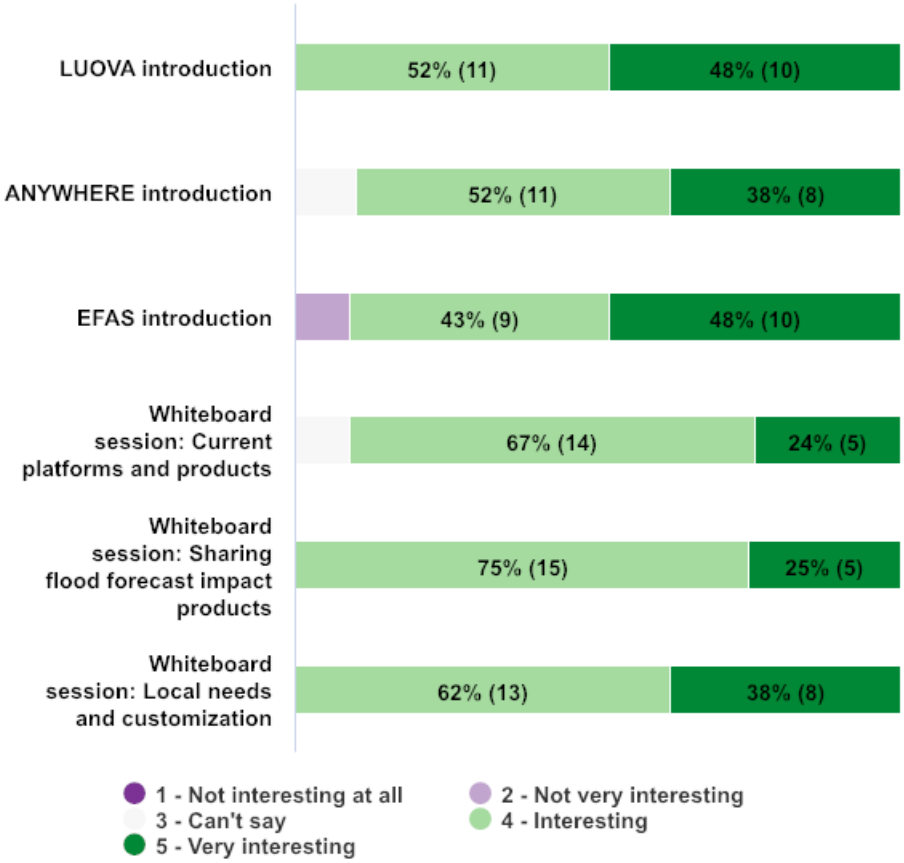

Figure 11. Feedback survey statistics for question "How interesting were the following parts of session for you?" for session two based on the received 21 answers.

5 CONCLUSIONS

The TAMIR project organized an online end-user workshop to collect feedback and to promote the new products and tools being developed in the project for prediction and nowcasting of hazards induced by severe weather. The end-user feedback was collected on six broad topics: multi-hazard thunderstorm nowcasting product, flash flood hazard forecasting product, and flood impact assessment product being developed in the TAMIR project, as well as on current platforms and products used by end-users for severe weather & flood forecasts and warnings, sharing flood forecast impact products & including TAMIR products in local end-user platforms, and the local needs and customization required for accessing the products.

The main added value from the thunderstorm hazard and risk nowcast products were considered to be the longer warning time and extended lead time provided by the products. End-users preferred to receive the warning and risk information as impact and risk maps as early as possible, with 1 km spatial and 15 min or higher temporal resolution and with lead times up to 1 h. When producing the risk estimates, at least critical infrastructure, road and traffic information, population, land use type, and buildings should be considered as additional vulnerability and exposure information.

At the moment, most public entities use radar-based rainfall observations and nowcasts for flash flood monitoring and forecasting operations, sometimes complemented with in-situ observations. Regarding user needs, most end-users prefer to receive only the final flash flood products, with only some wanting also the intermediate products. The end-users strongly prefer very high-resolution probabilistic nowcasts with lead times up to 6 hours as well as a traffic-light scheme for presenting the hazard level in terms of the return period. Misses are considered to be the worst type of errors in flash flood forecast products, with errors for longer lead time forecasts (24 h) considered to be more tolerable than errors for short lead time nowcasts.

The main purpose of the flood impact product was considered to be in improving preparedness during emergencies, for example to identify the most at-risk areas. Transport infrastructure, infrastructure (e.g. education, hospitals, power generation) and population were rated as the most important vulnerability/exposure datasets. The preferable spatial and temporal representation options for the impact product were 1 km grid and hourly animations.

In their current operations, nearly all end-users currently use local or national platforms to get severe weather and flood forecasts and warnings, in addition to international platforms such as EFAS, GLoFAS, Meteoalarm, and FFGS which are also used by many. The current product catalogue used by the end-users varied greatly, but in general outputs from several weather forecast models and hydrological simulation models are use. The products are mostly supplied by national hydrometeorological organizations. Different precipitation products on one hand and water level, discharge, or flood extent products on other hand were considered as the most important products.

The feedback on the technical preferences regarding data and product sharing revealed that the end-users favored NetCDF and .csv files as the raw data formats. Workflows and technological incompatibility such as interface; service quality, i.e., service availability and insufficient metadata; and security were identified as the major technical barriers. In addition, the end-users identified may non-technical barriers, with the financial barrier and lack of expertise receiving the highest proportion of responses but co-operation with civil protection agencies being identified amongst the most important barriers. Two main limitations were identified in current EFAS products related to flash flood forecasting, namely too coarse temporal resolution and too coarse spatial resolution in mountainous areas. Both limitations are considered in TAMIR product development.

Lastly, the feedback on the specific local needs and customization required by the users revealed that almost all institutions use real-time data in their operations but also utilize historical data in validating the models. Products are the preferred option over raw data, although raw data is also useful to some end-users. Most end-users use web services to retrieve their data, whereas Python is the most common programming language used for managing data retrieval. The use of firewalls and proxies were indicated as potential security restrictions requiring attention.

The positive outcome of organizing an online meeting instead of face-to-face meeting turned out to be much wider outreach that could have realistically been gained otherwise. The workshop also succeeded in reaching the relevant end-users, as the total number of participants was nearly 100 and the most well-represented user groups were hydro-meteorological forecasting (38% of participants) and civil protection authorities (27%).

When organizing an online workshop, the difficulty is to create an effective interaction between the participants and the hosts. Considering especially that long online meetings, lasting e.g. the whole day, can be wearing, and therefore active interaction could suffer from the long duration. Here, the interaction was selected to be more through surveys and questions, rather than through discussions. Very little time was reserved for discussions during the workshop, although interaction was allowed through chat box and in short Q&A sessions at the end of each session. This is an aspect that should be considered for each online workshop separately, considering especially the expected outcome of the interaction.

The technical solutions of using virtual whiteboards and post-it notes were found an effective way to collect feedback and were well received by the participants as well. In the feedback survey, there was some criticism of the usable time for each whiteboard, 10 minutes were occasionally considered too short, but 15 minutes too long, this experience was shared with the hosts as well. On more practical level, the whiteboards with pre-defined voting options and selectable items turned out to work more effectively than whiteboards with only open questions and feedback options. The positive experience from the completely virtual workshop as well as the very positive feedback from the participants is encouraging for utilizing similar tools in future workshops as well.

The results of the end-user workshop will be used as a basis to guide the development of products and services in the next stages of the TAMIR project in work packages 2-5 and when providing the developed tools for testing on end-user platforms in work package 6. The feedback gathered on the post-event questionnaire will also be used when organizing future workshops.

APPENDICES

Appendix 1. Workshop presentation slides.

European Union
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Humanitarian Aid

Impact and Risk Management

Online Workshop on Tools for Impacts and Risks Induced by Severe Weather

October 27, 2020

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METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Centre de Recerca Aplicada
en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ECMWF

KYMPE
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Technical instructions

European Union
Civil Protection and
Humanitarian Aid

- Make sure your name and institution are correct in the participant list, e.g. FirstName LastName (ORGANISATION)
- Keep your microphone muted and video off during the main session, when not speaking
- Write questions and comments to the chat.
- Use "Raise your hand" functionality for questions in breakout room

Impact and Risk Management — Online Workshop on Tools for Impacts and Risks Induced by Severe Weather

October 27, 2020

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Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

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TAMIR - Online Workshop on Tools for Impacts and Risks Induced by Severe Weather

October 27, 2020

Annakaisa von Lerber, coordinator
Finnish Meteorological Institute

Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

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Civil Protection and
Humanitarian Aid

Outline

1. Introduction to TAMIR –project

2. Introducing the workshop and its goals

3. Practicalities

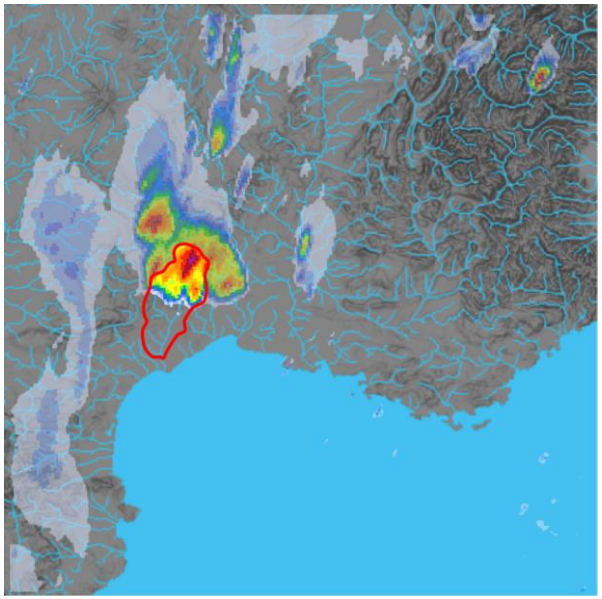
Background

Hazards induced by convective storms and heavy rains (e.g. floods) become disasters when and where they interact with exposed **and vulnerable societal systems**, for example human life and activities, assets, and infrastructure.

TAMIR - Advanced Tools for pro-Active Management of Impacts and Risks induced by convective weather, heavy rain and flash floods in Europe

Main goal is to

"*enhance the response capacity in emergencies caused by convective and heavy rainfall events by developing rapid risk assessment products and IT tools for improved* ***impact forecasting*** *to support decision making*"

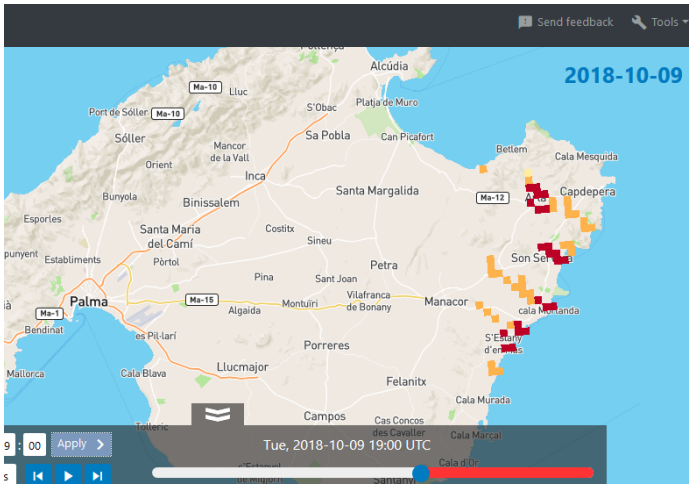


Settlement Classification

	Low Exposure	Medium Exposure	High Exposure
High Likelihood			
Medium Likelihood			
Low Likelihood			

Severe Risk
High Risk
Medium Risk
Low Risk

Flood Hazard Level 1 Exceedance Probability



Key needs addressed in TAMIR

1. Accounting for different **precipitation type** in flood forecasting and **developing a multi-risk weather hazard products**, for better accounting of the compound hazard in emergency response

2. Enhancing flood impact warning capacity through **improved flood hazard assessment** and warning, **better exposure estimation and detailed vulnerability information**

3. **Delivery through operational platforms and new web services**, for effective uptake and delivery of the TAMIR products

TAMIR

European Union
Civil Protection and
Humanitarian Aid

- 24 months, 1.2.2020 - 31.1.2022
- Funded by the Civil Protection Mechanism aswering to the call for improving **preparedness** in civil protection
- Consortium includes:
  - European Centre for Medium-Range Weather Forecasts (ECMWF)
  - Polytechnic University of Catalonia (UPC)
  - Kymenlaakso Rescue Department (Kympe)
  - Finnish Meteorological Institute (FMI)

- Website: http://www.tamir-project.eu/
- Contact information: tamir@fmi.fi

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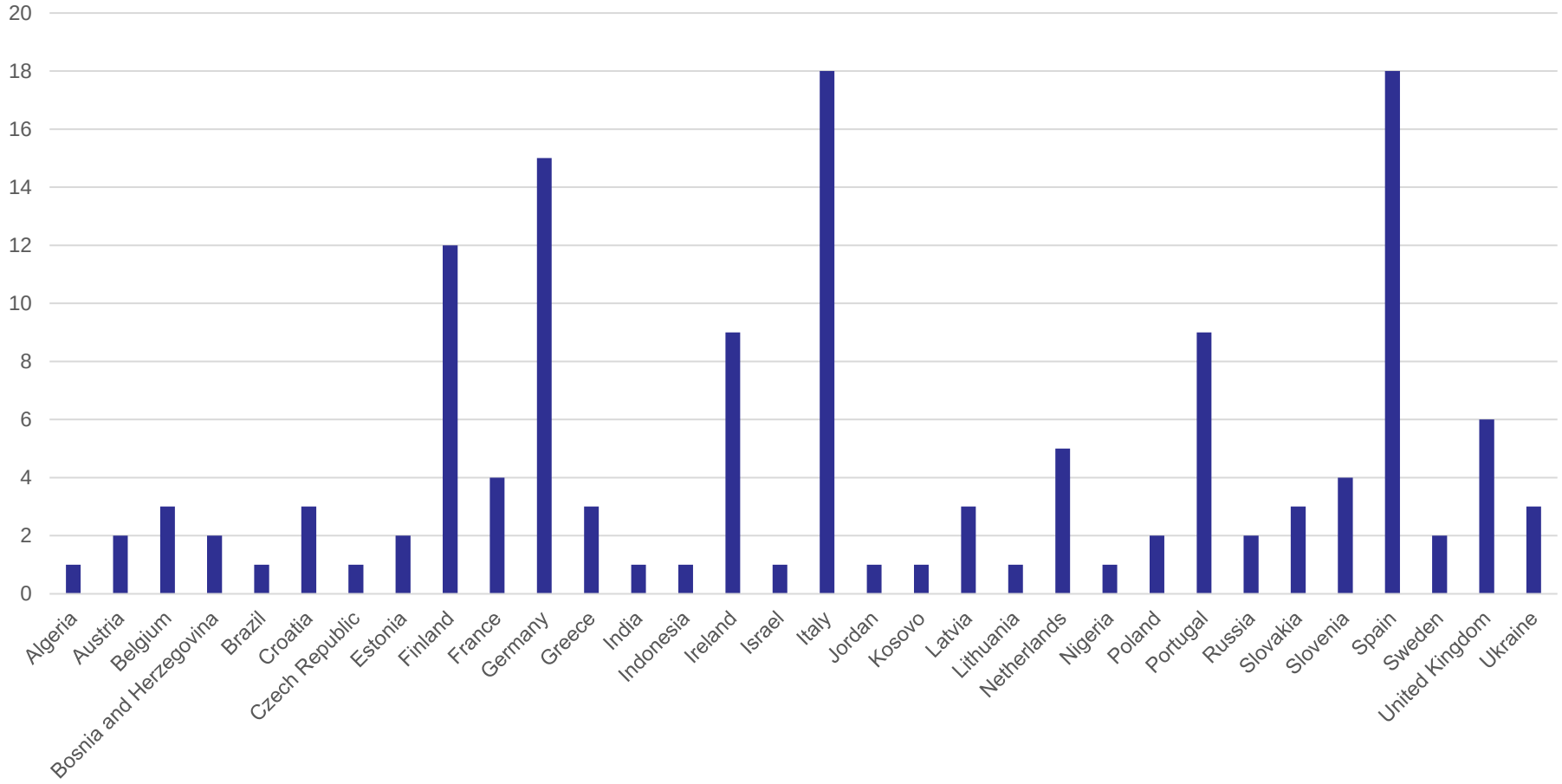
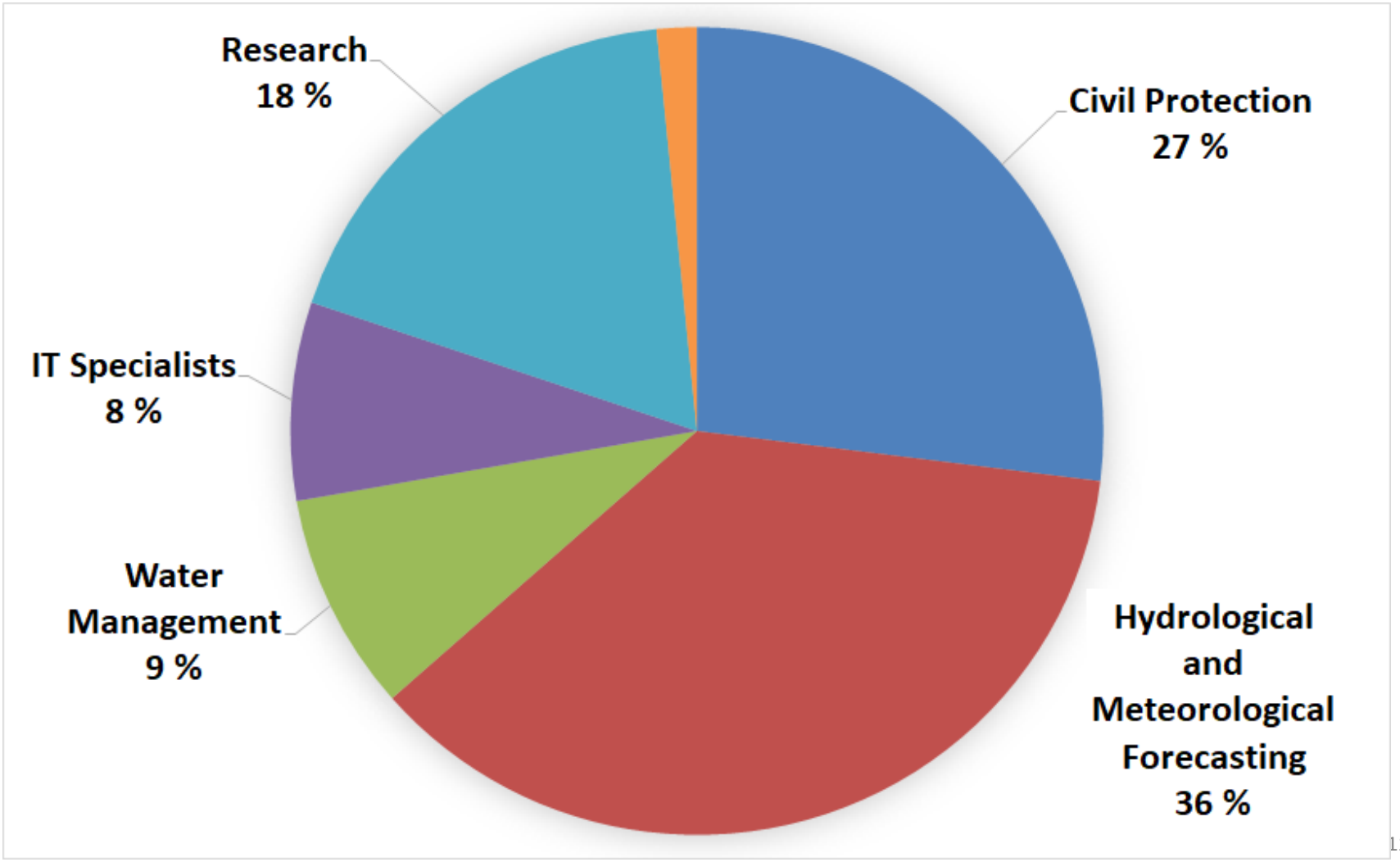
End-user Workshop

- **Promote the envisaged new products** and tools for the prediction and nowcasting of hazard induced by severe
- Provide an opportunity **to discuss the necessary features** in the tools for expressing the impact and risk information to the end-users
- **Discuss the technical and IT aspects** of integrating the services to local end-user platforms
- Promote **networking**

Who are we?


20
18
16
14
12
10
8
6
4
2
0
Algeria
Austria
Belgium
Bosnia and Herzegovina
Brazil
Croatia
Czech Republic
Estonia
Finland
France
Germany
Greece
India
Indonesia
Ireland
Israel
Italy
Jordan
Kosovo
Latvia
Lithuania
Netherlands
Nigeria
Poland
Portugal
Russia
Slovakia
Slovenia
Spain
Sweden
United Kingdom
Ukraine

Who are we?


Research
18 %
Civil Protection
27 %
IT Specialists
8 %
Water
Management
9 %
Hydrological
and
Meteorological
Forecasting
36 %

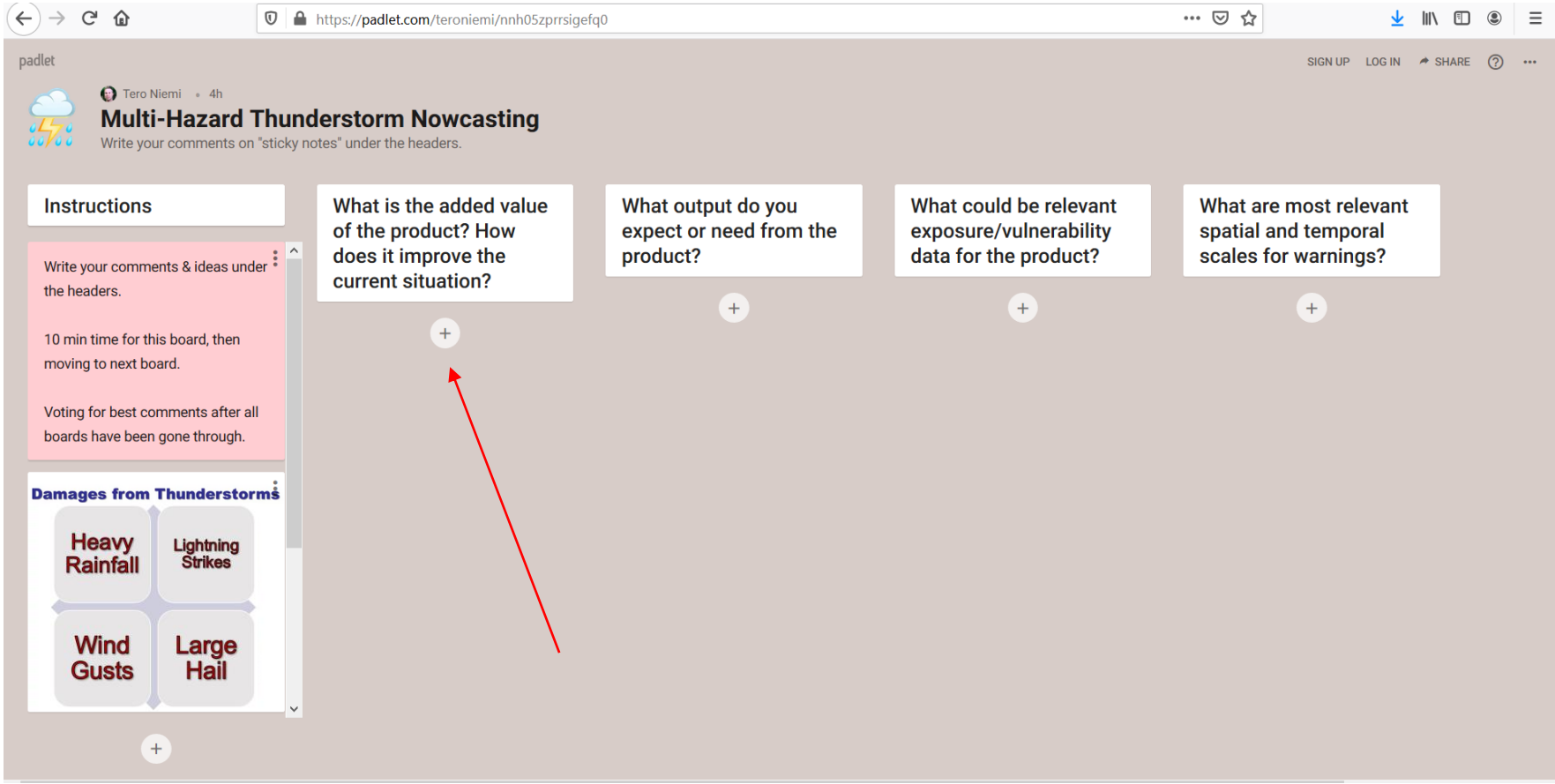
Session 1: Impact and Risk management (9:30 - 11:00 CET)

1) Nowcasting multi-hazards from thunderstorms
2) Flash flood hazard forecasting
3) Flood Impact Assessment tools

Session 2: Technical Solutions and Services (12:00 - 14:00 CET)

1) Current platforms and products
2) Sharing new products
3) Adjusting to local needs

Breakout Sessions: Questions and virtual post-it notes (3*10 minutes)



Voting and wrap-up

1) Short break of 5 minutes – TAMIR promo video
2) Voting for important aspects: padlet links are found in chat main room chat
3) Wrap-up of each topic and questions

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TAMIR - Multi-Hazard Thunderstorm Nowcasting tool

Tero Niemi, Jenna Ritvanen, Seppo Pulkkinen, Annakaisa von Lerber

Finnish Meteorological Institute

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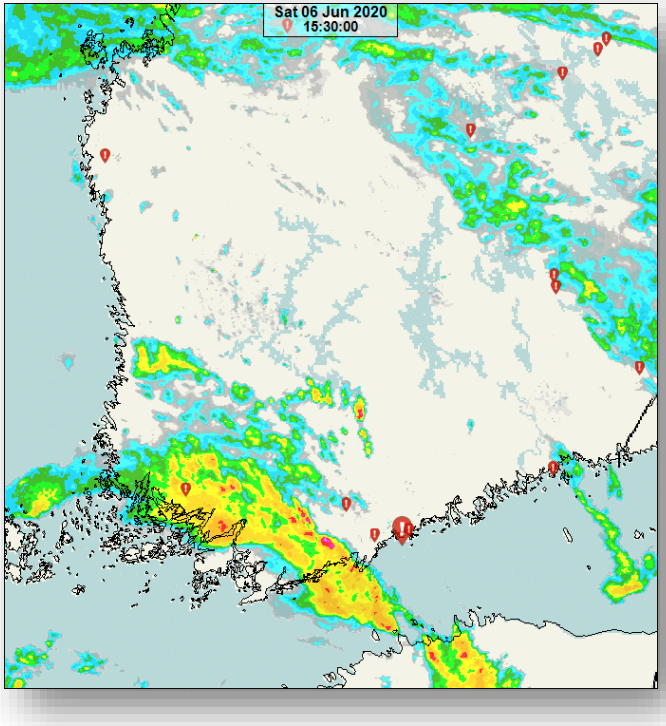
Damages from Thunderstorms

- Heavy Rainfall
- Lightning Strikes
- Wind Gusts
- Large Hail

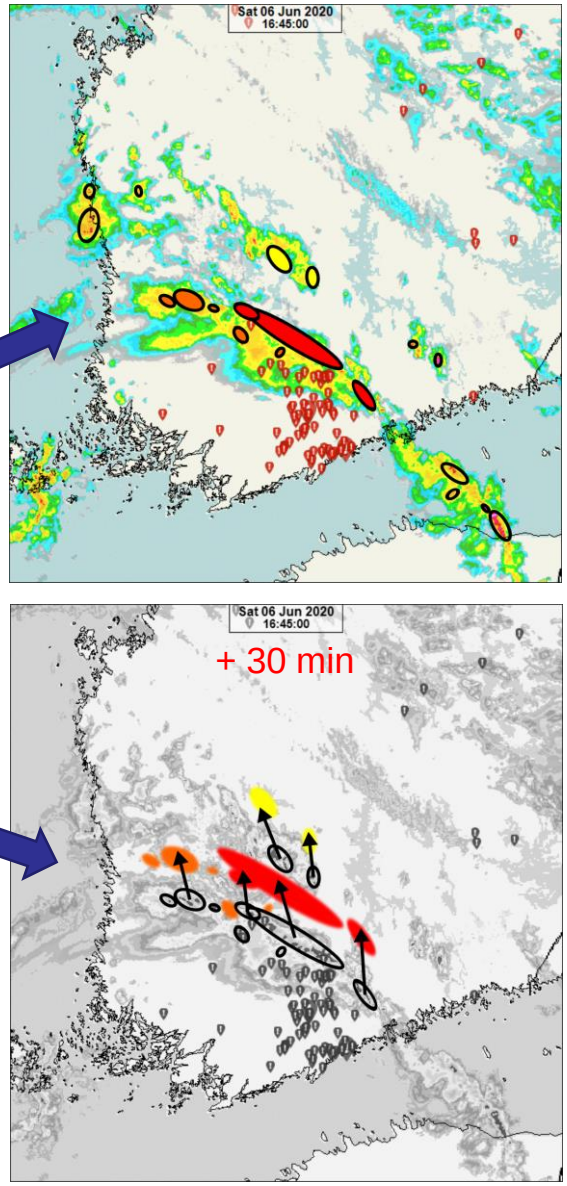


A squall line moving over Southern Finland and the civil protection missions due to related wind damages.

In total, civil protection had nearly 400 rescue missions caused by the squall line.

TAMIR: Forecasting Thunderstorm Hazards and Risks

1. Create a model to classify thunderstorm threat based on historical observations and emergency calls.
2. Use the model to classify thunderstorms in real time.
3. Create short-term forecasts (0-2 h) of future thunderstorm locations.
4. Combine with impact and vulnerability layers to create risk nowcasts.



Whiteboard 1: Thunderstorm Hazard Nowcasting

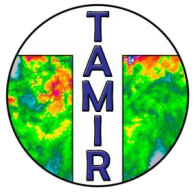
padlet

Tero Niemi • 2m

Multi-Hazard Thunderstorm Nowcasting

Write your comments on "sticky notes" under the headers.

Instructions	Added value	Expected output	Exposure data	Spatio-temporal scales
This session: 10 min time to write your ideas under each header, then moving to next board. Write your comments & ideas under the headers. Yellow notes have assisting questions. No need to answer them all :) When possible give **specific examples**. **In next plenary session**: Voting of most important comments/suggestions.	What is the **added value of the product**? How does it improve the current situation?	What **output** do you expect / need from the product for it to be useful?	What **exposure / vulnerability data** should be considered to estimate risks?	What are most relevant **spatial and temporal scales**? What temporal resolution (e.g. 5 min, 15 min, 1 h) and level (e.g. suburb, city, municipality, 1 km grid) would you like to see the products?



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TAMIR – Flash flood hazard forecasting

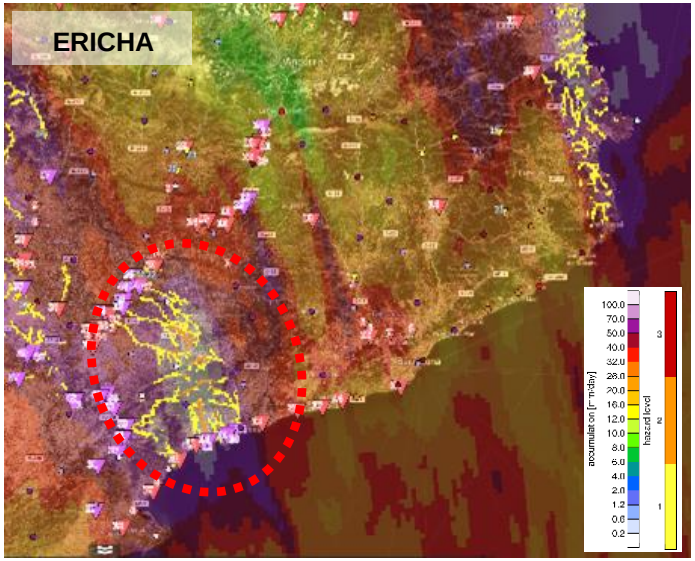
Marc Berenguer, Shinju Park, Daniel Sempere-Torres

Flash flood hazard products over Europe

	ERICHA
Precipitation inputs	Radar observations and nowcasts (2 km)
	Deterministic
Resolutions	1 km, 15 min
Forecasting horizon	6 h
Update	15 min
Forcing variable	Catchment-aggregated rainfall

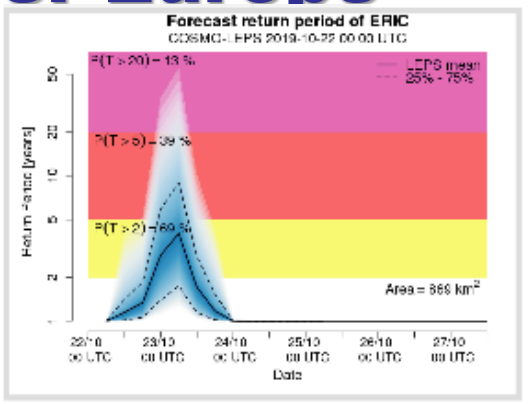
Flash flood hazard products over Europe

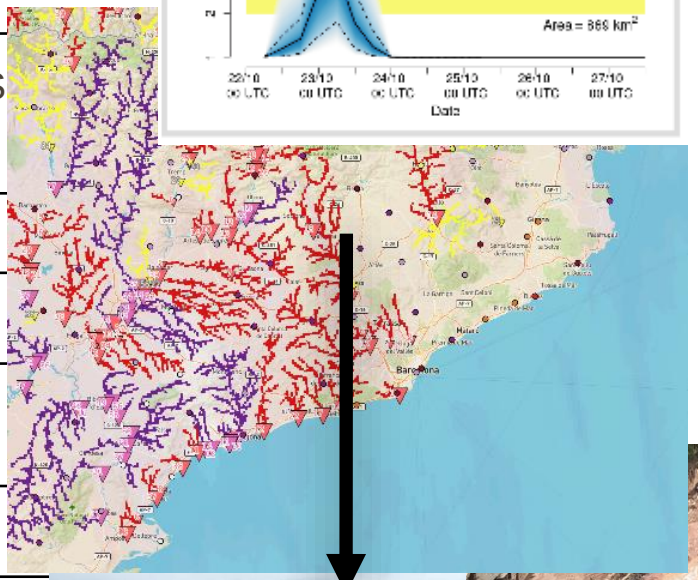
	ERICHA
Precipitation inputs	Radar observations and nowcasts (2 km)
	Deterministic
Resolutions	1 km, 15 min
Forecasting horizon	6 h
Update	15 min
Forcing variable	Catchment-aggregated rainfall



Flash flood hazard products over Europe

	ERICHA	EFAS ERIC
Precipitation inputs	Radar observations and nowcasts (2 km)	COSMO-LEPS km)
	Deterministic	Probabilistic
Resolutions	1 km, 15 min	1 km, 6h
Forecasting horizon	6 h	5 days
Update	15 min	12 h
Forcing variable	Catchment-aggregated rainfall	Catchment runoff





ERICHA

EFAS
European Flood Awareness System

Marc Berenguer + 1 • 44m

Flash flood hazard forecasting

Write your comments on sticky notes under the headers and rate

Instructions

Write your comments & ideas under the headers.

10 min time for this board, then moving to next board.

Voting for best comments after all boards have been gone through.

0 0

1. What is your source of real-time flash flood hazard forecasts?

Explain if your institution has access to flash flood hazard forecasts, how they are used and their main features.

0 0

2. What are the requirements for flash flood hazard products?

Minimum resolution:

250 m & 15 minutes (upvote)
1 km & 3 h (downvote)

0 0

Minimum lead time:

<6 hours (upvote)
>12 hours (downvote)

0 0

Hazard type:

Hazard index (upvote)
Return period (downvote)

0 0

Deterministic/probabilistic

Deterministic (upvote)
Probabilistic (downvote)

0 0

3. Are you interested in detailed intermediate information or in FF hazard products?

Explain if your institution could benefit from the detailed intermediate information (e.g. precipitation forecasts, FF forcings, probabilities of exceeding hazard levels...).

0 0

4. Accuracy and lead times - How are your procedures affected by...

location errors in 24-h forecasts?

Minor effect (upvote)
Major effect (downvote)

0 0

false alarm in 24-h forecasts?

Minor effect (upvote)
Major effect (downvote)

0 0

miss in 24-h forecasts?

Minor effect (upvote)
Major effect (downvote)

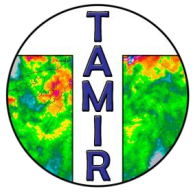
0 0

location error in 6-h forecasts?

Minor effect (upvote)
Major effect (downvote)

0 0

false alarm in 6-h forecasts?



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TAMIR – Flood Rapid Impact Assessment Tools

Calum Baugh, Eleanor Hansford, Christel Prudhomme

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FINNISH METEOROLOGICAL INSTITUTE

Centre de Recerca Aplicada
en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

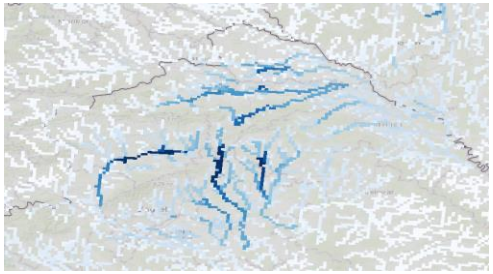
ECMWF

KYMPE
KYMENLAAKSON PELASTUSLAITOS

What is Flood Impact?

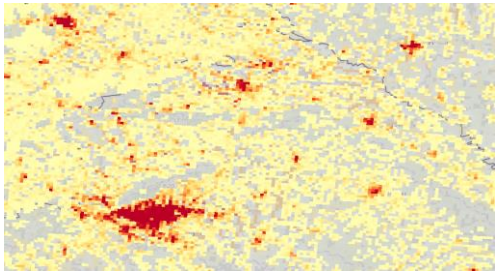
$$Impact = Hazard * Exposure * Vulnerability$$

Flash flood probability



Darker shades show higher probability of flooding

Population/Infrastructure in path of flooding



Dark reds show high density population centres

Ability of population/infrastructure to cope with hazard

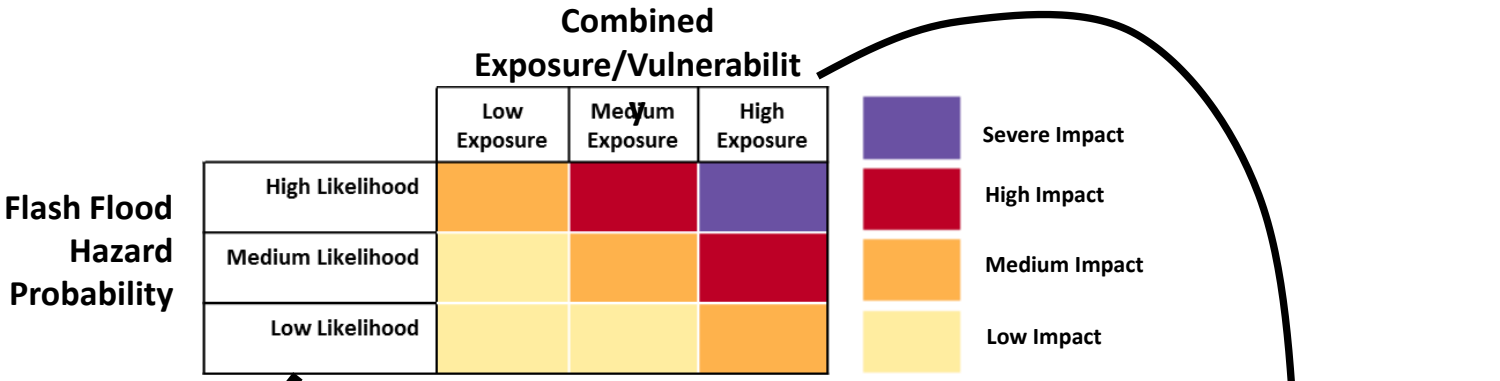
Rush hour traffic

Refugee camps

What should the impact (calculated above) show in order for it to be useful?

Flood Impact Matrix

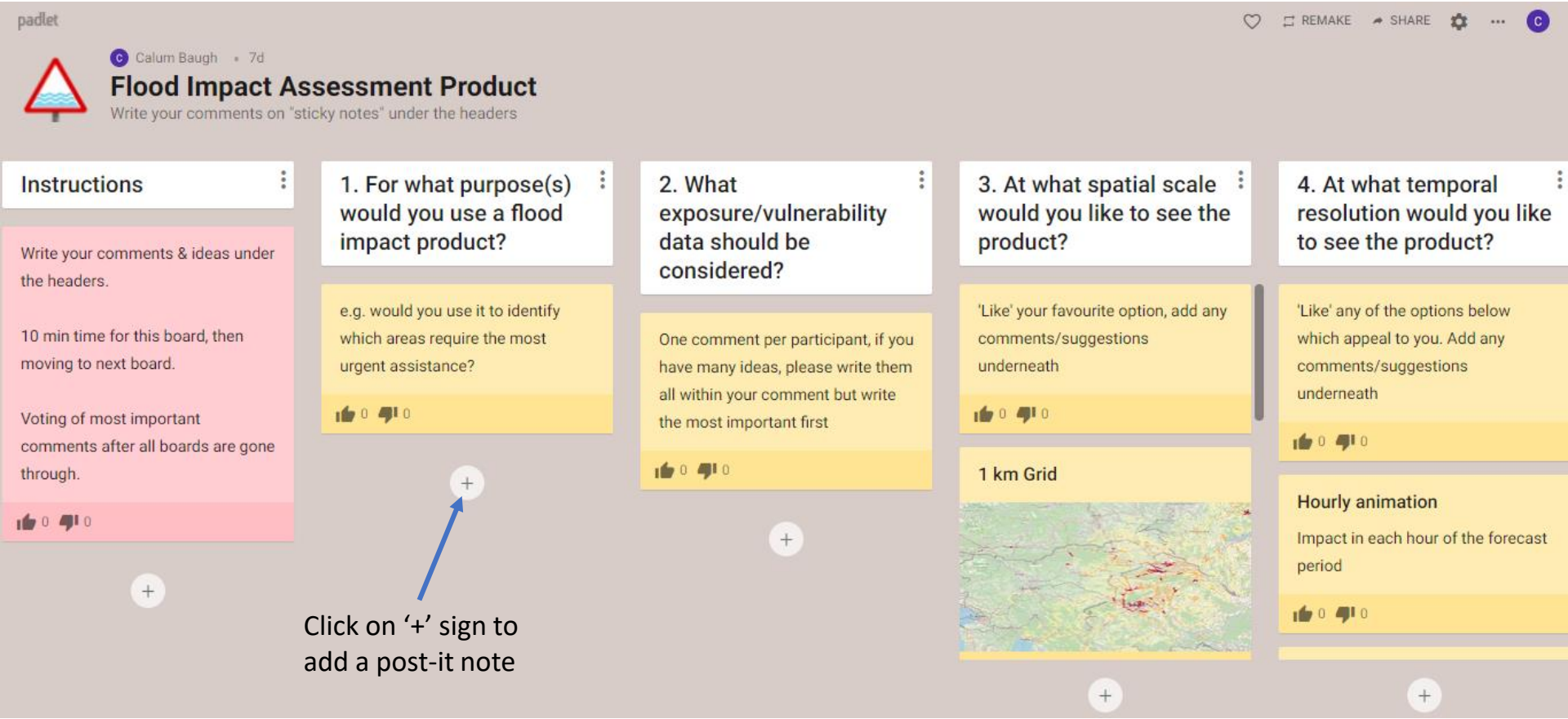
Matrix is used to combine hazard, exposure and vulnerability information into a flood impact product



Hazard Class	Exceedance Probability
High Likelihood	>=75%
Medium Likelihood	20% - 75%
Low Likelihood	5% - 20%

Proposed thresholds

Whiteboard


padlet
REMAKE
SHARE
Calum Baugh • 7d
Flood Impact Assessment Product
Write your comments on "sticky notes" under the headers
Instructions
Write your comments & ideas under the headers.
10 min time for this board, then moving to next board.
Voting of most important comments after all boards are gone through.
0 0
1. For what purpose(s) would you use a flood impact product?
e.g. would you use it to identify which areas require the most urgent assistance?
0 0
2. What exposure/vulnerability data should be considered?
One comment per participant, if you have many ideas, please write them all within your comment but write the most important first
0 0
3. At what spatial scale would you like to see the product?
'Like' your favourite option, add any comments/suggestions underneath
0 0
1 km Grid
4. At what temporal resolution would you like to see the product?
'Like' any of the options below which appeal to you. Add any comments/suggestions underneath
0 0
Hourly animation
Impact in each hour of the forecast period
0 0
Click on '+' sign to add a post-it note

Technical instructions for sessions and move to breakout rooms – in short

1) You will be assigned to the breakout rooms (click "Join" when prompted)
2) Each topic takes approximately 10 minutes
3) Links to these Whiteboards (padlets) are given in the breakout room chat
4) You are expected to provide your inputs through virtual post-it notes to the presented questions
5) Questions, technical or from the topic, in the breakout rooms can be given through the chat or "raising your hand"
6) After going through all topics you will be automatically returned to main session

Wrap-up and the afternoon session

1) Workshop report, distributed to the participants
2) Survey and feedback (here)
3) End-user workshop in 2022

Session 2: Technical Solutions and Services (12:00 - 14:00 CET) (link)

1) Current platforms and products
2) Sharing new products
3) Adjusting to local needs

European Union
Civil Protection and
Humanitarian Aid

Technical Solutions and Services

Online Workshop on Tools for Impacts and Risks Induced by Severe Weather

October 27, 2020

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Centre de Recerca Aplicada
en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ECMWF

KYMPE
KYMENLAAKSON PELASTUSLAITOS

Technical instructions

European Union
Civil Protection and
Humanitarian Aid

- Make sure your name and institution are correct in the participant list, e.g. FirstName LastName (ORGANISATION)
- Keep your microphone muted and video off during the main session, when not speaking
- Write questions and comments to the chat.
- Use "Raise your hand" functionality for questions in breakout room

Technical Solutions and Services — Online Workshop on Tools for Impacts and Risks Induced by Severe Weather

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TAMIR - Online Workshop on Tools for Impacts and Risks Induced by Severe Weather Technical Solutions and Services

October 27, 2020

Christel Prudhomme

European Centre for Medium-range Weather Forecast

Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

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FINNISH METEOROLOGICAL INSTITUTE

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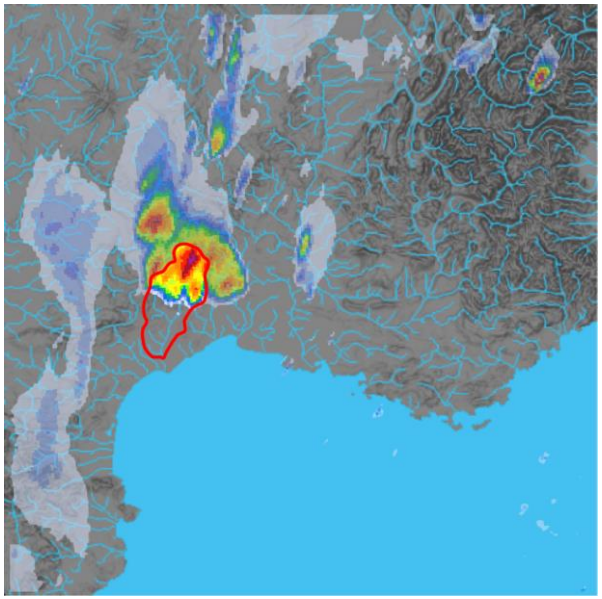
European Union
Civil Protection and
Humanitarian Aid

TAMIR - Advanced Tools for pro-Active Management of Impacts and Risks induced by convective weather, heavy rain and flash floods in Europe

Main goal is to

"*enhance the response capacity in emergencies caused by convective and heavy rainfall events by developing rapid risk assessment products and IT tools for improved* ***impact forecasting*** *to support decision making*"

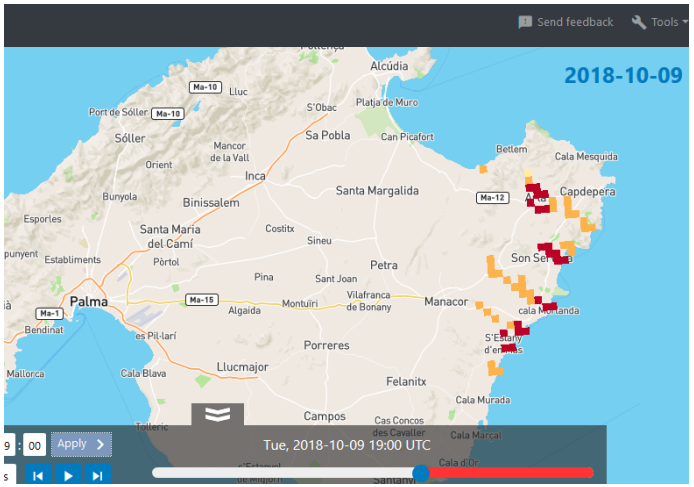


Settlement Classification

	Low Exposure	Medium Exposure	High Exposure
High Likelihood			
Medium Likelihood			
Low Likelihood			

Severe Risk
High Risk
Medium Risk
Low Risk

Flood Hazard Level 1 Exceedance Probability



End-user Workshop

- **Promote the envisaged new products** and tools for the prediction and nowcasting of hazard induced by severe
- Provide an opportunity **to discuss the necessary features** in the tools for expressing the impact and risk information to the end-users
- **Discuss the technical and IT aspects** of integrating the services to local end-user platforms;

Technical solutions and services (12:00 - 14:00 CET)

Aims and objectives

Better **understand** the **type of service** that would benefit most users to **reduce risks related to high-impact weather and floods**

- **Part 1**: short description of existing services at local, national and European levels
- **Part 2**: interactive sessions on existing tools, potential for data sharing, and technical customization needs
- **Part 3**: Voting, wrap-up and final comments

Practical information

- **Overview and introduction sessions**
  - Main zoom room (here)

- **Breakout-sessions:**
  - Participants sent to 3 separate zoom rooms
  - Three interactive sessions asking for your inputs (padlet)

- **Wrap-up sessions**
  - Main zoom platform (here)
  - Voting session on suggestions (padlet)
  - Summary for each theme

Part 1 : existing local, national and European services

European Union
Civil Protection and
Humanitarian Aid

LUOVA – Natural Disaster Information System in Finland

i.e.

How FMI Distributes Warnings to Emergency Services (and others)

Tero Niemi, Finnish Meteorological Institute

TAMIR End-user Workshop, 27 Oct 2020

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ECMWF

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LUOVA System

Overview

- 24/7/365 operational system
- Operated by expert network from
  - Finnish Meteorological Institute (FMI), Finnish Environment Institute, and University of Helsinki, Institute of Seismology
  - FMI coordinates the system and provides the technical background

Severe weather outlooks

- Sent in case of expected severe weather (e.g. severe thunderstorms)
- Two parts
  1. Alert e-mail with short outlook
  2. Webpage with extended outlook (on Ilmanet-portal)
  3. (If necessary, virtual briefing between FMI meteorologist and civil protection end-users)

Online Ilmanet-portal

- Extended severe weather outlooks
- Severe weather follow-up product
- Weather observations & forecasts
- User-specific products

LUOVA Alert Email

From: Viranomaisten Luova-tiedotepalvelu
Sent: keskiviikko 9. syyskuuta 2020 14.48
To: Viranomaisten Luova-tiedotepalvelu
Subject: FMI LUOVA-tiedote: voimakkaat myrskypuuskat (yli 20 m/s), runsas vesisade

LUOVA-tiedote 9.9.2020 klo 14:48 (SA)
1. tilannetta koskeva tiedote

Vaara-aika:
10.9.2020 klo 14:00 - 10.9.2020 klo 23:00 (SA)

Vaara-alue:
Etelä-Karjala, Etelä-Savo, Kymenlaakso, Pohjois-Karjala, Pohjois-Savo, Päijät-Häme

Tiedotteen syy:
Voimakkaat myrskypuuskat, Runsas vesisade

Ilmiön vaarallisuus:
Säätilanne aiheuttaa vaaran säälle alttiissa toiminnassa

Säätilanteen tiivistetty kuvaus:
Voimakas matalapaine liikkuu torstain 10.9 vastaisesta yöstä alkaen maan etelä- ja keskiosan poikki itäkoilliseen. Matalapaineen etelä- ja länsipuolella puuskainen tuuli yltyy iltapäivästä Kymeenlaaksossa, Päijät-Hämeessä, Etelä-Savossa, Etelä-Karjalassa ja mahdollisesti Pohjois-Karjalassa yli 20 m/s puuskiin. Tilanne on ohitse torstain ja perjantain vastaisen yön aikana. Lisäksi Pohjois-Savossa ja Pohjois-Karjalassa voi sataa runsaasti, yli 50 mm vuorokaudessa.

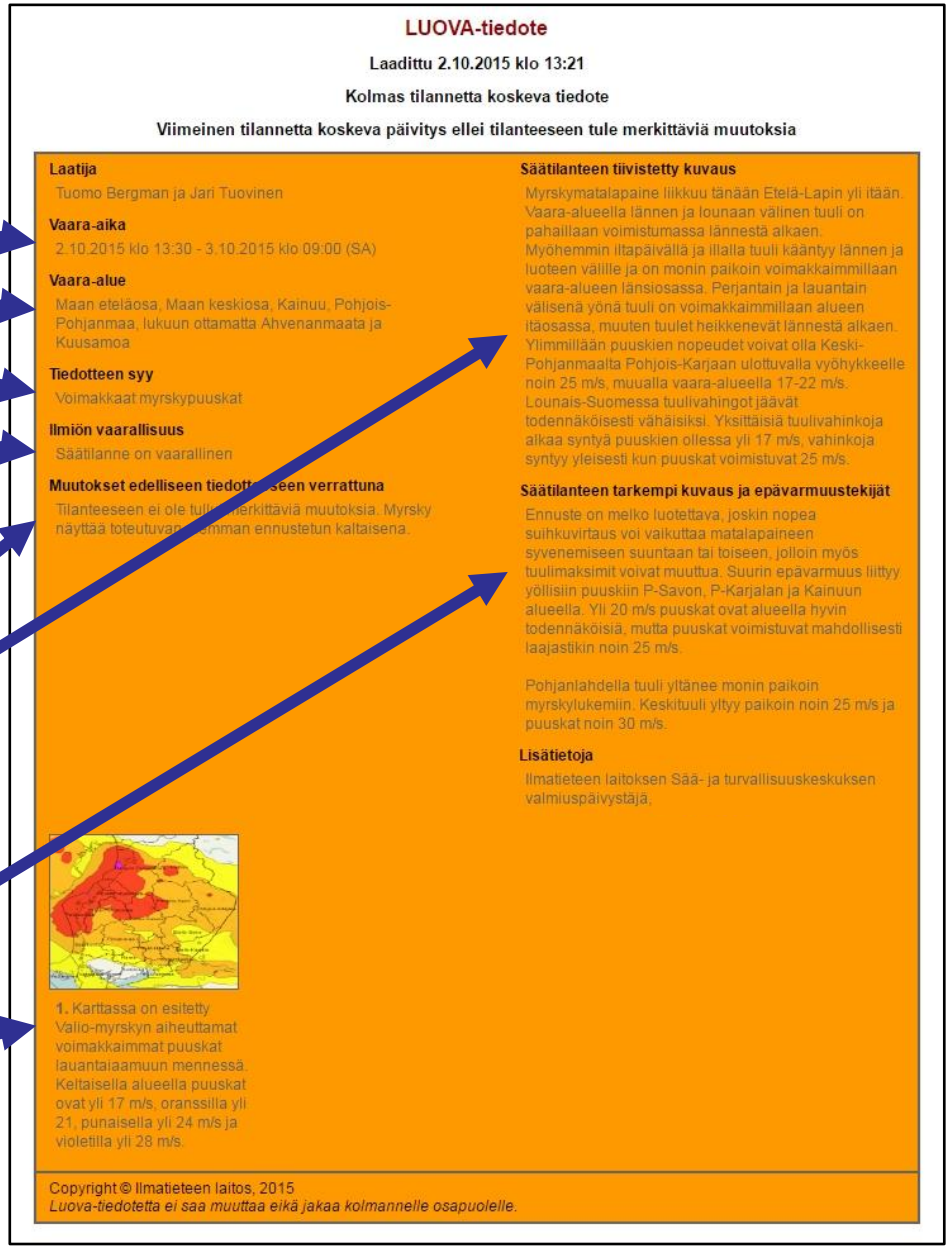
Tiedote luettavissa kokonaisuudessaan osoitteessa:
<http://ilmanet.fi/>, tunnus: XXXX ja salasana: XXX

--
LUOVA-tiedotteiden sisällöstä vastaa
Ilmatieteen laitoksen Sää- ja turvallisuuskeskuksen valmiuspäivystäjä,
XXX XXX XXXX, XXX[at]fmi.fi
(Yhteystiedot vain viranomaiskäyttöön.)
Viranomaisten välinen tiedotteen edelleenjakelu on sallittu.

- **Issue time**
- **Serial number** of the alert for the current phenomena
- **Expected time** of severe weather
- **Area** of risk
- **Reason** of the alert
- **Severity** of the weather situation
- **Compact description** of the evolution of weather event
- **Link to extended outlook** in Ilmanet- portal

LUOVA Extended Outlook

- Expected **time** of weather situation
- **Area** of risk
- **Reason** of the outlook
- **Severity** of the weather situation (also indicated with color)
- **Changes** compared to earlier outlooks
- Short **description** of the evolution of weather event
- Information on the **uncertainty** of the forecast
- **Images** (warning map, radar picture, etc.)



LUOVA-tiedote

Laadittu 2.10.2015 klo 13:21

Kolmas tilannetta koskeva tiedote

Viimeinen tilannetta koskeva päivitys ellei tilanteeseen tule merkittäviä muutoksia

Laatija

Tuomo Bergman ja Jari Tuovinen

Vaara-aika

2.10.2015 klo 13:30 - 3.10.2015 klo 09:00 (SA)

Vaara-alue

Maan eteläosa, Maan keskiosa, Kainuu, Pohjois-Pohjanmaa, lukuun ottamatta Ahvenanmaata ja Kuusamoa

Tiedotteen syy

Voimakkaat myrskypuuskat

Ilmiön vaarallisuus

Säätilanne on vaarallinen

Muutokset edelliseen tiedotteeseen verrattuna

Tilanteeseen ei ole tullut merkittäviä muutoksia. Myrsky näyttää toteutuvan suunnilleen ennustetun kaltaisena.

Säätilanteen tiivistetty kuvaus

Myrskymatalapaine liikkuu tänään Etelä-Lapin yli itään. Vaara-alueella lännen ja lounaan välinen tuuli on pahaillaan voimistumassa lännestä alkaen. Myöhemmin iltapäivällä ja illalla tuuli kääntyy lännen ja luoteen välille ja on monin paikoin voimakkaimmillaan vaara-alueen länsiosassa. Perjantain ja lauantain välisenä yönä tuuli on voimakkaimmillaan alueen itäosassa, muuten tuulet heikkenevät lännestä alkaen. Ylimmillään puuskien nopeudet voivat olla Keski-Pohjanmaalta Pohjois-Karjaan ulottuvalla vyöhykkeelle noin 25 m/s, muualla vaara-alueella 17-22 m/s. Lounais-Suomessa tuulivahingot jäävät todennäköisesti vähäisiksi. Yksittäisiä tuulivahinkoja alkaa syntyä puuskien ollessa yli 17 m/s, vahinkoja syntyy yleisesti kun puuskat voimistuvat 25 m/s.

Säätilanteen tarkempi kuvaus ja epävarmuustekijät

Ennuste on melko luotettava, joskin nopea suihkuvirtaus voi vaikuttaa matalapaineen syvenemiseen suuntaan tai toiseen, jolloin myös tuulimaksimit voivat muuttua. Suurin epävarmuus liittyy yöllisiin puuskiin P-Savon, P-Karjalan ja Kainuun alueella. Yli 20 m/s puuskat ovat alueella hyvin todennäköisiä, mutta puuskat voimistuvat mahdollisesti laajastikin noin 25 m/s.

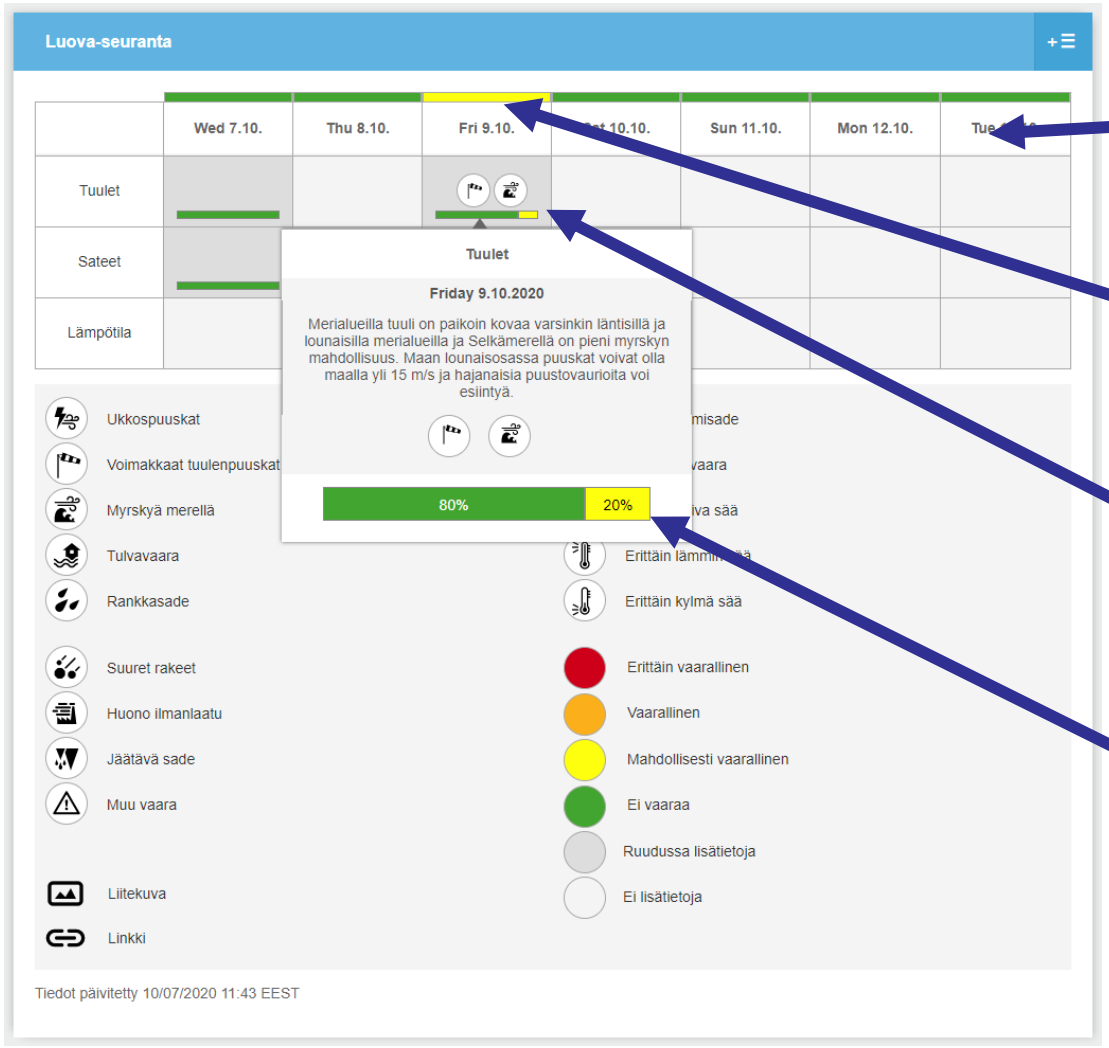
Pohjanlahdella tuuli yltänee monin paikoin myrskylukemiin. Keskituuli yltyy paikoin noin 25 m/s ja puuskat noin 30 m/s.

Lisätietoja

Ilmatieteen laitoksen Sää- ja turvallisuuskeskuksen valmiuspäivystäjä.

1. Karttassa on esitetty Valio-myrskyn aiheuttamat voimakkaimmat puuskat lauantaiaamuun mennessä. Keltaisella alueella puuskat ovat yli 17 m/s, oranssilla yli 21, punaisella yli 24 m/s ja violetilla yli 28 m/s.

Severe Weather Follow-up Product



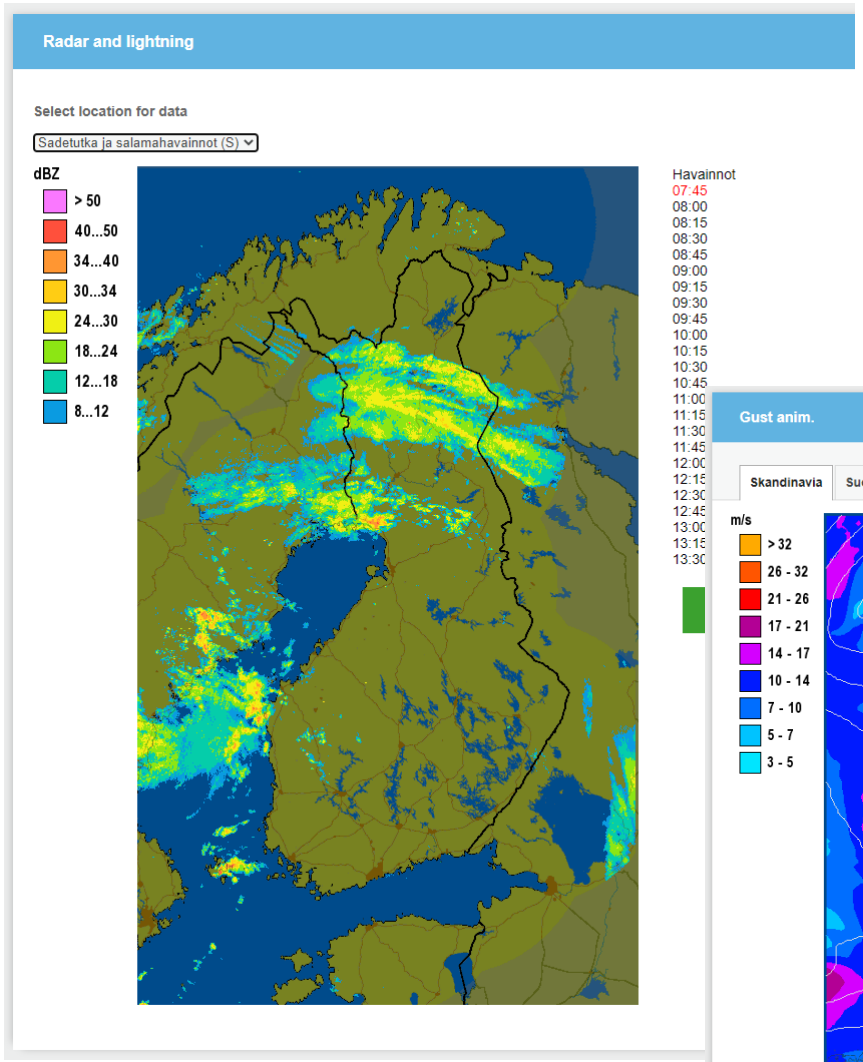
Short weather brief for coming 1-10 days

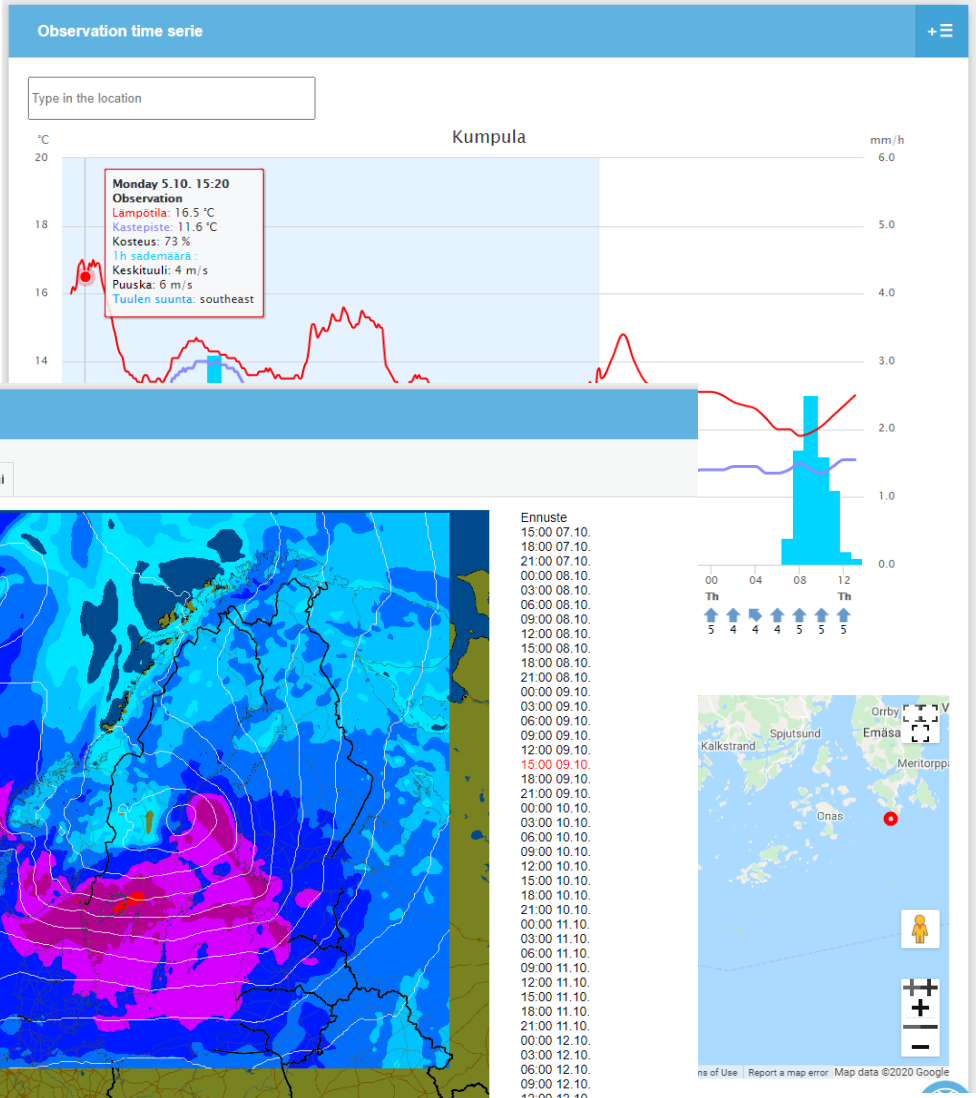
Color displays highest hazard level

Cell background and probability distribution indicate cells with more information

Probability distribution of hazardous weather

Other Services on Ilmanet-portal



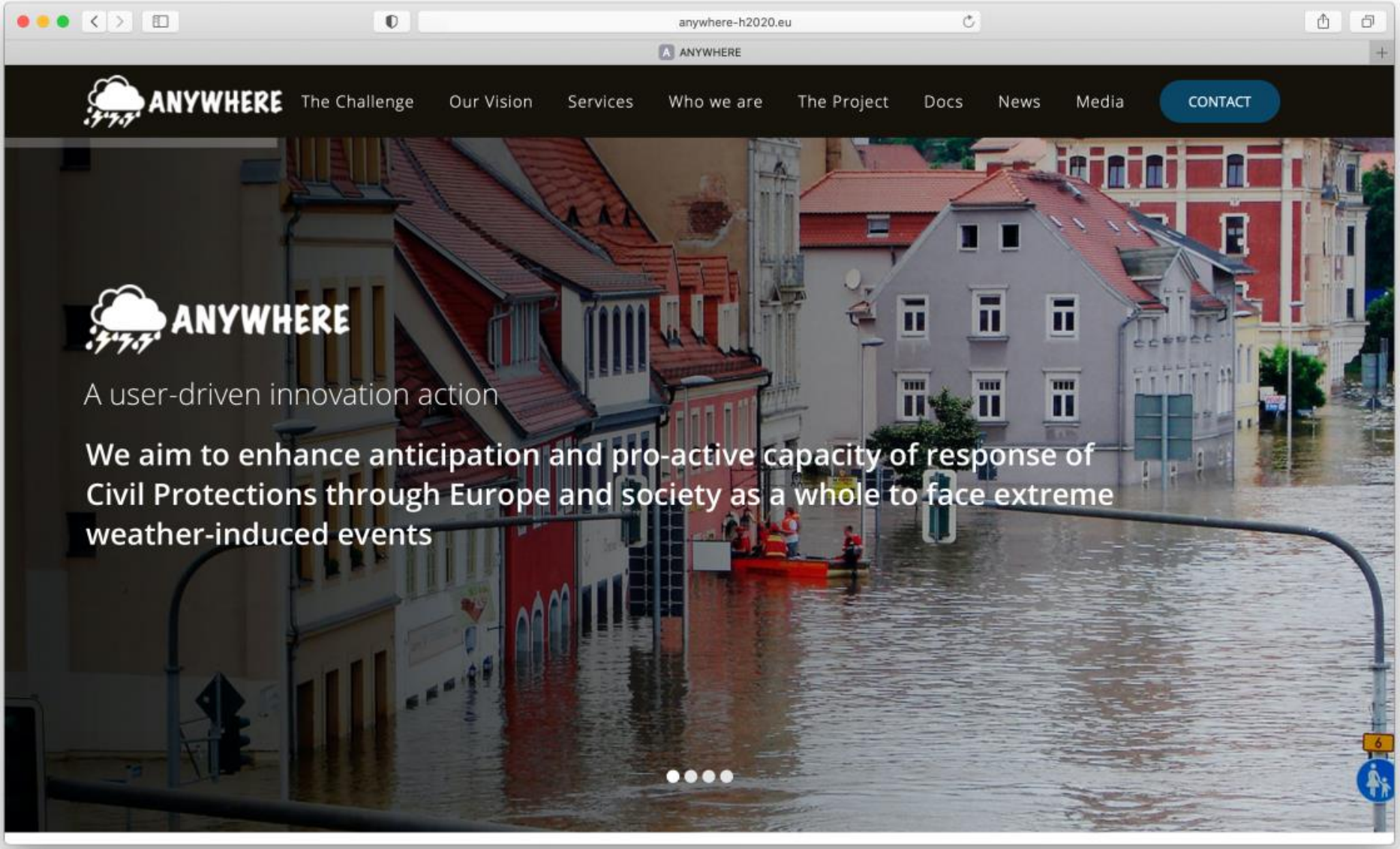


ANYWHERE

ANYWHERE MH-EWS: Acquisition, generation and dissemination of products

This Project has received funding from European Comission by means of Horizon 2020, The EU Framework Programme for Research and Innovation, under Grant Agreement no. 700174

ANYWHERE-H2020 Project



31 Partners

ANYWHERE

Consortium

Norway — SINTEF; HELSE STAVANGER

Finland — Finnish Meteorological Institute; Sisäministeriö / Inrikesministeriet

Slovakia — VÚJO

Germany — Helmholtz Centre for Environmental Research – UFZ; Paderborn University

United Kingdom — University of Reading

Netherlands — Wageningen UR

Belgium — JRC European Commission

Switzerland — Université de Genève; MeteoDat; Kanton Bern / Canton de Berne; geo7

France — Airbus Defence & Space; Université Nice Sophia Antipolis; CNRS; LTHE; S.D.I.S 28

Italy — D'Appolonia; CFR; Sant'Anna; ARPAL; CIMA; Comune di Genova

Spain — Agència Catalana de l'Aigua; Consejería de Medio Ambiente y Ordenación del Territorio; Generalitat de Catalunya, Departament d'Interior; hydsolutions; Centre de Recerca Aplicada en Hidrometeorologia, Universitat Politècnica de Catalunya

International — ECMWF

31 Partners

ANYWHERE

Norway
Finland
Slovakia
Germany
United Kingdom
Netherlands
Belgium
Switzerla
France
Italy
Spain
International

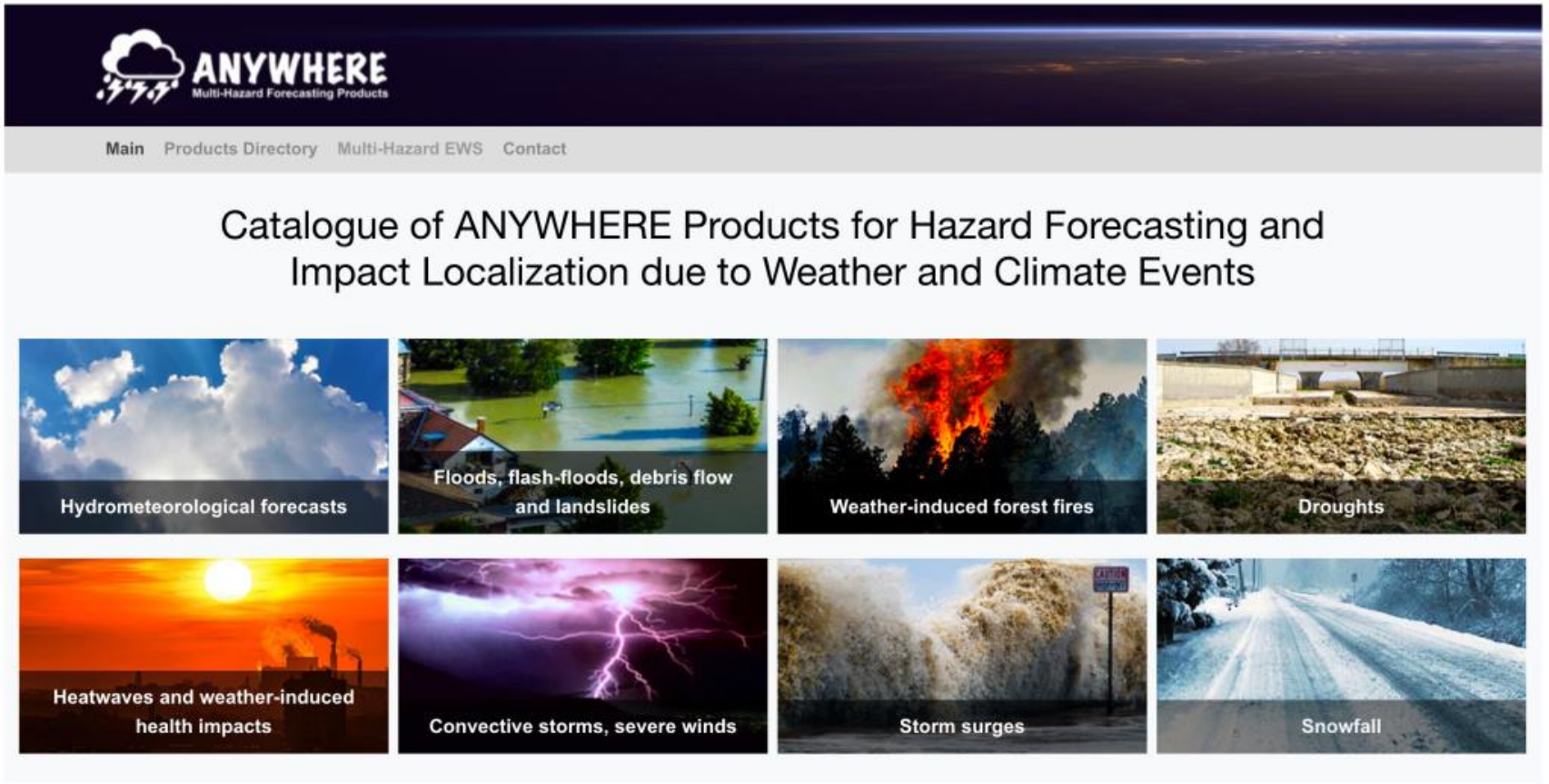
SINTEF
HELSE STAVANGER
FINNISH METEOROLOGICAL INSTITUTE
SISÄMINISTERIÖ INRIKESMINISTERIET
HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH - UFZ
PADERBORN UNIVERSITY
University of Reading
WAGENINGEN UR
JRC EUROPEAN COMMISSION
Kanton Bern Canton de Berne
geo7
S.D.I.S 28
ARPAL
COMUNE DI GENOVA
Agència Catalana de l'Aigua
Generalitat de Catalunya Departament d'Interior
hydsolutions
ECMWF

12 Operational Authorities

13 RTD Partners (former project coordinators)

6 SMEs and Industries

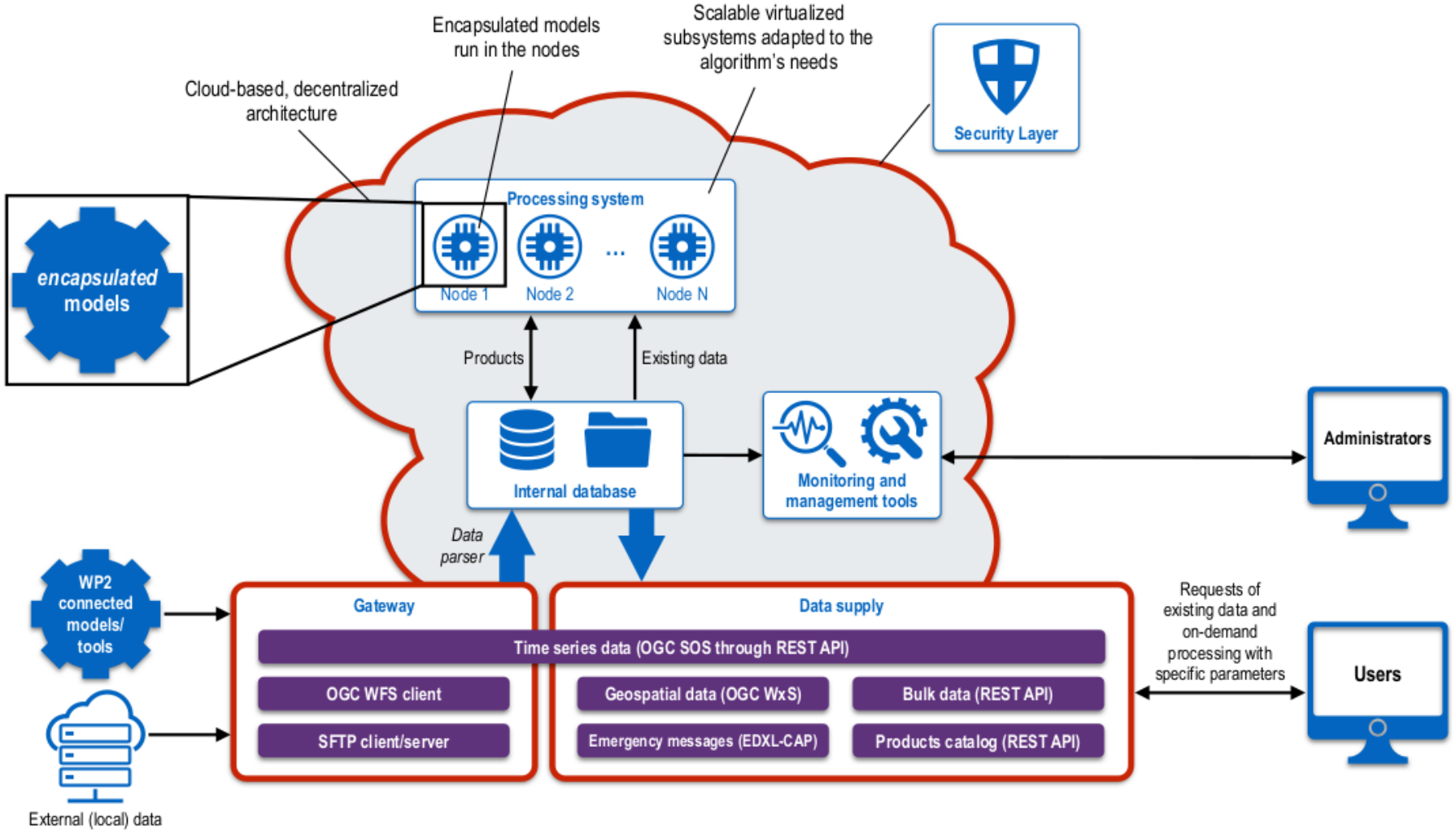
ANYWHERE: MH-EWS



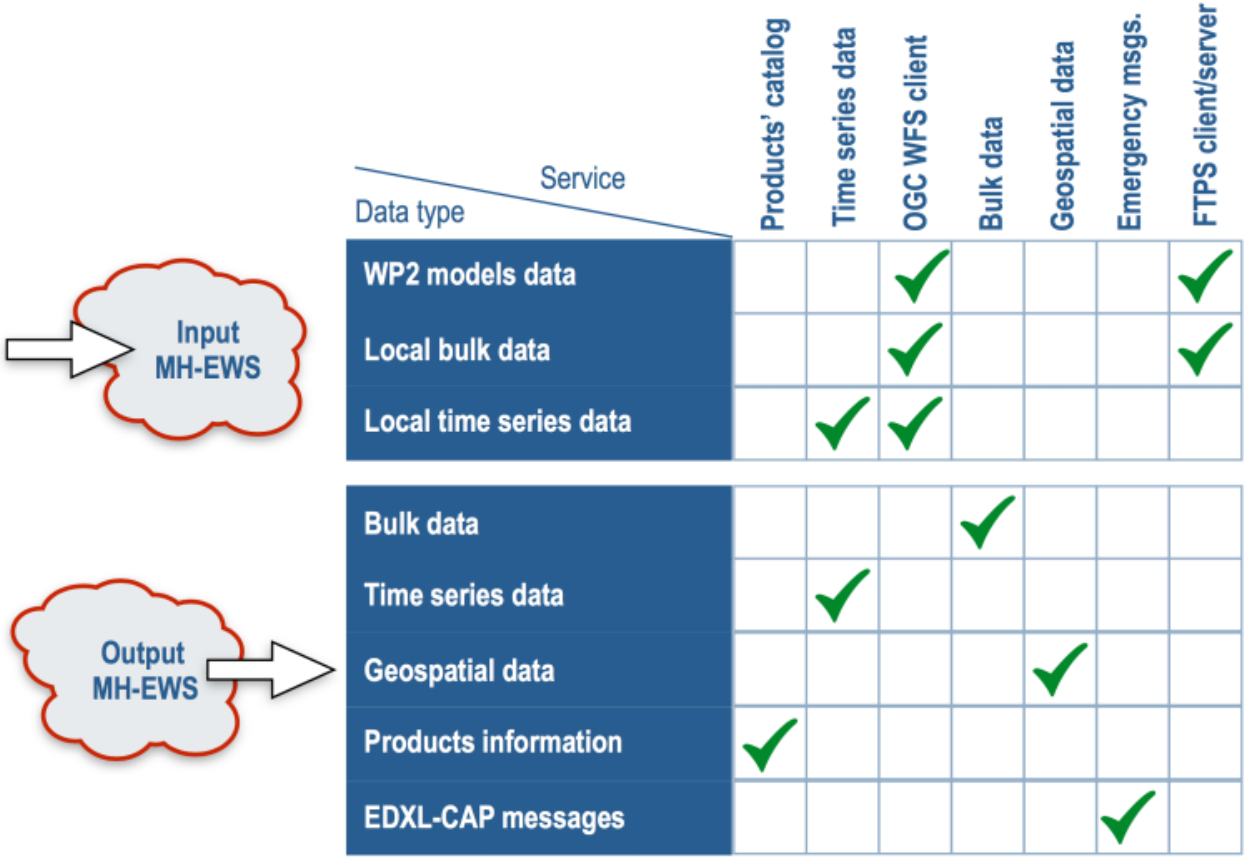
More information:

www.anywhere-h2020.eu/catalogue

MH-EWS Modules



MH-EWS services and interfaces



Summary of data types and services providing input/output access to them.

More information on the MH-EWS services and interfaces:
http://gebrada.upc.es/anywhere/the-project/wp-content/uploads/docs/D3.2.pdf

MH-EWS services and interfaces

Services most used:

- **WMS** (to incorporate layers directly on web applications).
- **REST-API** (to gather numerical bulk data to build on top).

Challenges faced:

- **WMS**
  - Proxy for layer access control needed.
  - Domain and time interval access control.
  - Cache vs update on dynamical data.
  - Scalability.

- **REST-API**
  - Processing time to prepare data (retrieving from DB, domain trimming, transfer, etc.). —> Need for asynchronous process
  - Rate limit

ANYWHERE

hydS

Copernicus
Emergency Management Service (EMS)

EFAS introduction

European Flood Awareness System

- **Aims to support** preparatory measures before major flood events strike in Europe
- **The first operational European system** monitoring & forecasting floods across Europe
- **Provides complementary information** to relevant national & regional authorities (restricted access to real-time forecasts)
- **EFAS homepage:** www.efas.eu

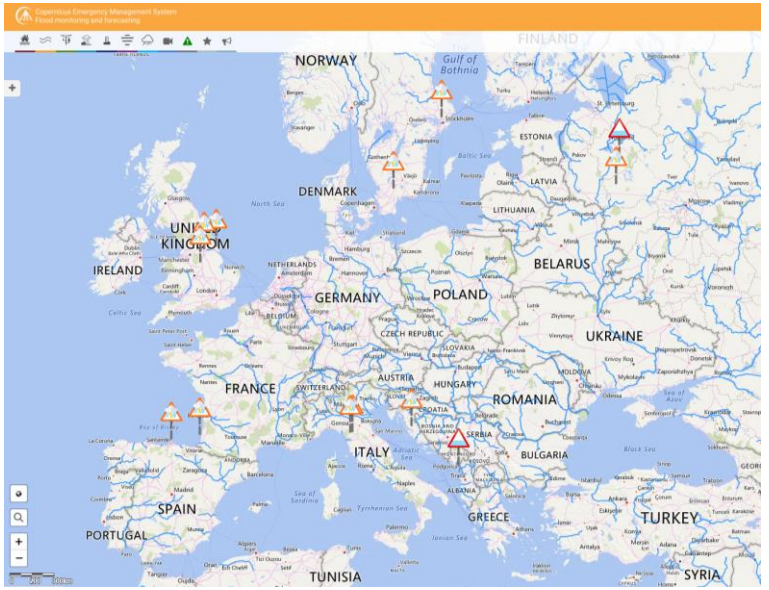
EFAS website

Can be accessed at: www.efas.eu

Copernicus Europe's eyes on Earth

EFAS map viewer

- **Easy access** to operational flood forecasts
- **Password protected** real-time interface for partners only
- **Updates** twice daily
- **Easily understandable** overview maps & plots
- **Hydrological** & hydrology-relevant meteorological information



26

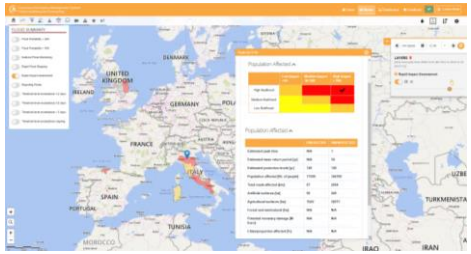
Copernicus Europe's eyes on Earth

Flood summary layers

Overview of the flood situation and possible impact for the next 10 days

- **Reporting points** to highlight areas expected to exceed 2 or 5 year return period flood

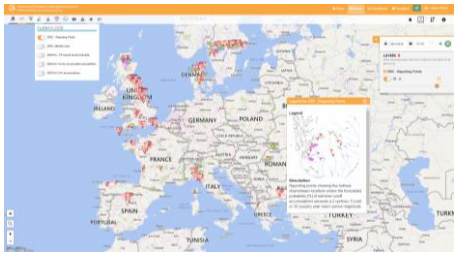
- **Flood probability** of exceeding 5yr flood for short (<48h) and medium (>48h) forecast range
- **Flood Impact estimates** as possible inundation extent and colour-coded risk levels

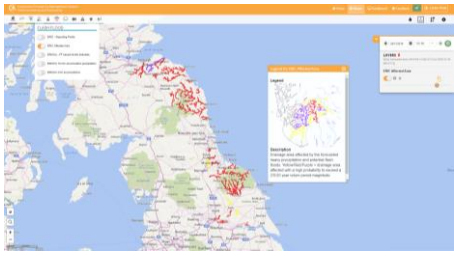


Flash-flood layers

Overview of the flash flood situation for up to the next 5 days from two systems (ERIC & ERICHA)

- **Reporting points** to highlight points with a flash-flood signal forecasted in next 5 days
- **River network** expected to be affected by flash-flood in next 5 days
- **Radar-based nowcasting** showing 15mn precipitation totals for next 8 hours, and last 24hour precipitation total

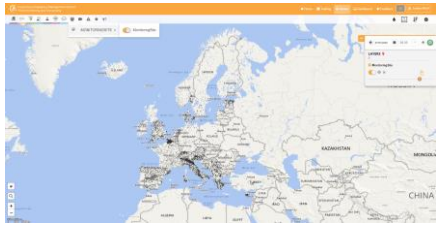


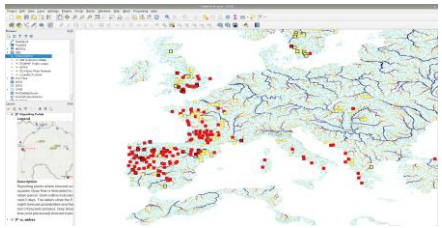


EFAS web and data services

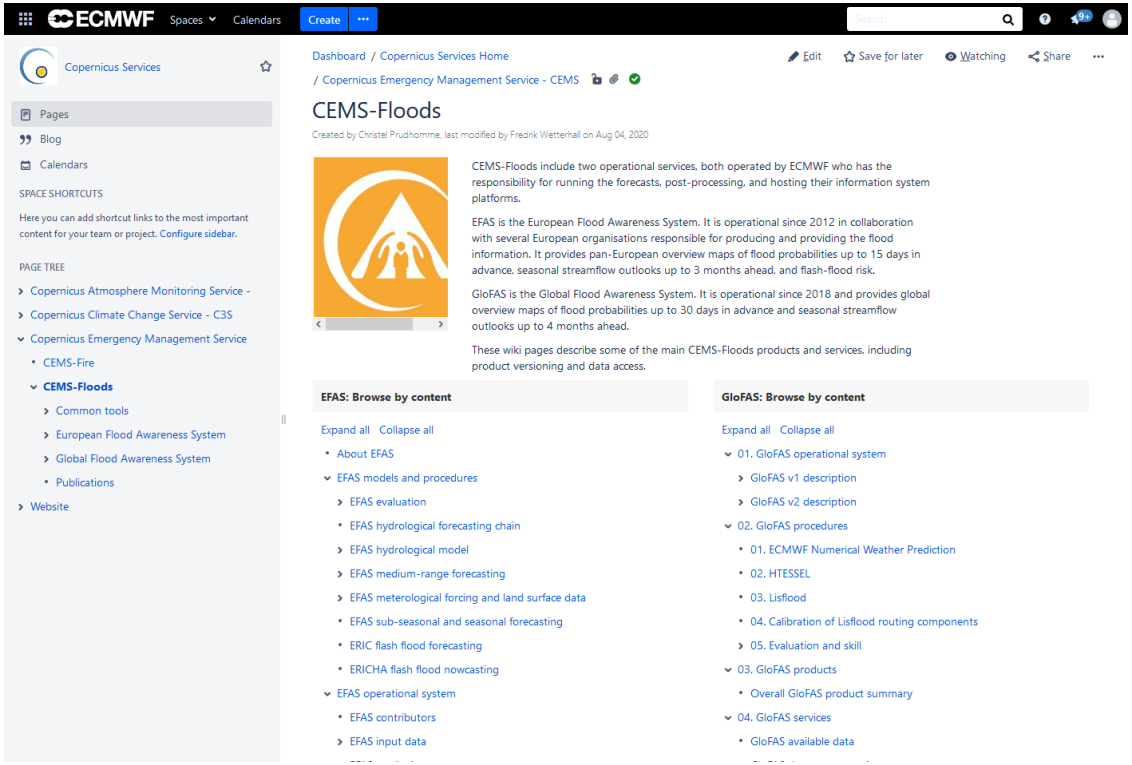
WMS Easy access to selected products and data

- **Open Geospatial Consortium** web service (password-protected
- **Add your own WMS-T layer** to the EFAS-IS mapviewer
- **Export** EFAS layers for visualisation on own GIS/ platform
- **API access** to all LISFLOOD-based river discharge simulations (historical and forecasts) through CDS (30-day delay for forecasts)





For more info



EFAS homepage – www.efas.eu

Copernicus Europe's eyes on Earth

Thank you

Contact details

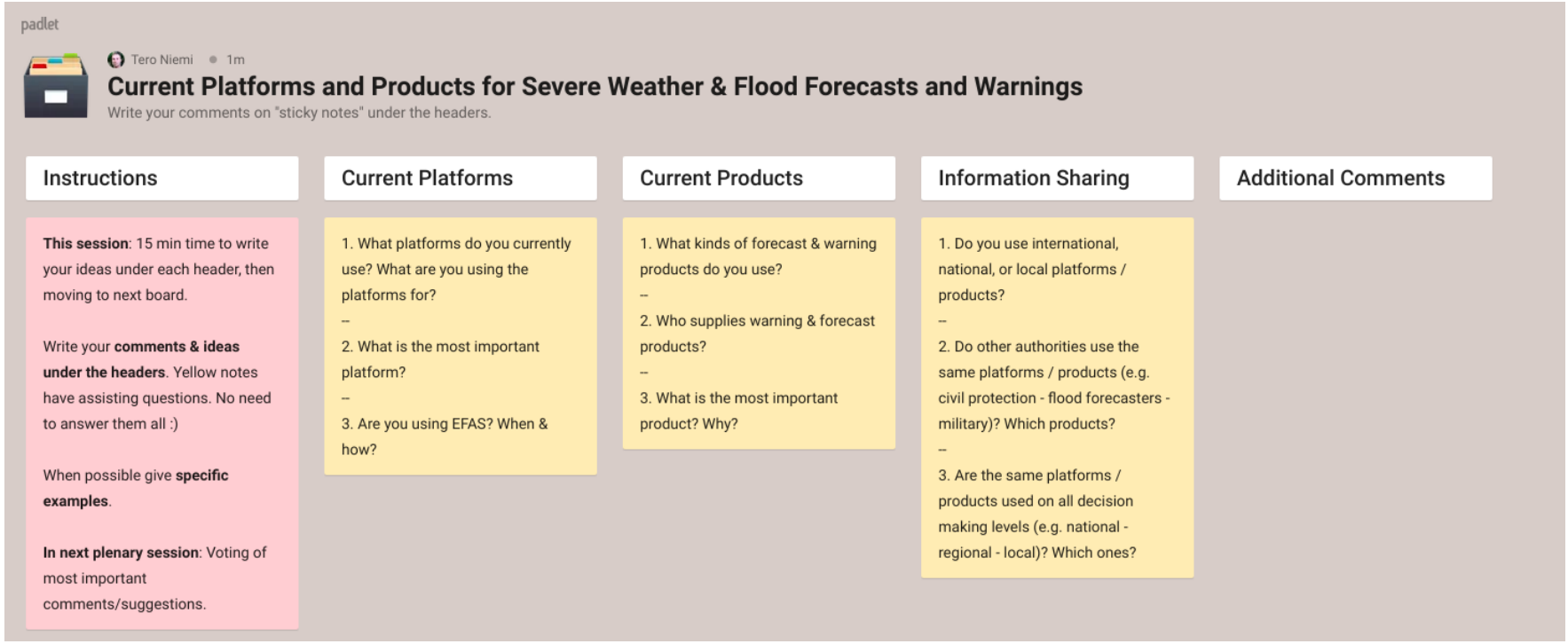
EFAS contact page - www.efas.eu/contact

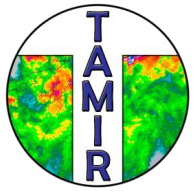
Part 2: Break-out session

Questions and virtual post-it notes (3*15 minutes)

- **Whiteboard 1**: Platform and data sources that you use
- **Whiteboard 2**: How to best share products and data
- **Whiteboard 3**: Technical requirements for local implementation

Whiteboard 1:
Current Platforms and Products





European Union
Civil Protection and
Humanitarian Aid

Sharing data and products

Christel Prudhomme, Calum Baugh, Corentin Carton-Wiart

European Centre for Medium-range Weather Forecast

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

CRAHI UPC Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

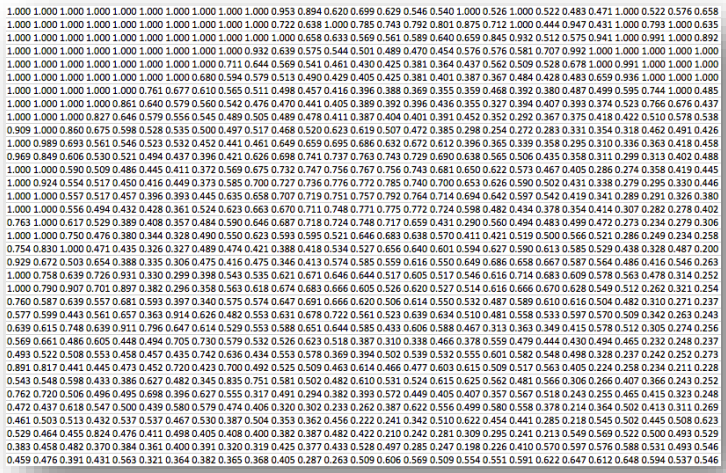
ECMWF

KYMPE
KYMENLAAKSON PELASTUSLAITOS

Expected TAMIR outputs

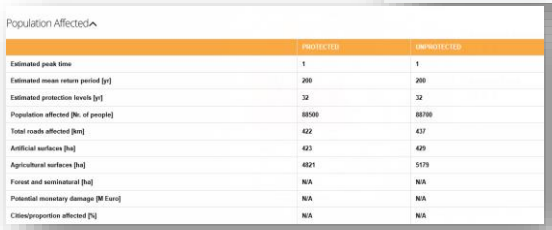
Data:

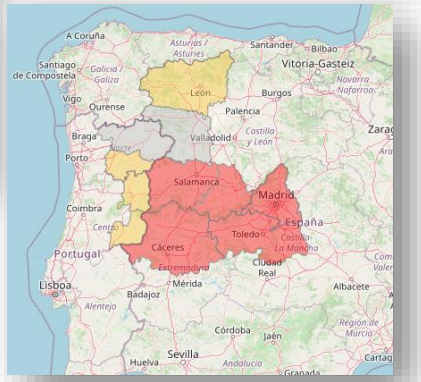
Raw model outputs, at the spatial/ temporal scale of the models



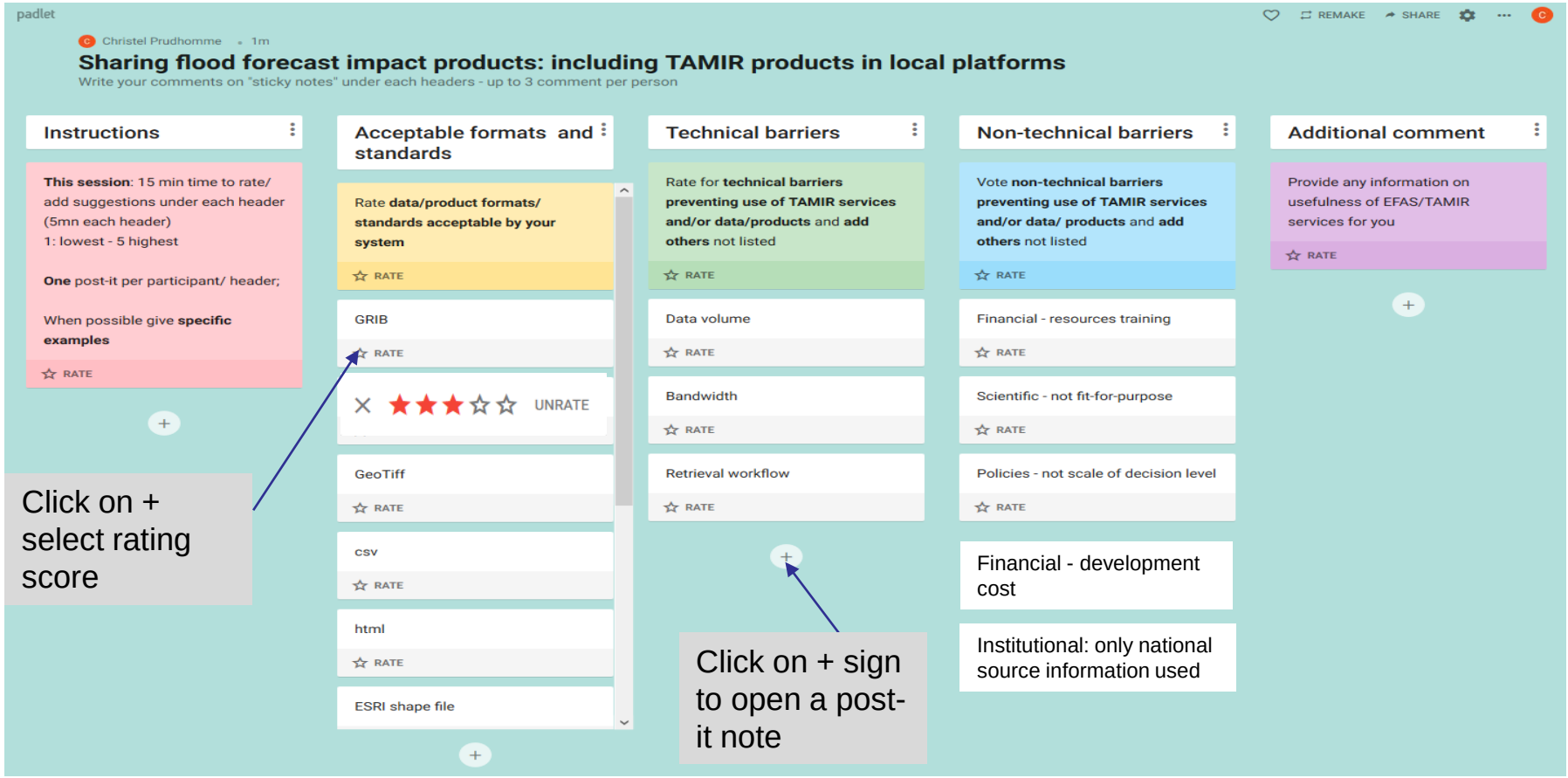
Product:

Transformed data to respond to specific questions and reduce volume





Whiteboard


padlet
REMAKE
SHARE
Christel Prudhomme · 1m
Sharing flood forecast impact products: including TAMIR products in local platforms
Write your comments on "sticky notes" under each headers - up to 3 comment per person
Instructions
This session: 15 min time to rate/ add suggestions under each header (5mn each header)
1: lowest - 5 highest
One post-it per participant/ header;
When possible give specific examples
RATE
Acceptable formats and standards
Rate data/product formats/ standards acceptable by your system
RATE
GRIB
RATE
UNRATE
GeoTiff
RATE
csv
RATE
html
RATE
ESRI shape file
Technical barriers
Rate for technical barriers preventing use of TAMIR services and/or data/products and add others not listed
RATE
Data volume
RATE
Bandwidth
RATE
Retrieval workflow
RATE
Non-technical barriers
Vote non-technical barriers preventing use of TAMIR services and/or data/ products and add others not listed
RATE
Financial - resources training
RATE
Scientific - not fit-for-purpose
RATE
Policies - not scale of decision level
RATE
Financial - development cost
Institutional: only national source information used
Additional comment
Provide any information on usefulness of EFAS/TAMIR services for you
RATE
Click on + select rating score
Click on + sign to open a post-it note

Anna Berruezo Parejas • 7m

Accessing flash flood products: local needs and customization

Write your comments on "sticky notes" under the headers.

Instructions

Write your comments & ideas under the headers. Yellow notes have assisting questions.

15 min time for this board, then moving to next board.

Voting for best comments after all boards have been gone through.

0 0

Other Comments & Questions:

0 0

+

Platform customization

Realtime or past events?

How do you consume your data?
- Realtime (upvote)
- Past events (downvote)

0 0

Products or raw data?

Your institution accesses mostly:
- Products (upvote)
- Processed data and simulation results (downvote)

Comment with examples.

0 0

Custom or preconfigured color palettes?

- Custom (upvote)
- Preconfigured (downvote)

Comment with other examples of customized preferences.

0 0

+

Data Management

Data retrieval method

How do you get your data?
Comment with your answer.
Examples:
- Custom platform
- System scripts
- Web service

0 0

Programming language

What language do you use to work on your data?
- Licensed language: IDL, Matlab... (upvote)
- Open-source language: R, Python... (downvote)

Other options (e.g. GIS, commercial platform), please comment

0 0

+

Policies

Security requirements

Does your organization have security management or access to data requirements?

0 0

Different languages support

Do you support different languages? If so, how does it affect your products?

0 0

+

Technical instructions for sessions and move to breakout rooms – in short

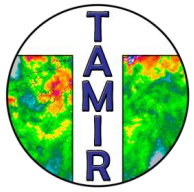
1) You will be assigned to the breakout rooms (click "Join" when prompted)
2) Each topic takes approximately 15 minutes
3) Links to these Whiteboards (padlets) are given in the breakout room chat
4) You are expected to provide your inputs through virtual post-it notes to the presented questions
5) Questions, technical or from the topic, in the breakout rooms can be given through the chat or "raising your hand"
6) After going through all topics you will be automatically returned to main session.

Wrap-up and plans for future

1) Report, distributed to the participants

2) Survey and feedback

1) End-user workshop in 2022



European Union
Civil Protection and
Humanitarian Aid

Thank you!

Questions?

tamir@fmi.fi / www.tamir-project.eu