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Global warming now and in the future

Relevance for Rescue Services

Juhani Damski,
Director General,
The Finnish Meteorological Institute

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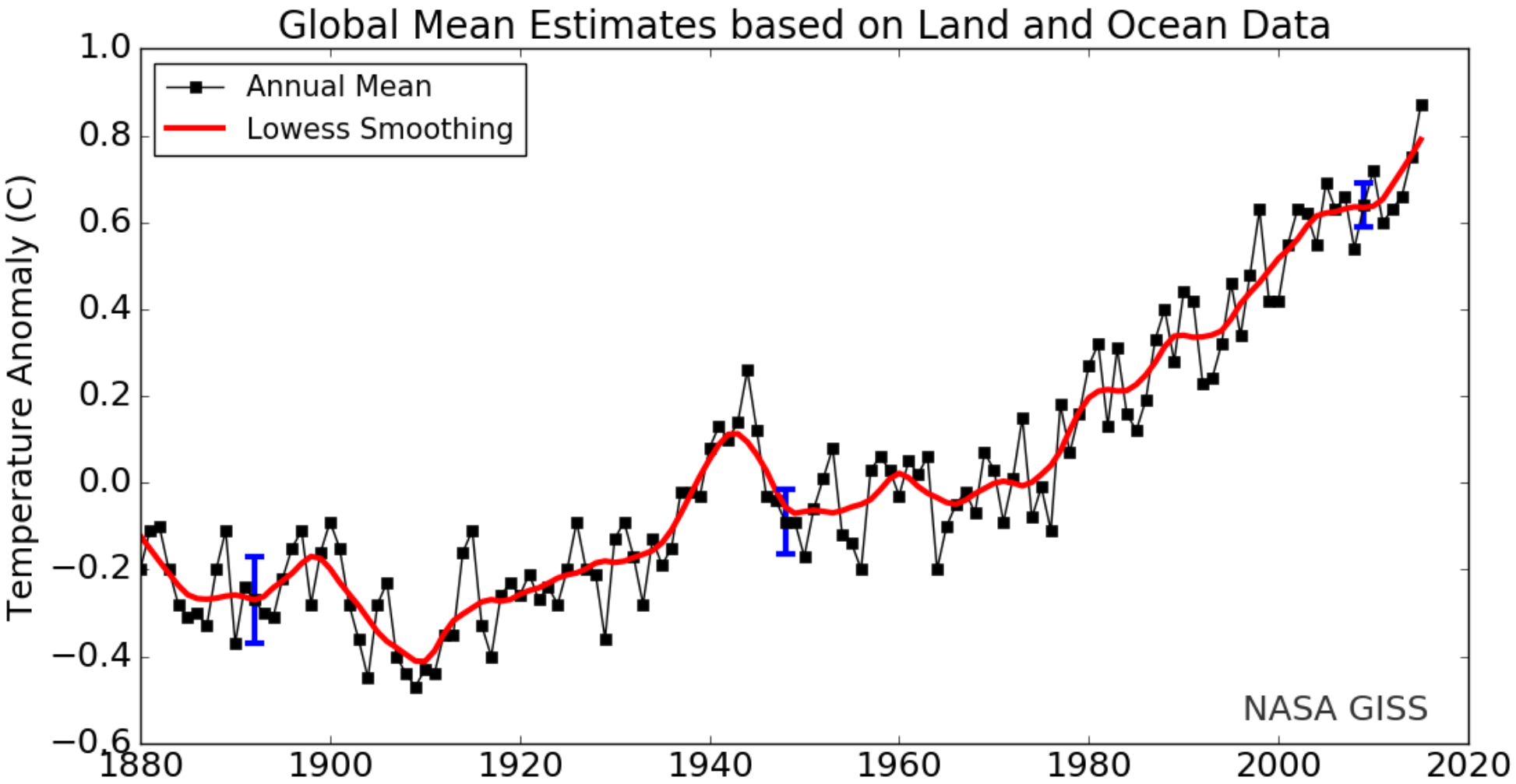
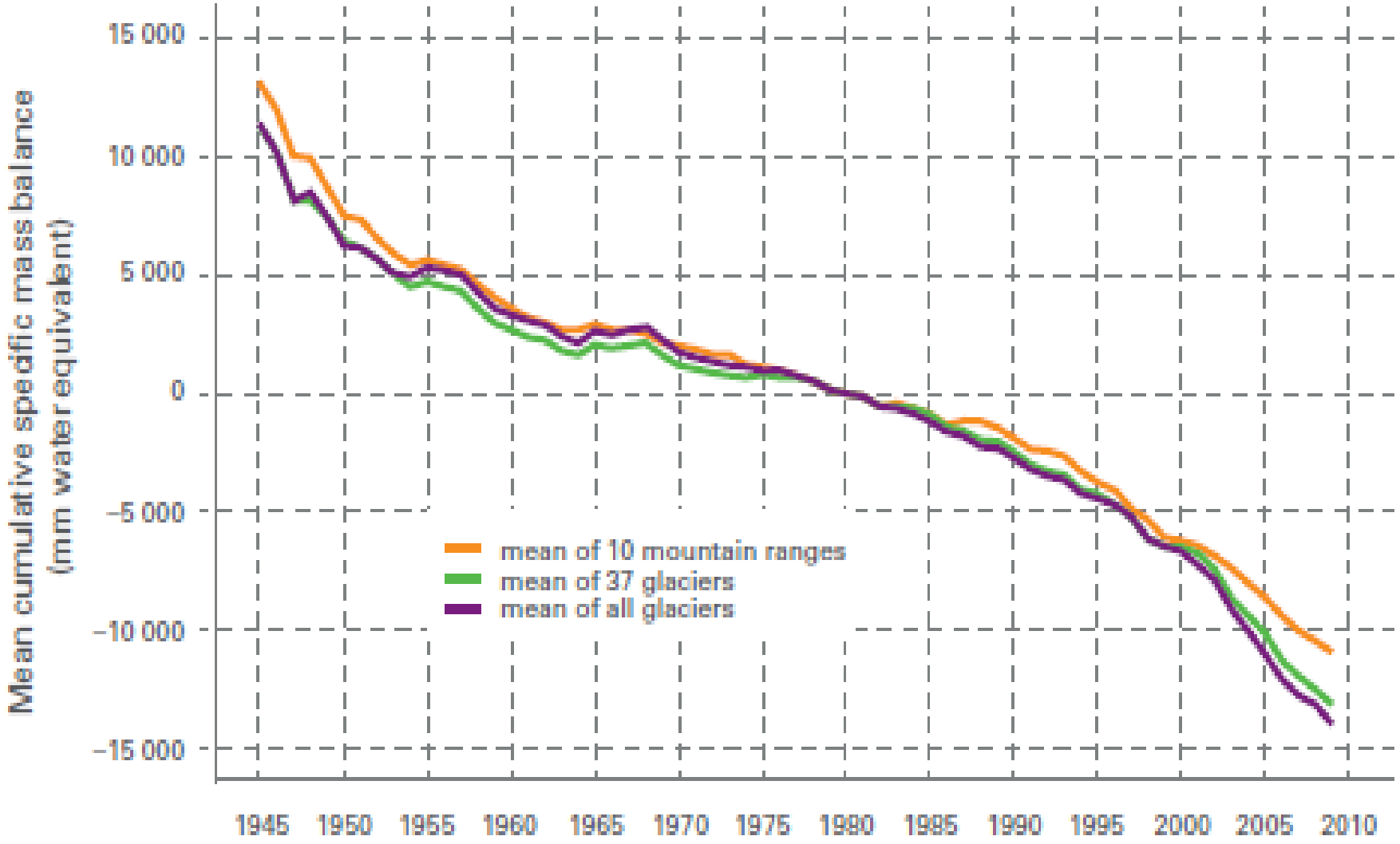
Global temperature is rising



http://data.giss.nasa.gov/gistemp/graphs/

MELTING OF GLACIERS 1945-2010

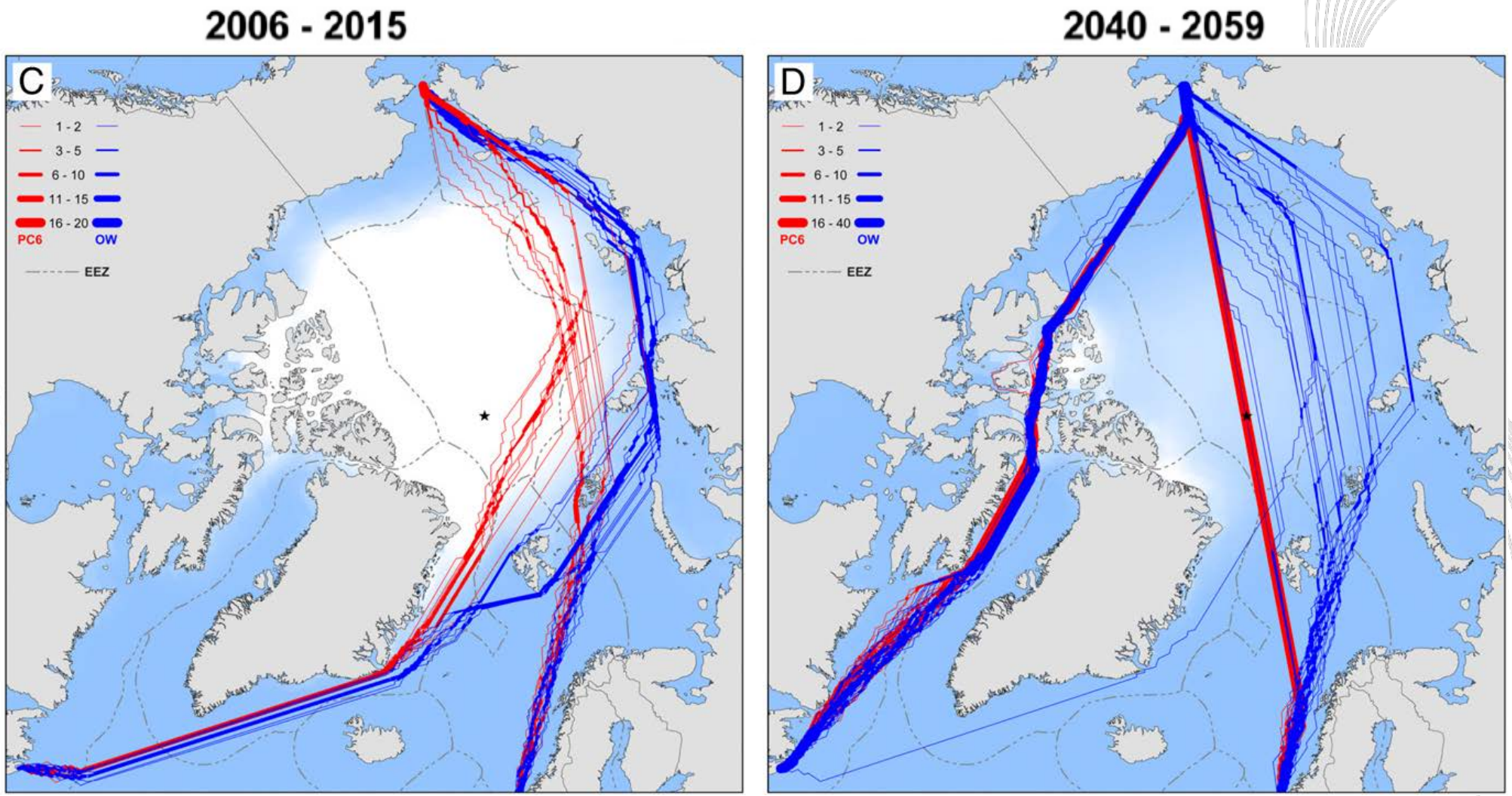
Figure 10. Mean cumulative specific glacier mass balance since 1945/1946 (*source: World Glacier Monitoring Service*)



ARCTIC SEA ROUTES IN SEPTEMBER 2006-2059

RED=ICE STRENGHTENED VESSEL, BLUE=NOT

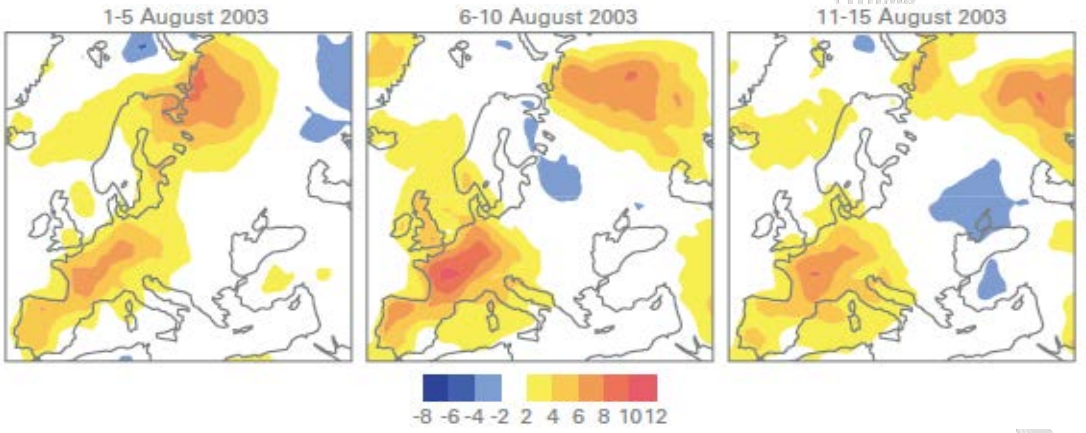
RCP 8.5



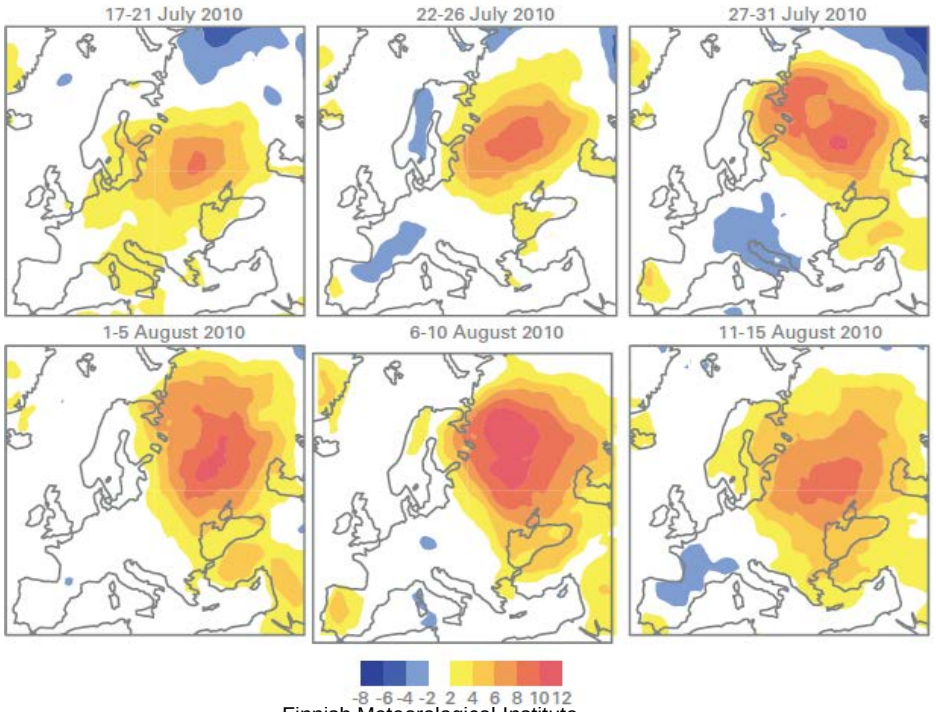
L. Smith, 2014

Heat waves in Europe 2003, 2010, ... 2016?

August 2003, 66 000 Deaths

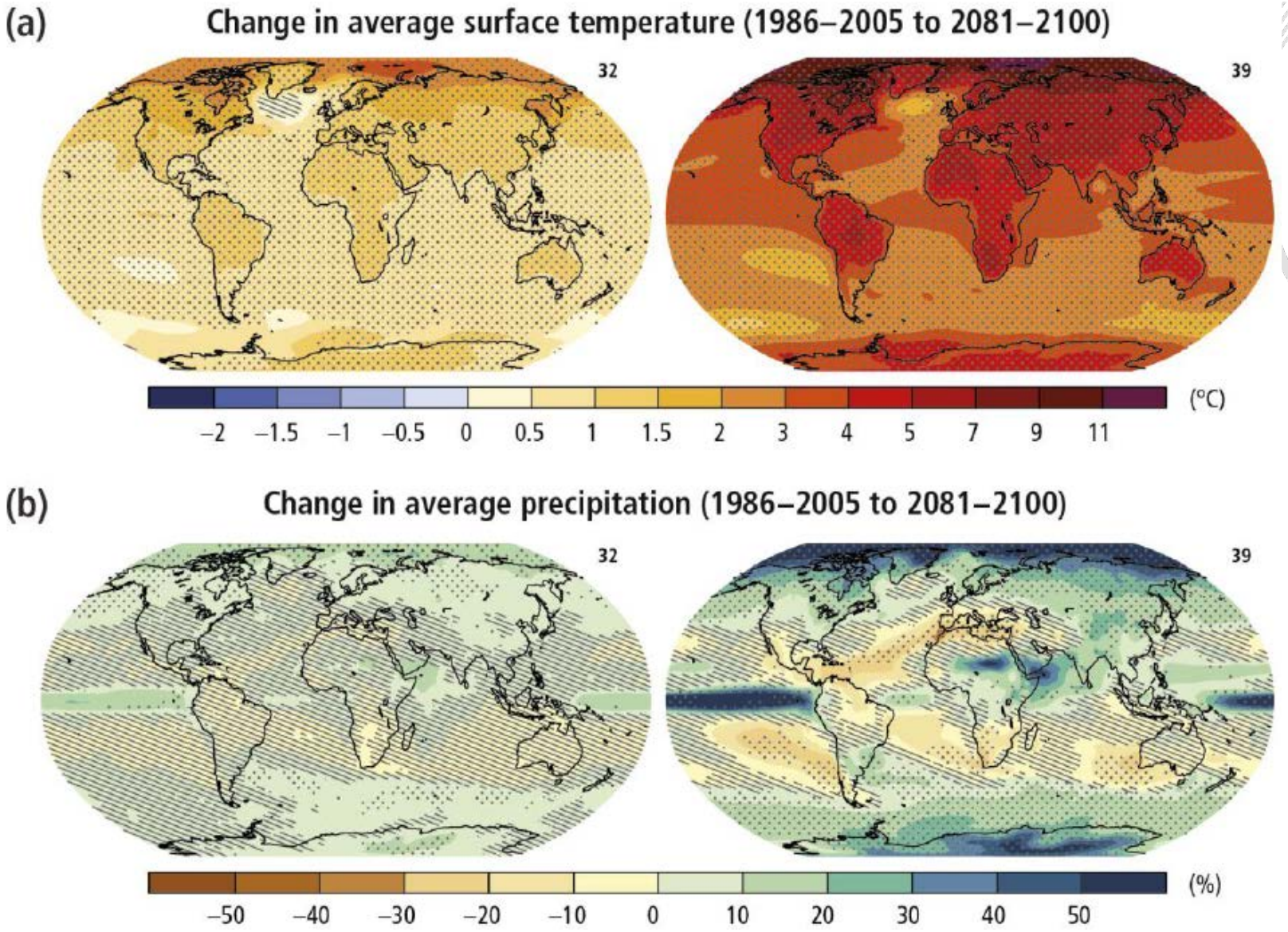


July-August 2010, 55 000 Deaths



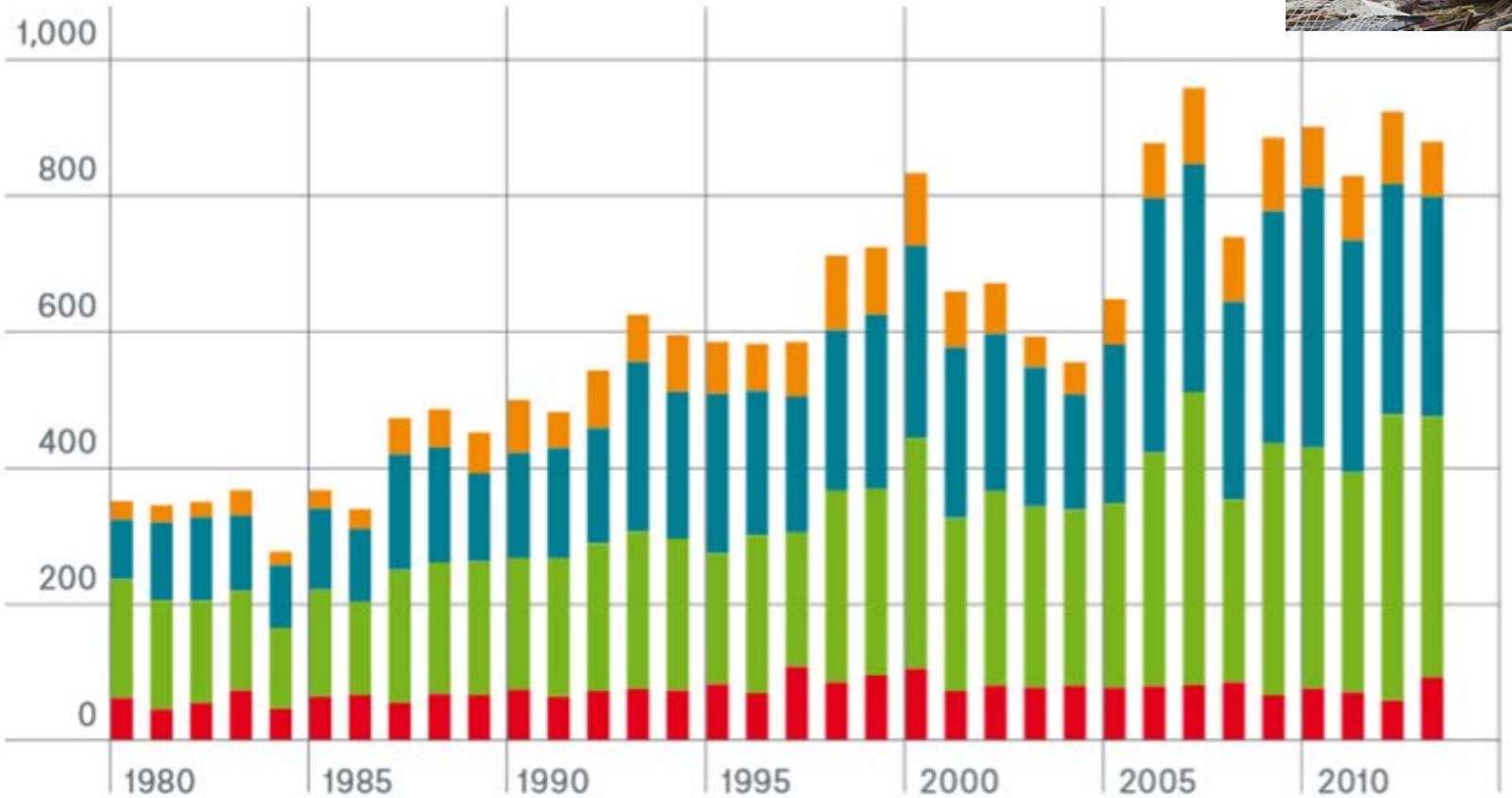
TEMPERATURE & PRECIPITATION 2081-2100/1986-2005

TWO DEGREE GOAL BUSINESS AS USUAL



AMOUNT OF LARGE DISASTERS GROWING

Number of loss events 1980–2013

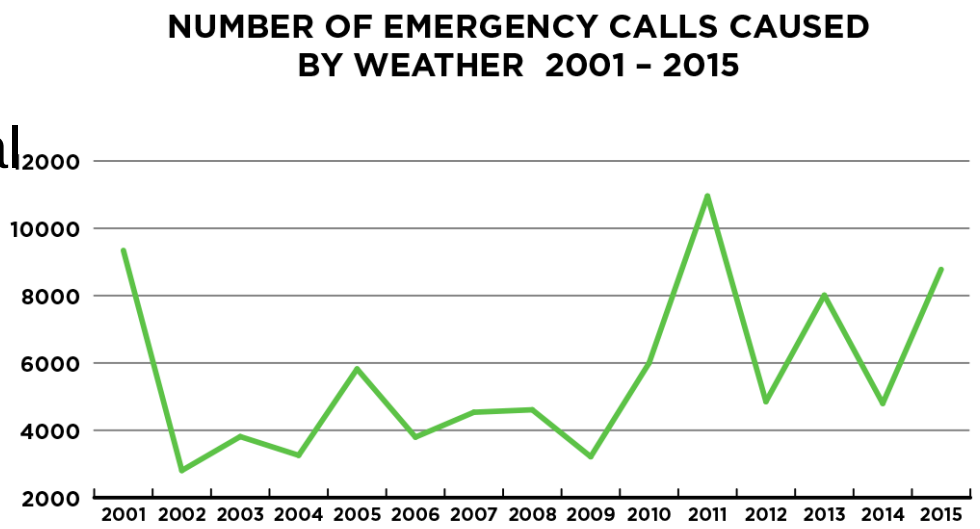


Weather has high impact on rescue service operations in Finland

Weather has caused more damages in 2010s than in the previous decade

In 2010–2015, the number of annual rescue operations has been > 5000 (see also 2000–2009)

The proportion of damage prevention tasks of the rescue service has increased during this decade



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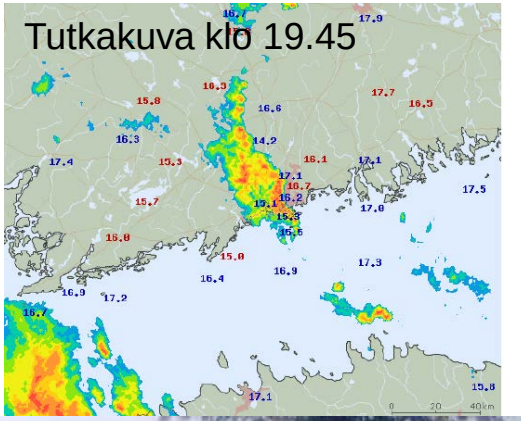
Extreme weather causes multiple problems



http://www.mtv3.fi

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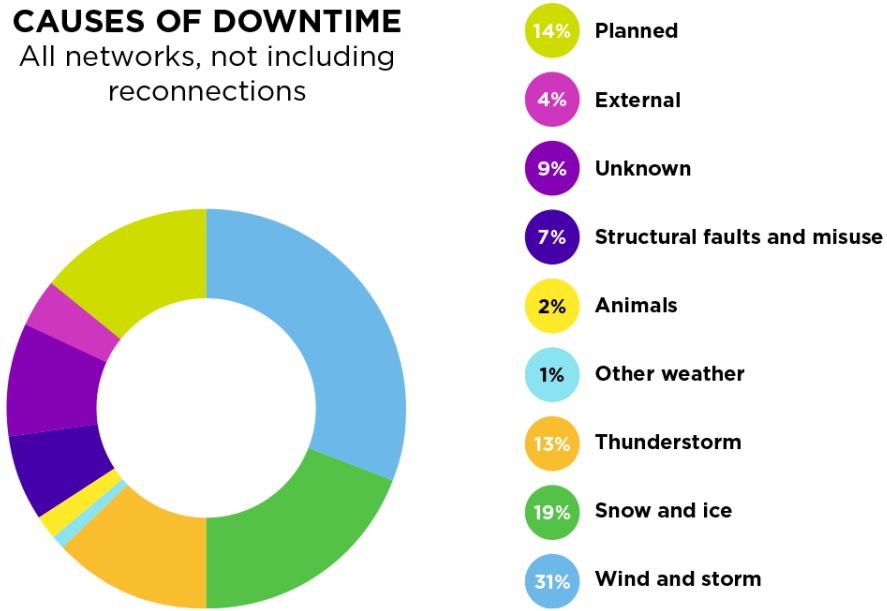
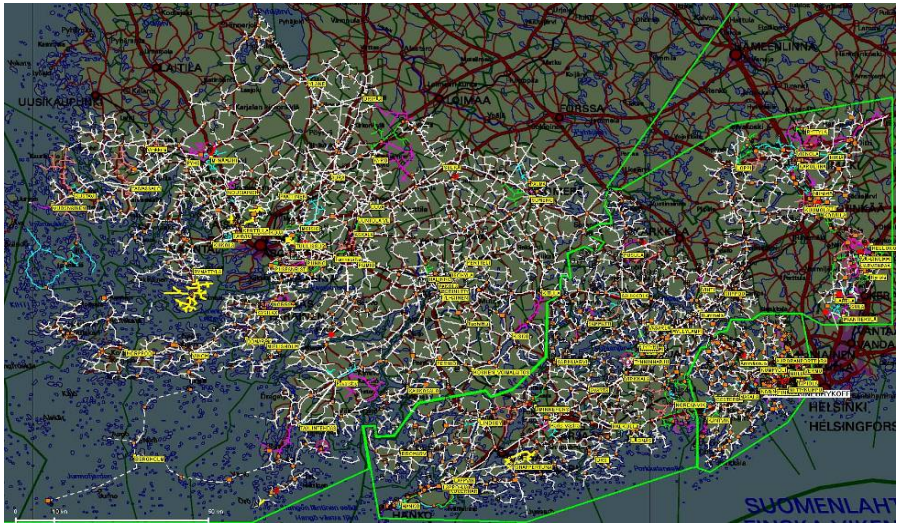
In Finland, weather is the most significant cause of disruptions to electricity supply



Source: Finnish Energy;
Downtime statistics 2014



Disruptions in energy supply caused by Tapani storm 2011

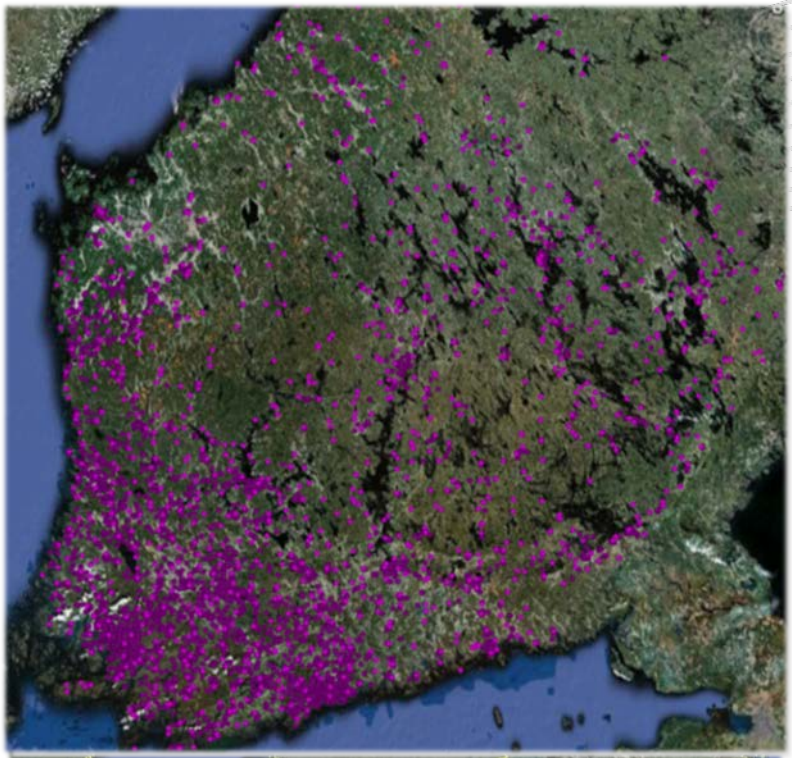
Source: Fortum oyj

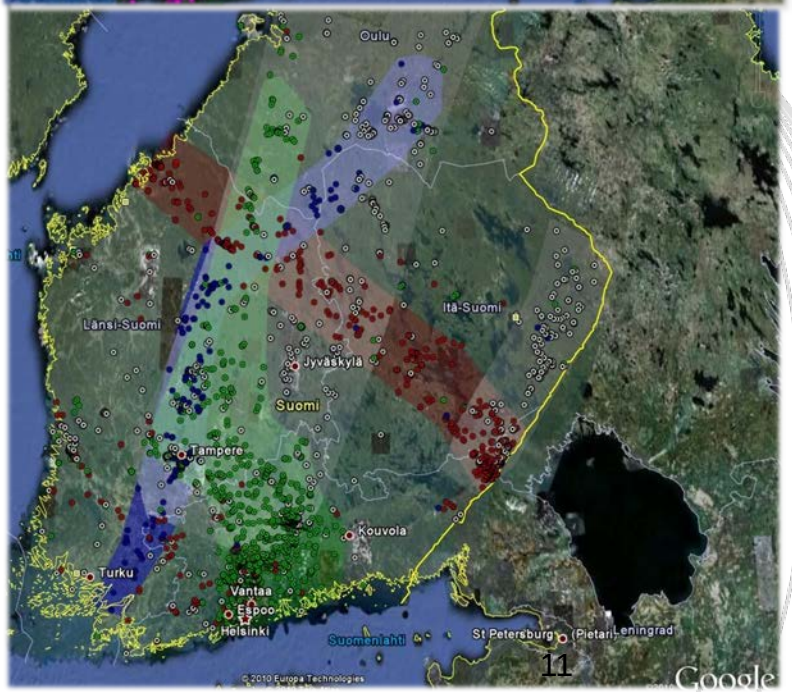
Severe storms in Finland

Rescue operations caused by weather

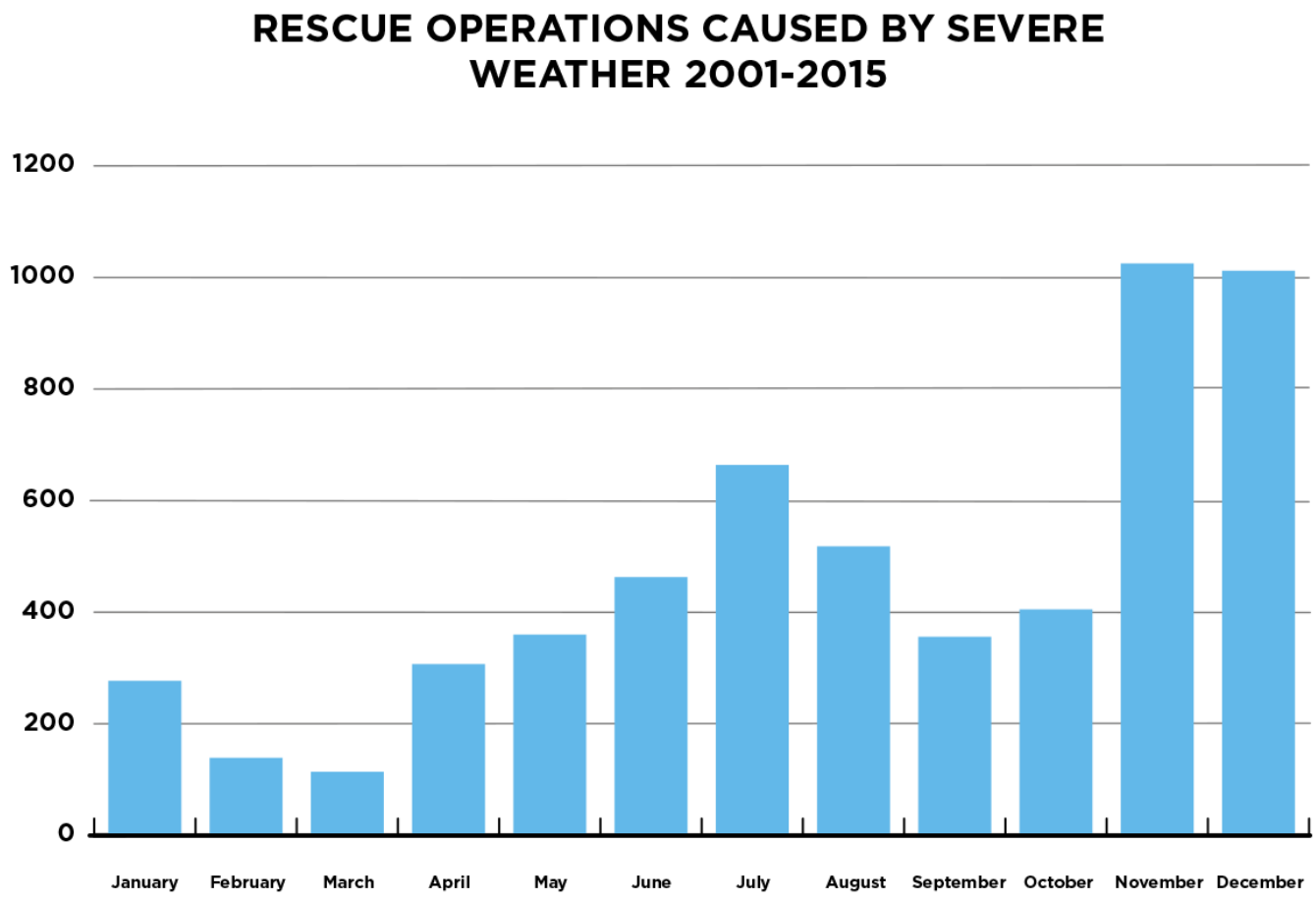
1.	Tapani-Hannu 26.–27.12.2011	5849
2.	Janika 15.-16.11.2001	5784
3.	Seija 13.12.2013	2072
4.	Rauli 27.8.2016	~2000*
5.	Eino 17.11.2013	1773
6.	**Valio 2.10.2015**	**1585**
7.	Lahja-Sylvi 7.–8.8.2010	1316
8.	Pyry 1.11.2001	1271
9.	Mielikki 23.9.2003	1021
10.	Martti 10.11.2008	911
11.	Helena 31.7.2014	872
12.	Unto 4.-5.7.2002	826
13.	**Lyyli 23.5.2015**	**750**
14.	Summer storms 12.6.2010	741
15.	**Suoma 8.4.2015**	**731**
16.	Floods 28.-31.7.2004	721

*Preliminary information





Monthly rescue operations in Finland



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Finnish National Risk Assessment 2015

EU ground

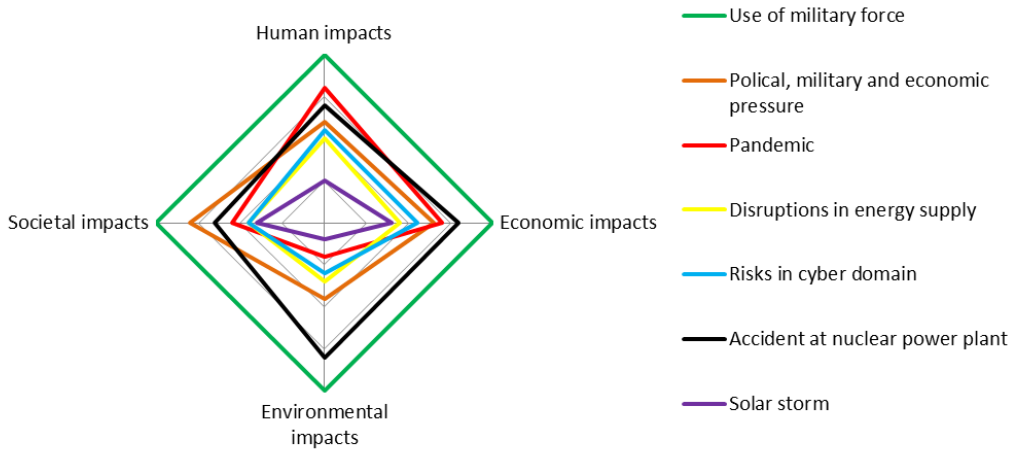
Member States shall develop risk assessments at national level in accordance with the EU's Decision on a Union Civil Protection Mechanism

Goal

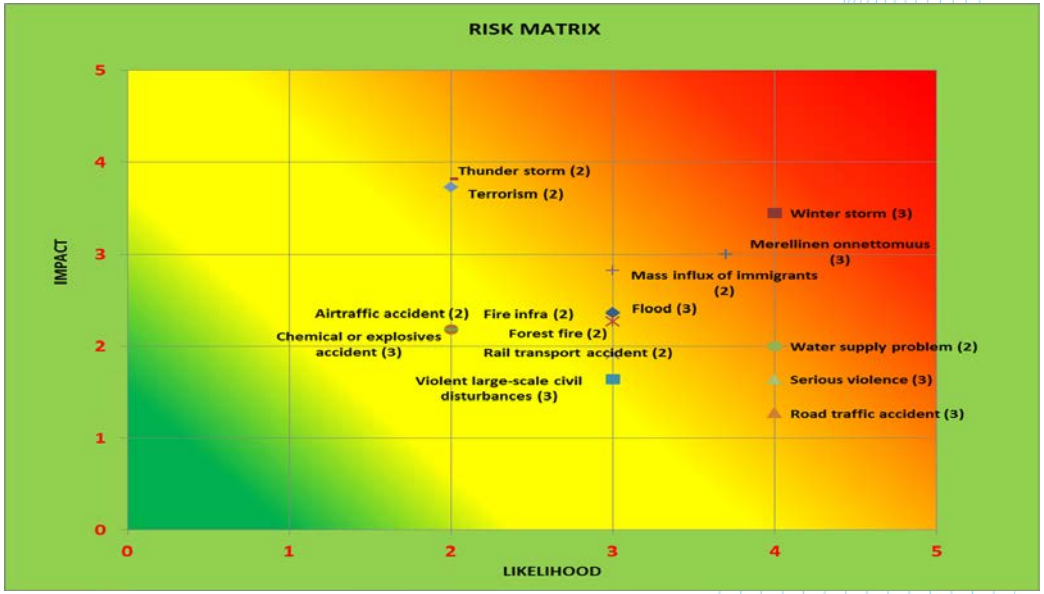
To distinguish unanticipated events that focus on Finland that would cause considerable impacts on humans, the economy and the environment or on society

On the basis of the probabilities and impacts 21 event scenarios for were selected and divided into two categories

- Significant events affecting society
- Serious regional events



Descriptive correlations between significant events affecting society



Serious regional events shown in a risk matrix

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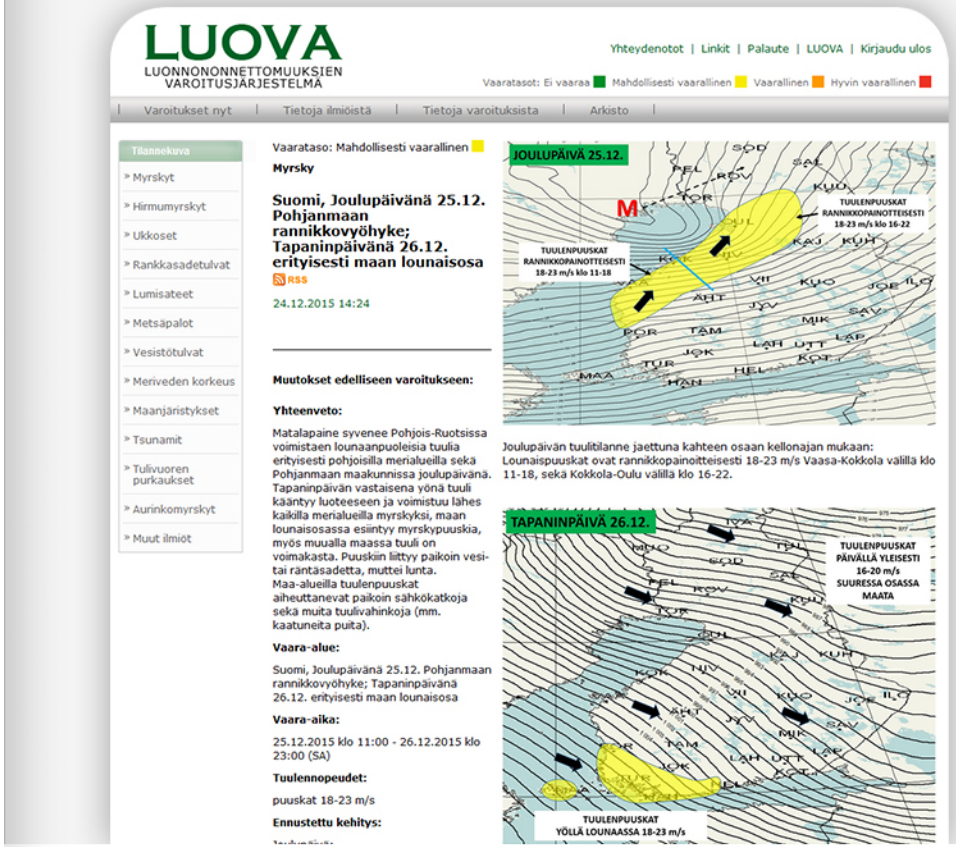
LUOVA

Monitoring Center of Natural Disasters

- 24/7 monitoring at FMI
- Information provided by FMI (weather phenomena), Finnish Environmental Agency (floods), University of Helsinki/Seismology (earthquakes)
- Early warnings, risk assesments to support preparedness and decision-making
- Information provided to ministries, authorities

Web portal, email, SMS, videobriefings

In 2014, LUOVA was granted “Timanttiteko” – award by the Security and Defence Committee for its significant action for the safety of population and society



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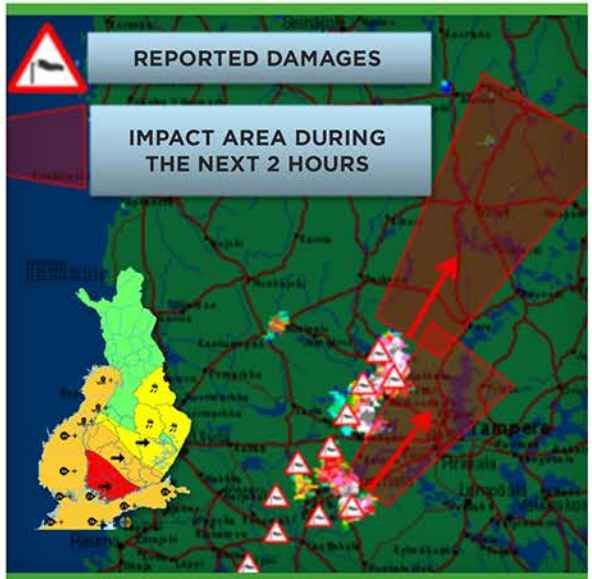
MONITORING

LUOVA MONITORING: FIRST SIGNAL AS MANY AS 5-10 DAYS IN ADVANCE

Monitoring tool operating with the 'one screen, one glance' principle for maintaining an overview of the situation

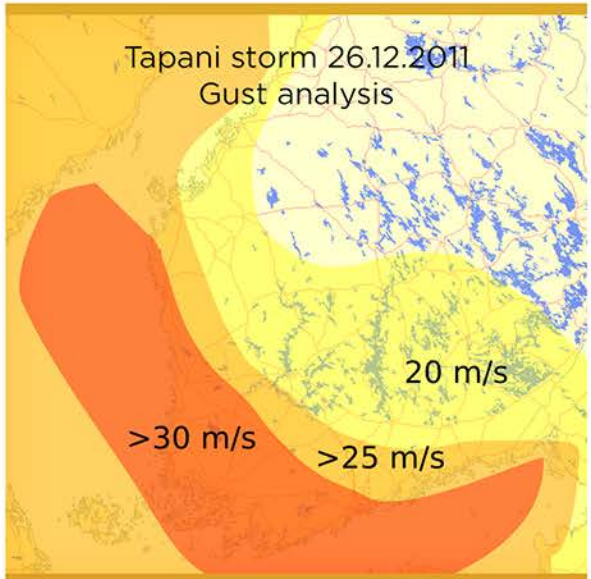
WARNING



LUOVA ANNOUNCEMENTS, 24/7 WEATHER WARNING SERVICE, VIDEO BRIEFINGS, TWITTER

Interactive and real-time warning service provided by meteorologists specialised in dangerous weather conditions

AFTERCARE



PRELIMINARY IMPACT ASSESSMENTS VERY SOON AFTER STORM HAS PASSED

Impact area, strength of impact and climatic frequency of event

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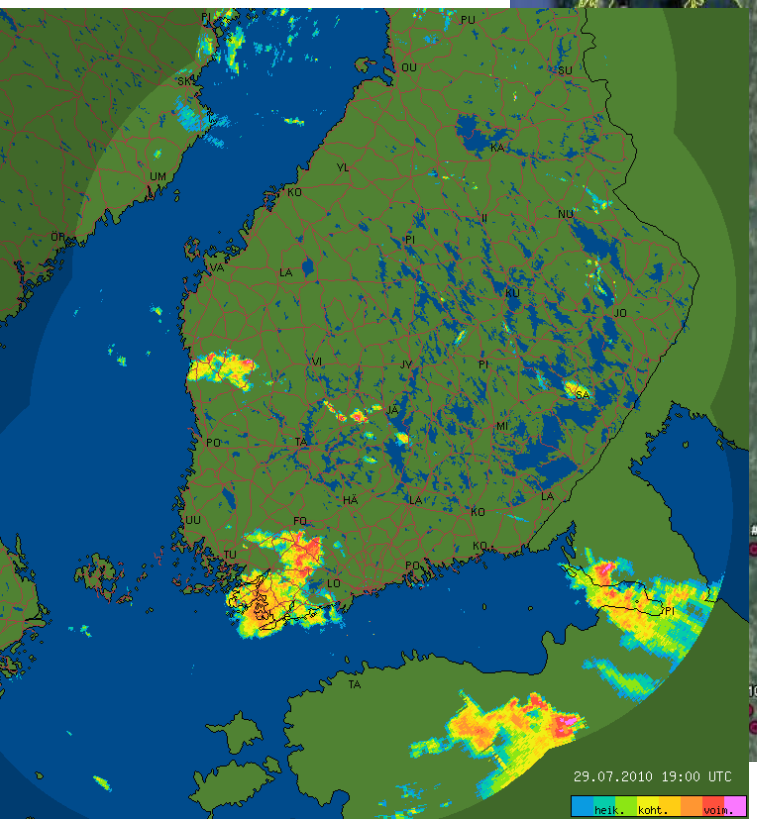
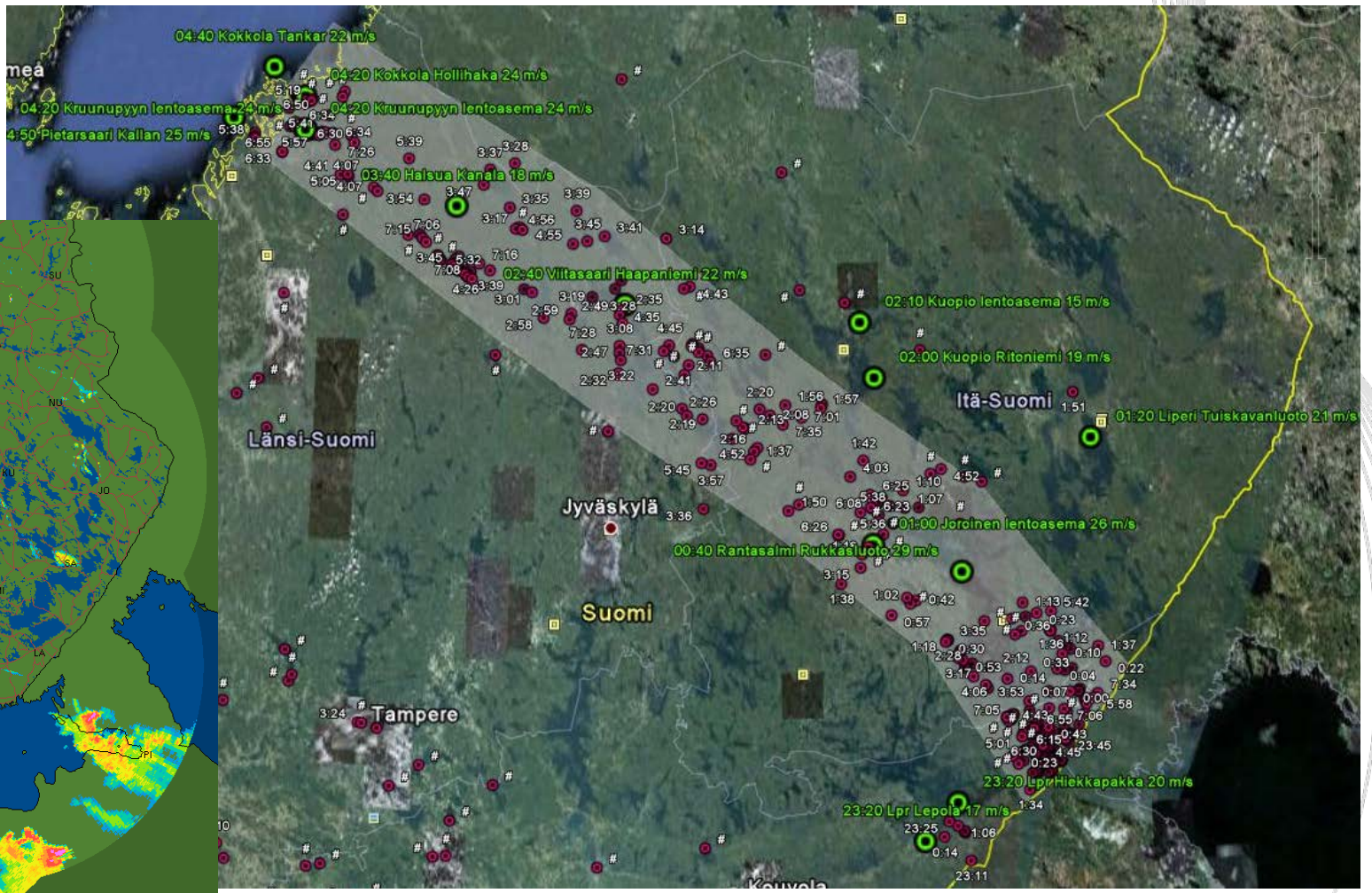
Wind observations and damages caused by Asta storm 29.–30.7.2010





Ari-Juhani Punkka & Paavo Korpela

Phenomena covered by LUOVA

LUOVA –alert threshold is exceeded, when natural disasters affect Finnish population, economy or critical infrastructure in Finland

- Storms – (Europa)
- Tropical storms – (Global)
- Forest fires (Europa)
- Thunderstorms (Finland)
- Heavy rain (Finland)
- Snowstorm (Finland)
- Sea water level (Finland)
- Floods (Finland)
- Earthquakes (Global)
- Volcanic eruption (Europa)
- Tsunamis (Global)
- Solar radiation storm (Finland)

Users - specialised user groups

- Prime Minister's Office - situation awareness centre
  - Maintenance of the security-related situation picture
- Ministry for Foreign Affairs
  - Assistance and advise Finnish nationals in distress abroad
- Ministry of the Interior
  - Maintenance of internal security and rescues services
- Ministry of Agriculture and Forestry
  - Flood risk management
- Defence forces
  - Provide executive assistance
- The Finnish Red Cross
  - National and international aid work
- Rescue Departments
  - Rescue operations

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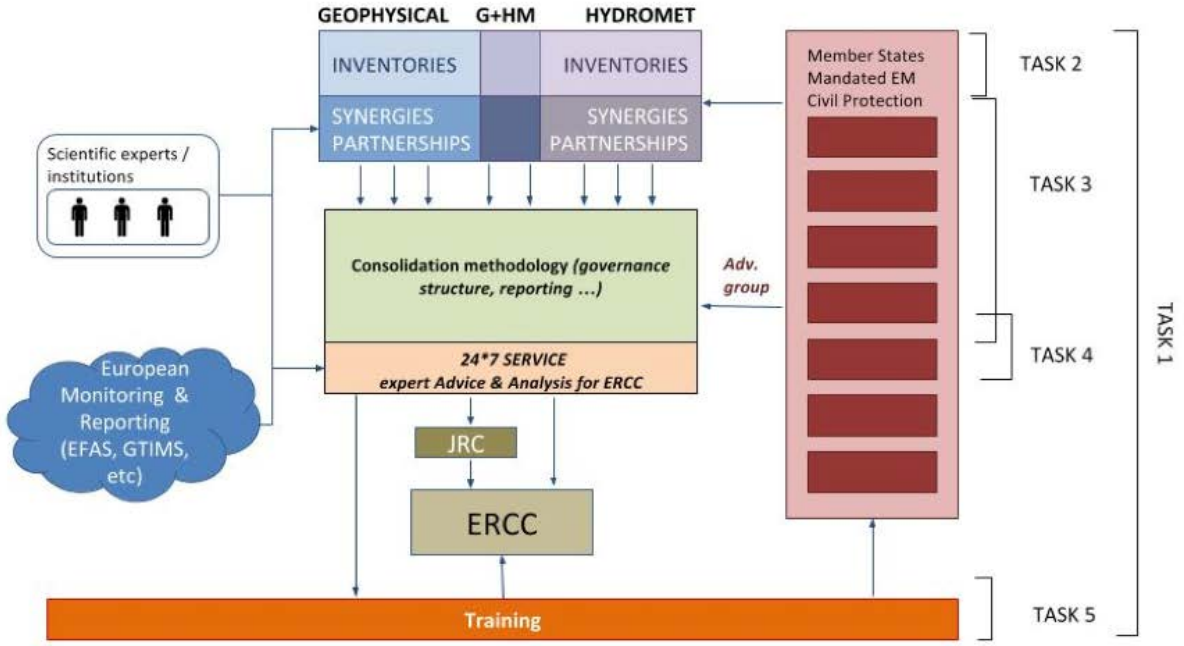
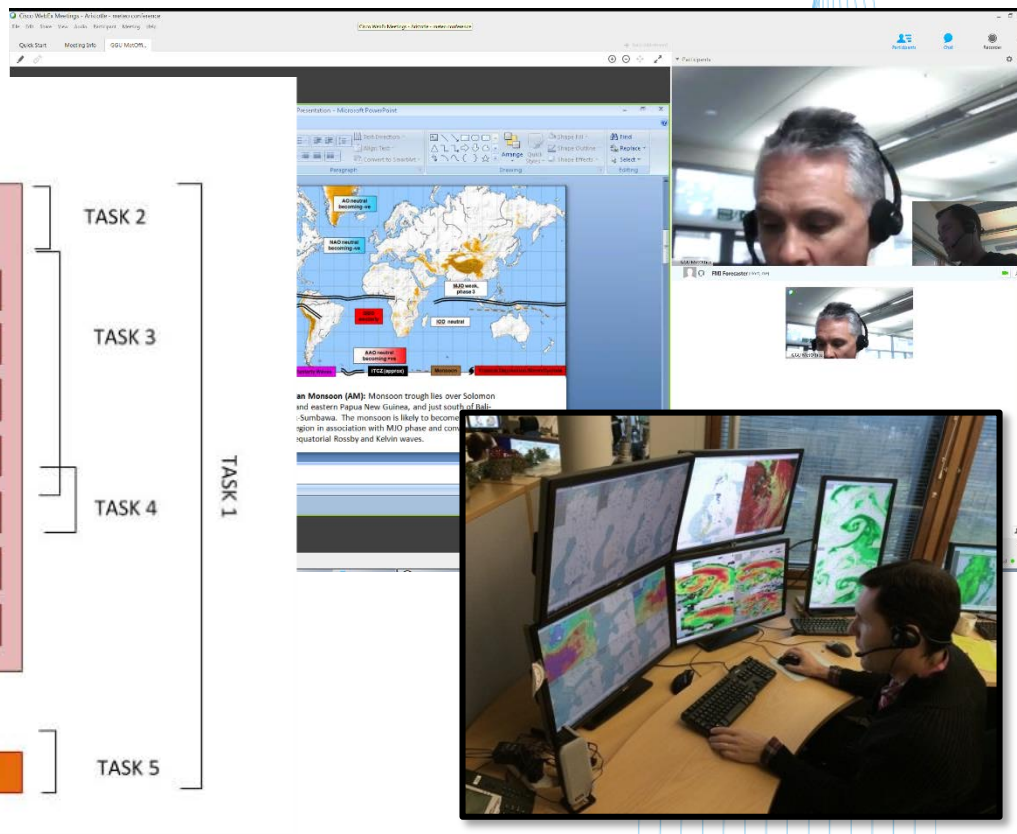
Aristotle-pilot

- All Risk Integrated System TOwards Trans-boundary hoListic Early-warning
- Create a pool of experts in the field of Meteorology and Geophysics of Europe that can support the ERCC with regard to situation assessments in crisis situations.
- Operational trial between UK and Finland started in April 2016
- Videoconferences twice a week





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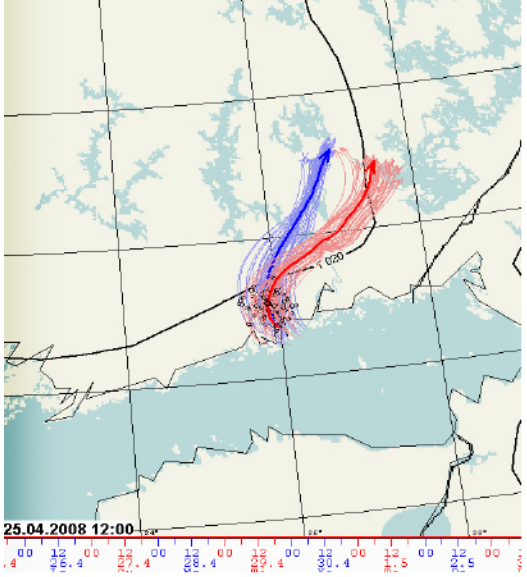
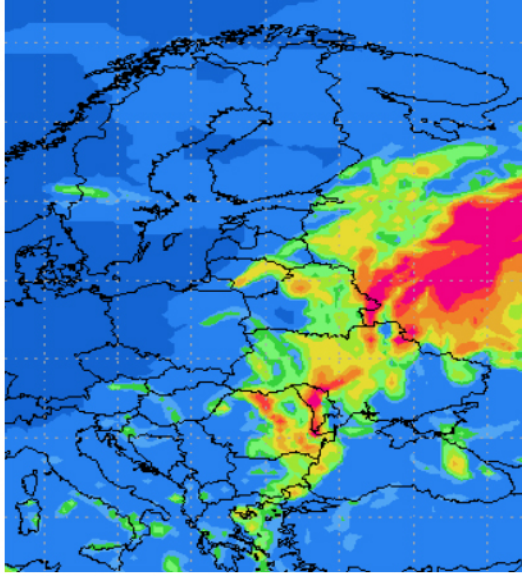
Special situations

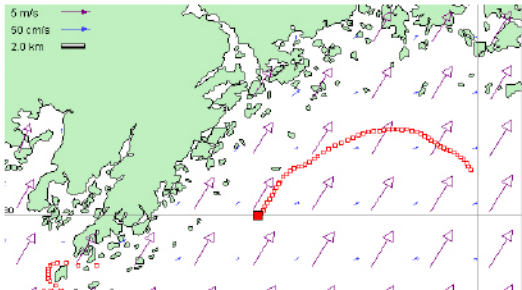
FMI supports other authorities in special situations

Services:

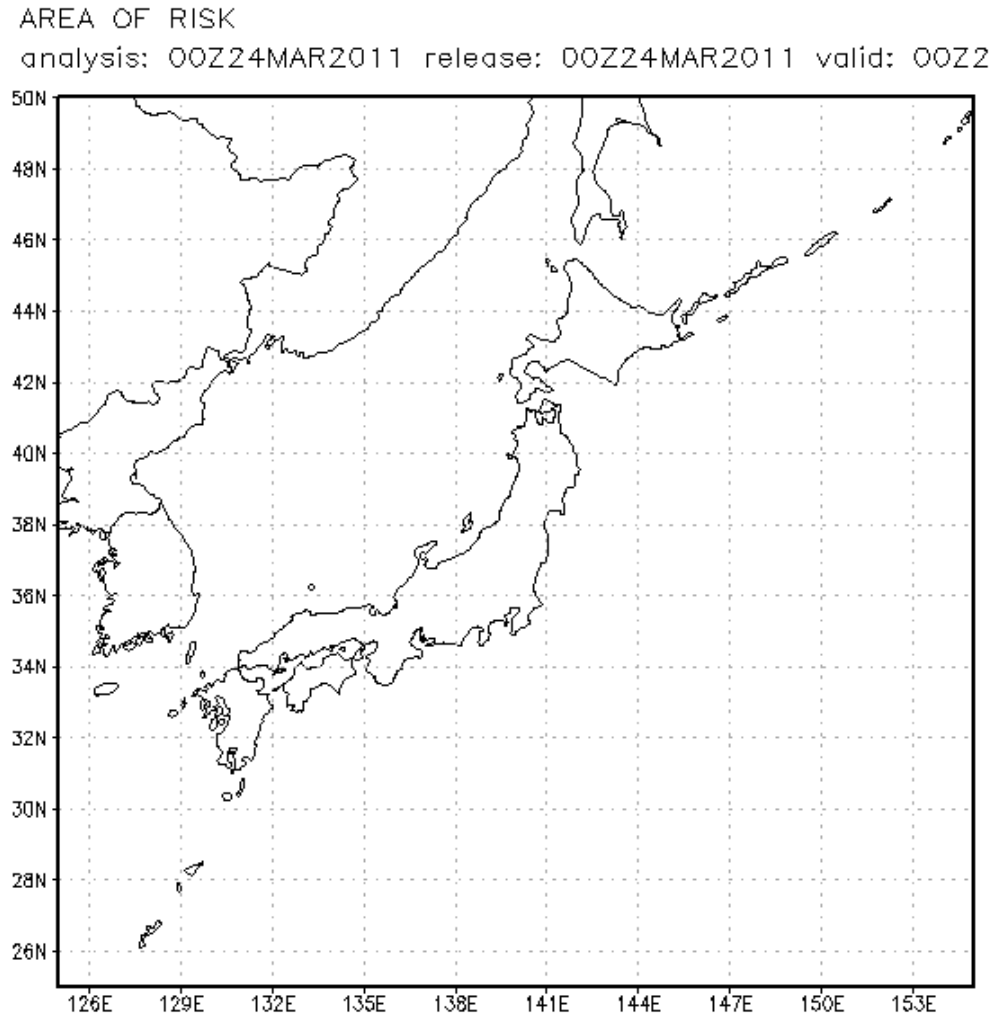
- Weather conditions
- Trajectory and dispersion modelling (e.g. radiation)
- Drift modelling (marine rescue operations, oil spillage)
- Trajectory modelling (e.g. volcano eruptions, forest fires, hazardous substances)



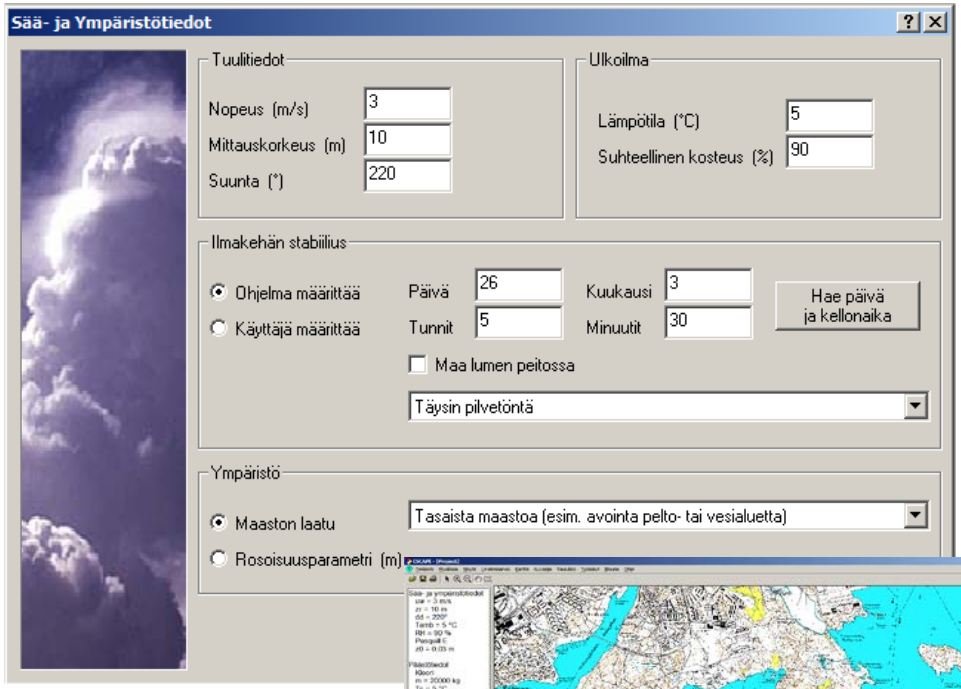


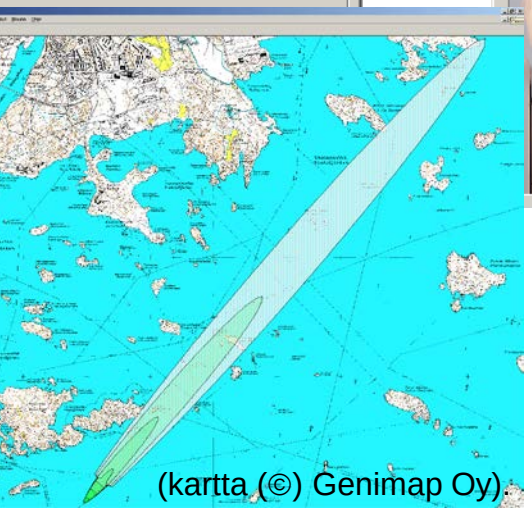


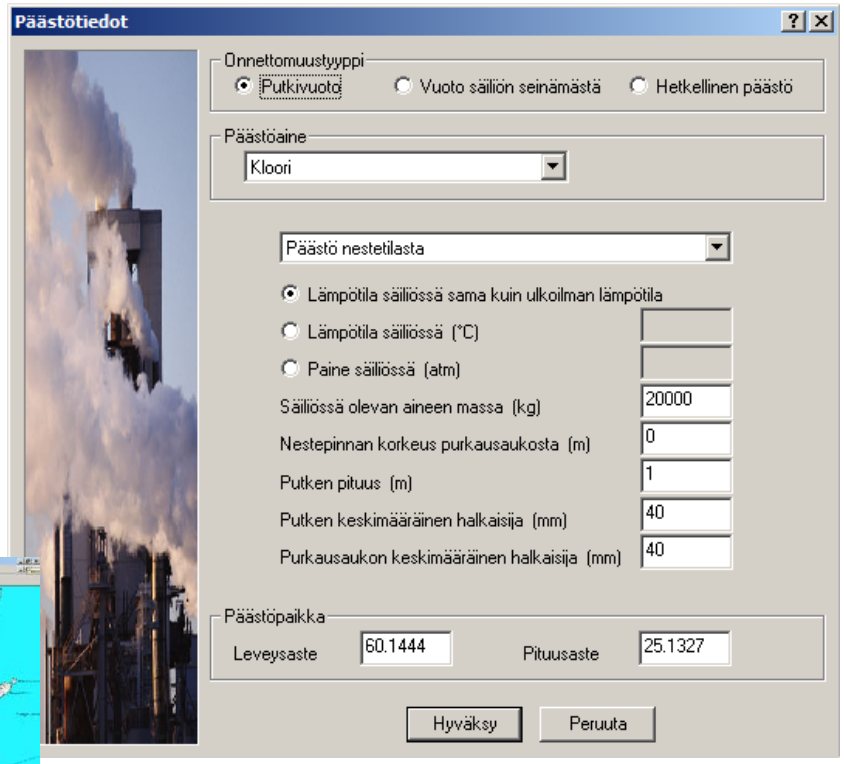
Fukushima: Trajectory calculations



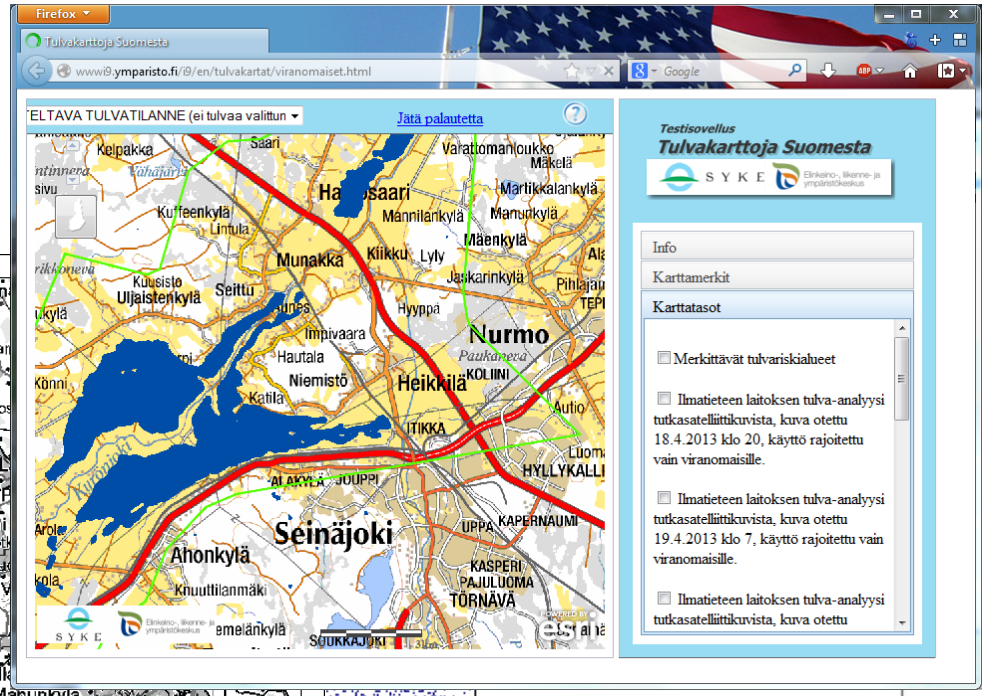
Dispersion modelling for chemicals - ESCAPE

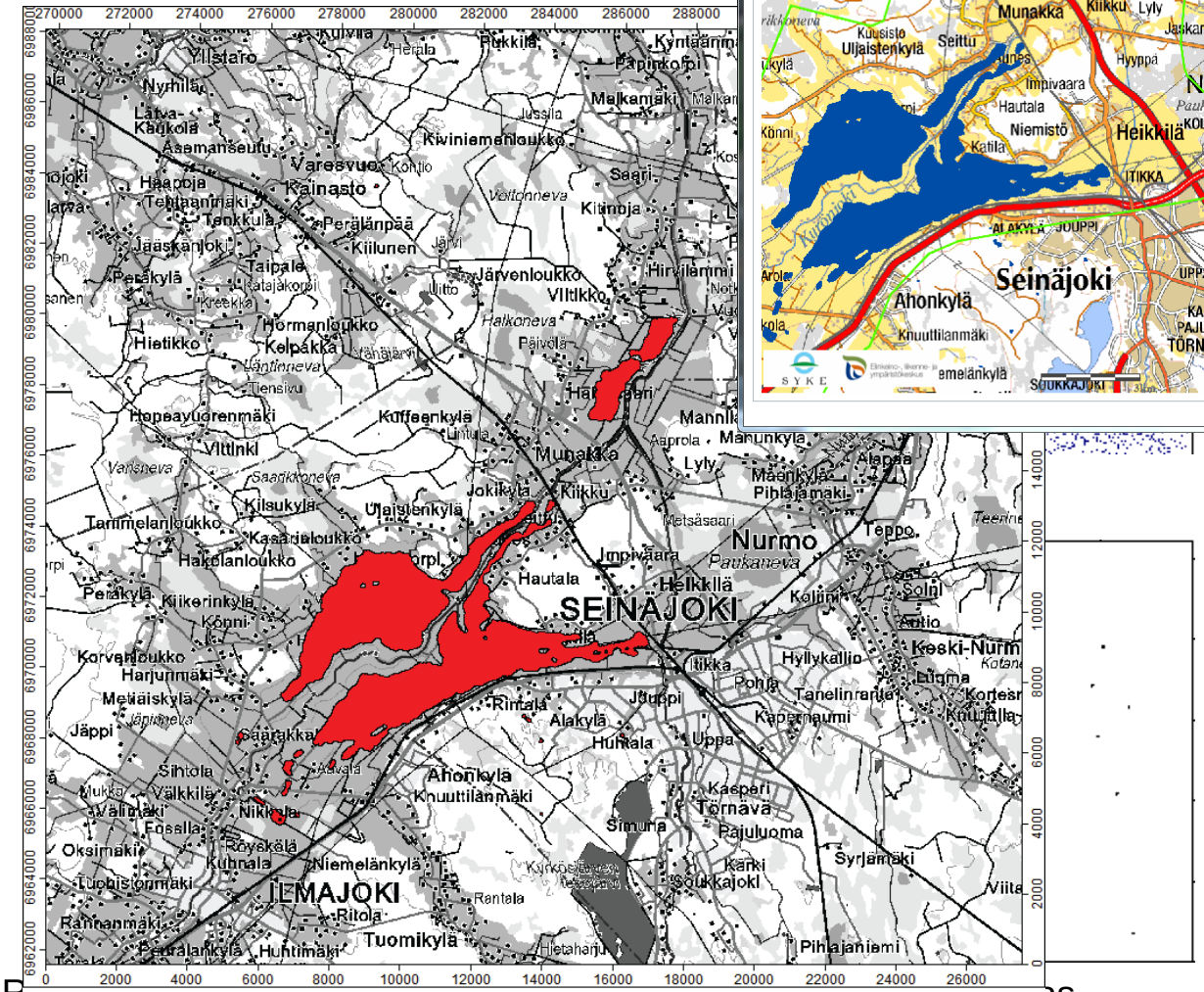






Flood analysis





Water detection
(using treshold value)

Removal of the natural waters and bogs
(rivers, lakes etc.)

Majority filter
(degrease noise)

Output writing

Web pages

- 2nd most valued web brand in Finland
  (Taloustutkimus 2015)
- 58 % of the active Finnish internet users visit fmi.fi at least occasionally (Taloustutkimus 2008)
- Amount of visitors 280 000 / day on average
- All-time high almost 650 000 visitors during stormy weather (June 27th, 2013)
- Local weather for over 17 000 locations in Finland, thousands abroad
- Social media: Twitter, YouTube, Facebook, LinkedIn, Flickr

Weather app

- Free of charge app for iOS, Android and Windows devices
- Local weather for 17 000 locations in Finland, thousands abroad
- Observations
- Warnings
- Weather services based on user's location

Social media

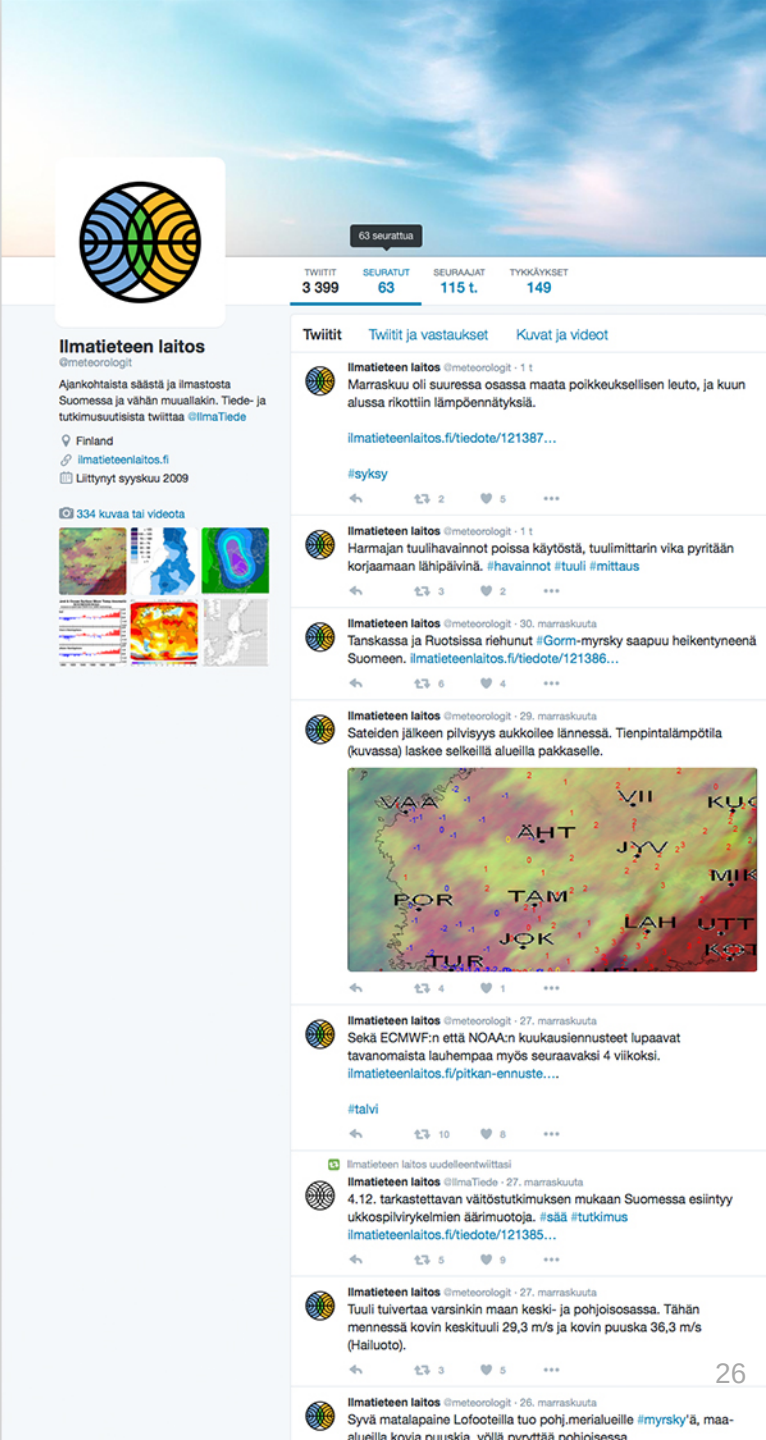
Twitter
- @meteorologit: ~ 127 000 followers, weather information
- @IlmaTiede: ~ 4000 followers, science and research communications

YouTube
- FMI-TV
- Expert interviews

Facebook
- FMIBeta – information about open data, product development

LinkedIn

Flickr



Open data

- Open data web service since 2013
- All FMI's observations, forecast and weather model information
- Open data from FMI's partners
  - Finnish Transport Agency: road condition observations
  - Cities: air quality observations
  - Radiation and Nuclear Safety authority: radiation observations
  - About 9000 registered users (1/2016)
- Dozens of new applications created from FMI's open data

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Be prepared for new and old!

23.2. 2008

23.2. 2011

Kuvat: Ilkka Juga

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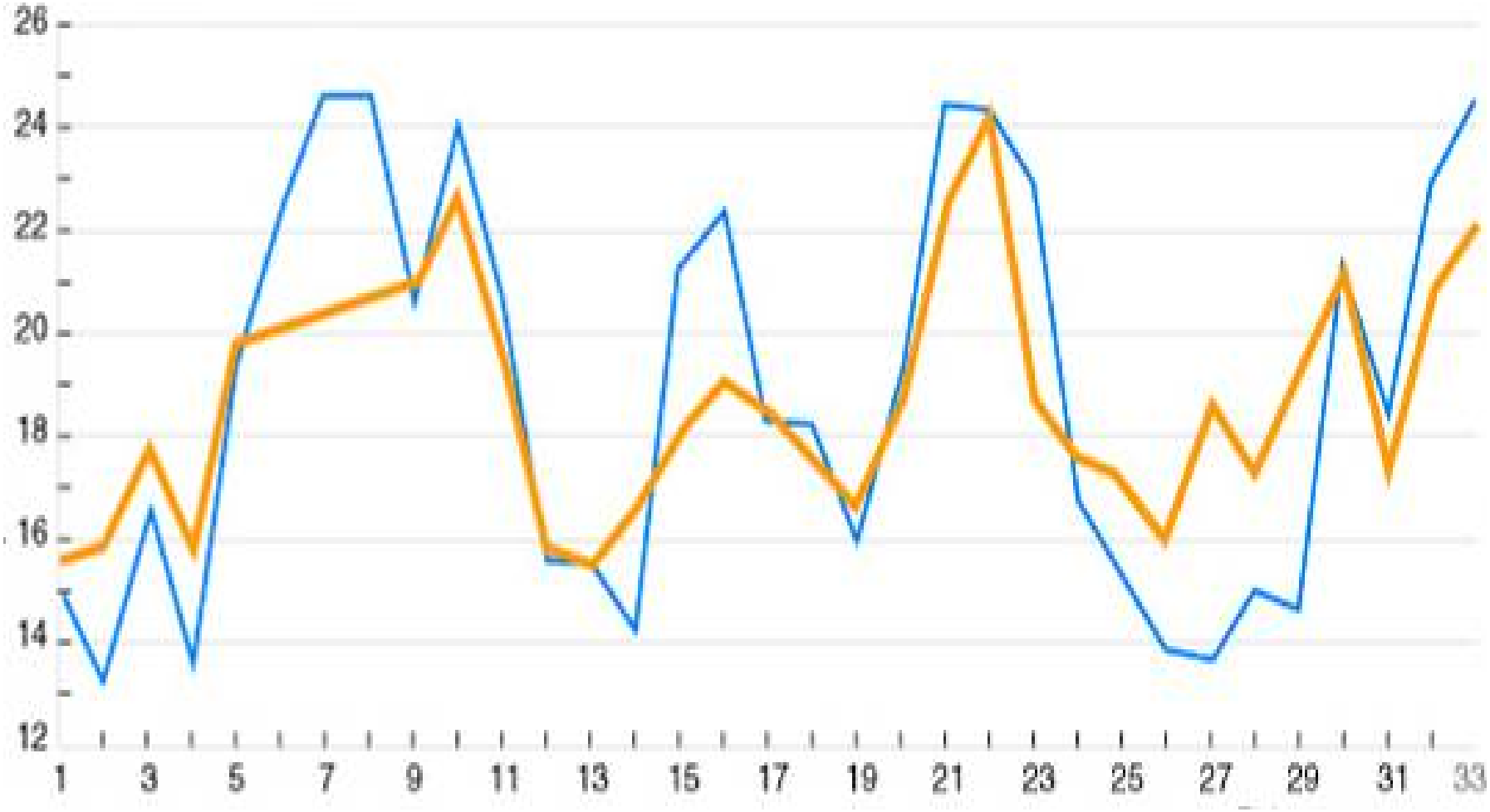
Weather impacts everything!



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Finnish Meteorological Institute

Research-based services for the whole society