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METEOROLOGISKA INSTITUTET  
FINNISH METEOROLOGICAL INSTITUTE

# Janne Miettinen



## **Account Manager Customer Services Finnish Meteorological Institute**

- 15 + years at FMI
- Worked at EFHK in the past
- Aviation Meteorologist
- Account Manager since 2013





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# FMI's collaboration with the Destia winter maintenance management center

EuMeTrain

Road Weather Event Week,  
December 9-13 2019

11/12/2019 Janne Miettinen, Account Manager







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# Content

- ✓ FMI Road Weather Services in Brief
- ✓ Services for Winter Road Maintenance
- ✓ PPP with Destia
- ✓ Research and Development

11/12/2019 Janne Miettinen, Account Manager



# FMI Road Weather Services in Brief



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# FMI Road Weather Model (RWM)

- Input data

- Observation analysis
- NWP-model

- Output parameters

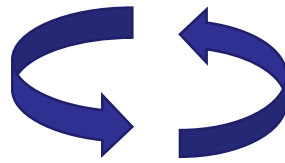
- Surface temperature
- Surface conditions
- Storages (ice, snow...)



Radiation



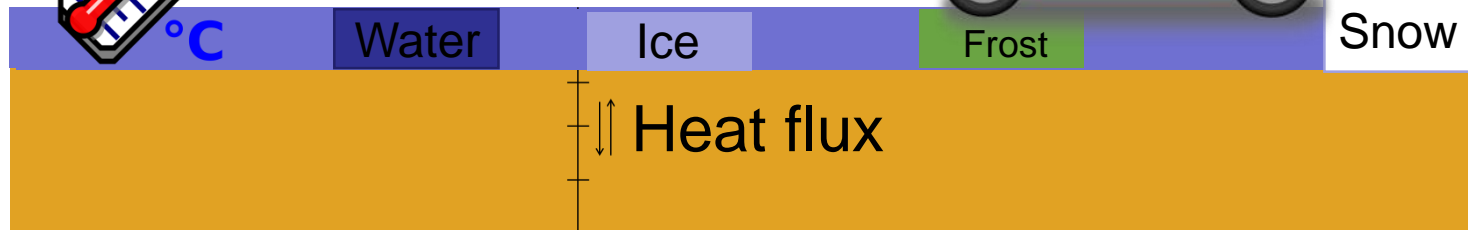
Heat transfer



Evapo-  
transpiration

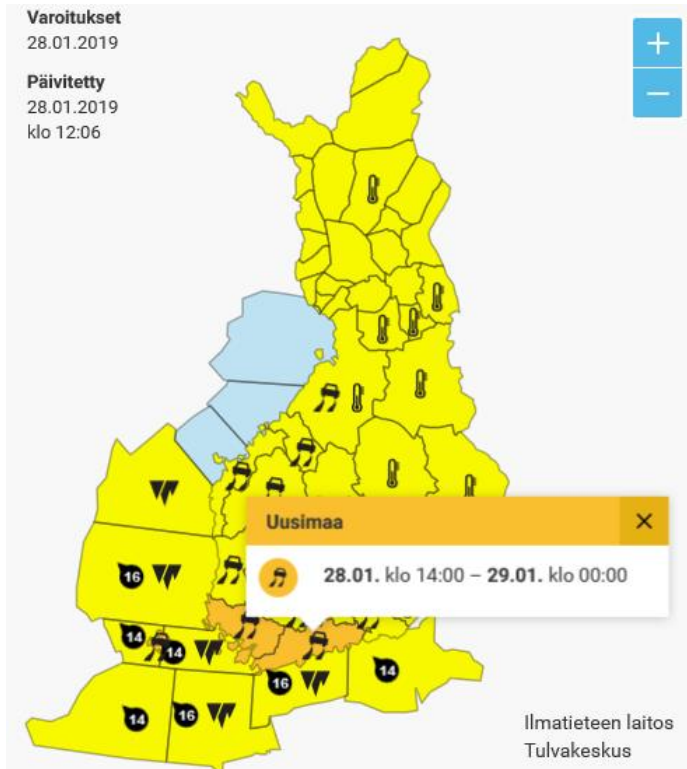


Precipitation





# FMI services for roadsector



Road traffic warnings for public

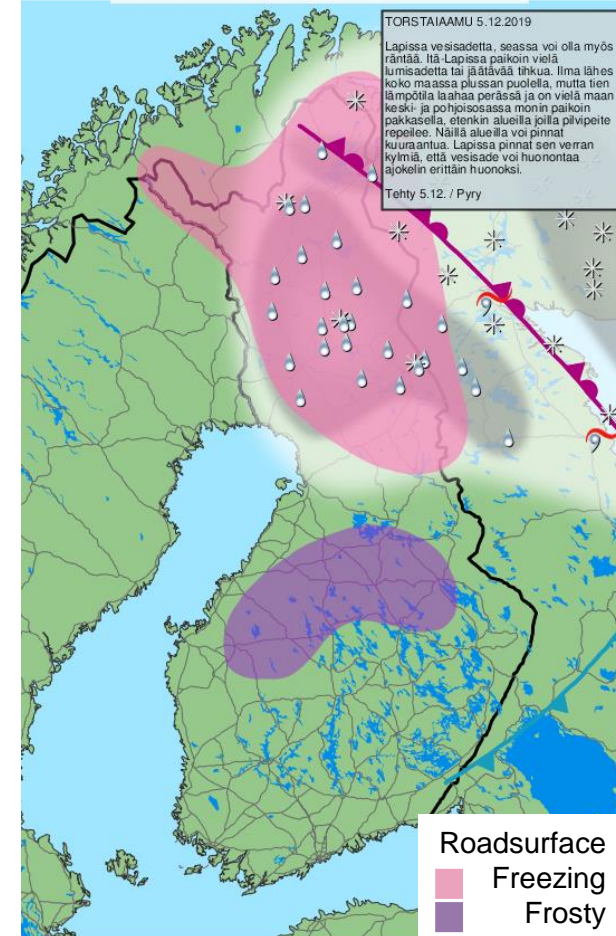


Safety and fluency to cities



Online notifications

SRWC 05.12.2019 5-7



Road maintenance forecast

# Road weather activities across the FMI

## Operational services

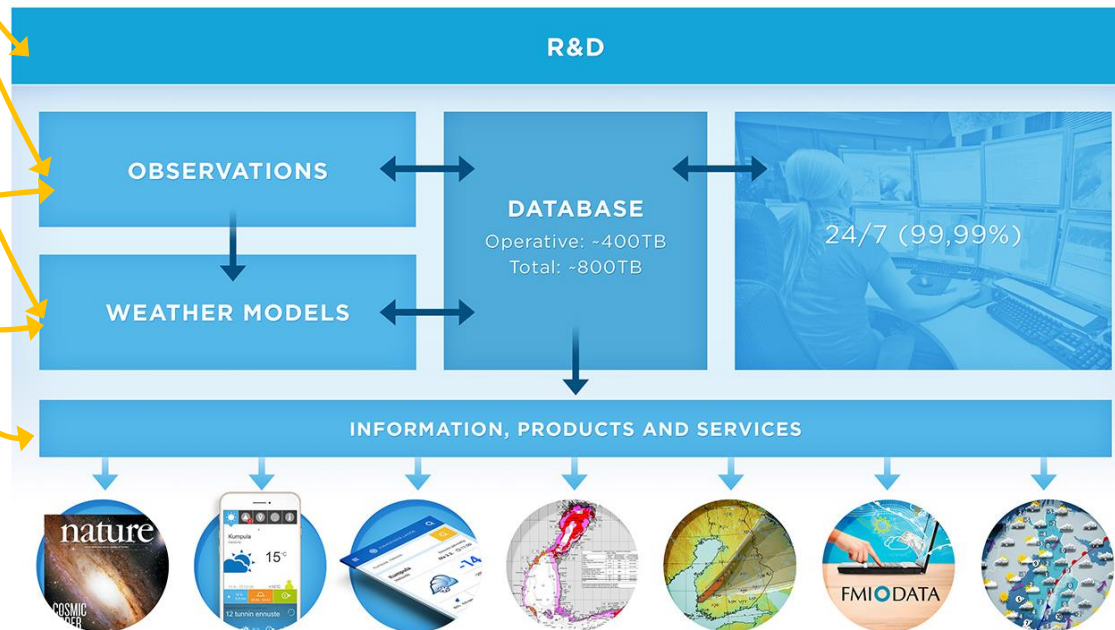
- Safety and warnings for all road users
- Traffic authorities' services
- Transportation and road maintenance industries

- Operative road weather models
- Web-pages and machine readable interfaces
- Integration to Intelligent Transport Systems (ITS)
- Observation data



## Research

- Road weather model development
- Observations, big data and IoT with mobile and road side technologies
- R&D for publications and new traffic services
- Future road conditions in the changing climate



# Services for Winter Road Maintenance



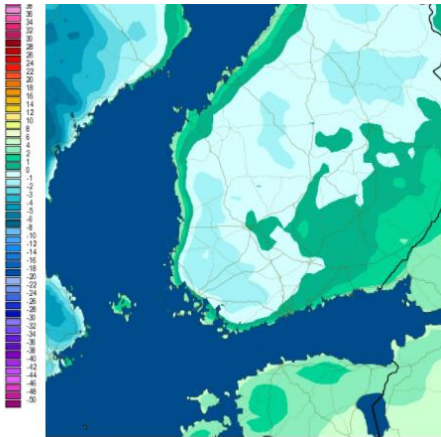
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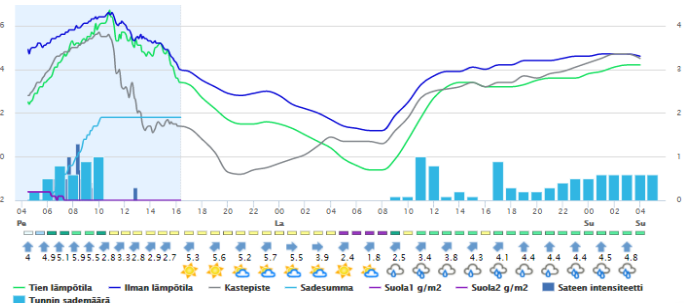


# Road weather services

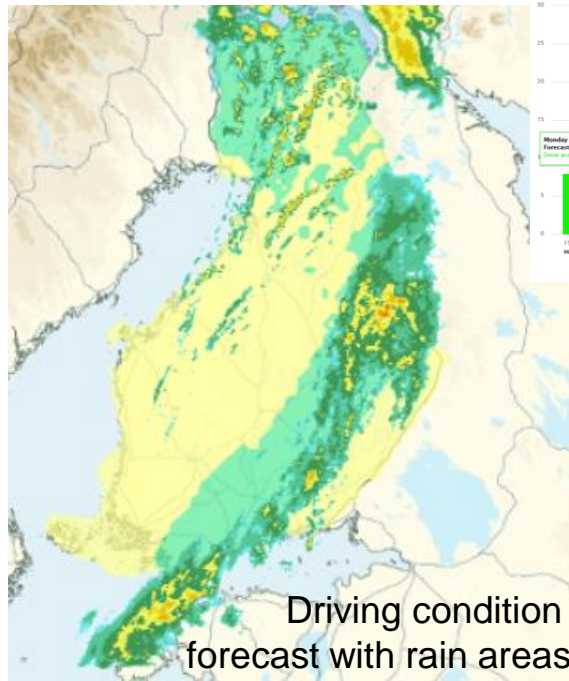
Road surface temperature forecast



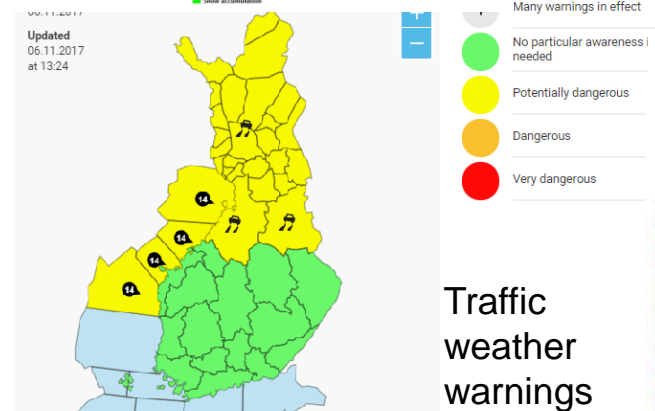
Road weather observation and forecast for road maintenance



Snow accumulation forecast

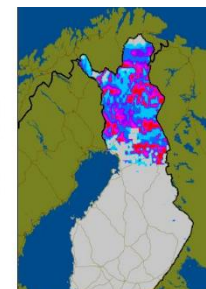


Driving condition forecast with rain areas



Traffic weather warnings

Time to next snow removal



ROAD WEATHER ALERTS FOR ITS



Road condition alerts to mobile terminals, with public-private partnerships



Destia Road Weather Centre





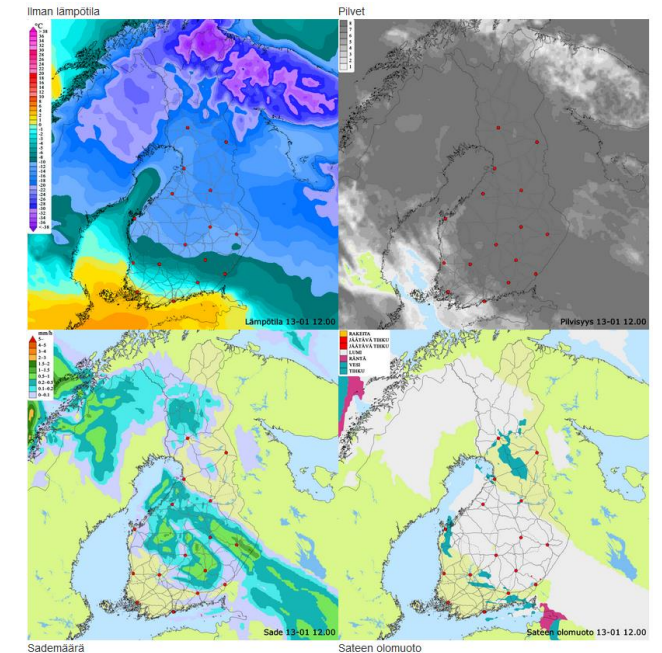
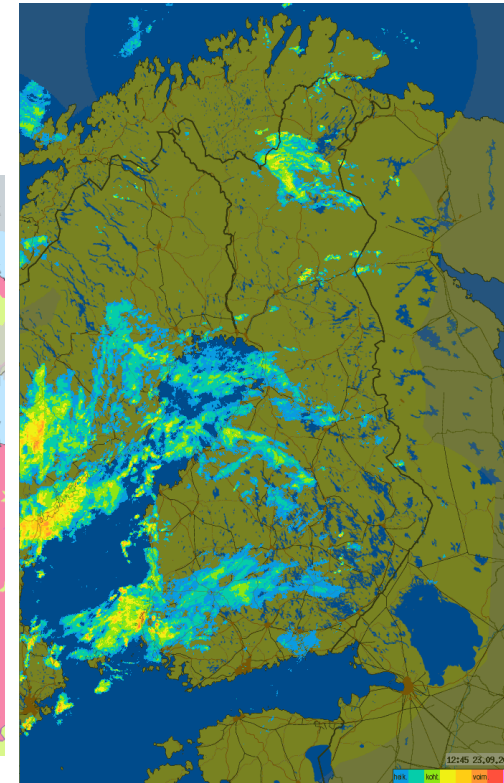
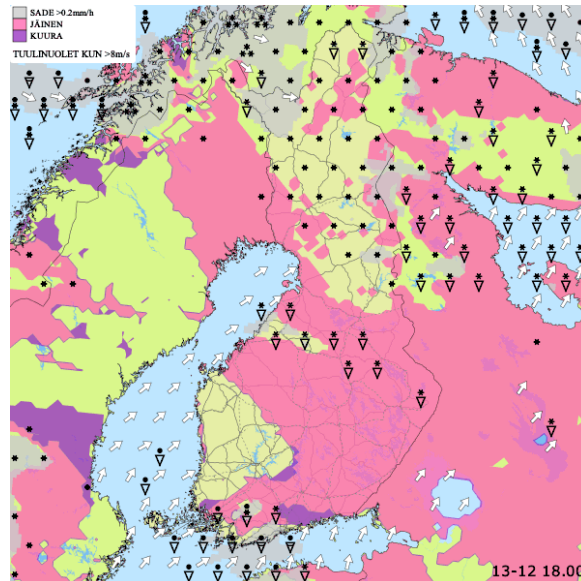
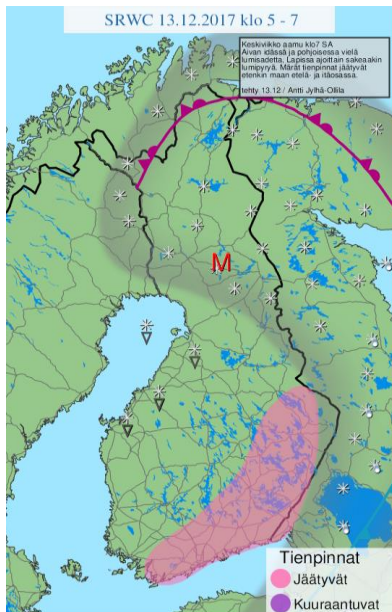
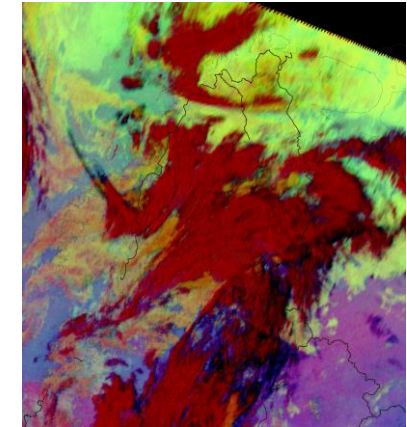
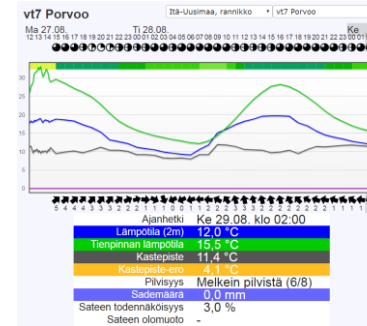
# Services for Road Maintenance

## Intelligent Traffic Management Finland

- Regional and point forecasts
- Phone support service
- Training

## Finnish Transport Infrastructure Agency

- Radar images
- Satellite images



Significant road weather analysis by meteorologist

Significant road weather analysis; fully automated product

# FMI data on customer's platform

## Visualization



- **Observations**
  - Radar
  - Road observations
- **Forecasts**
  - Alarms on fast changes in weather
  - Bad driving conditions
  - Situational awareness
  - Maintenance operations
- **Warnings**
  - Official weather warnings





# PPP with Destia



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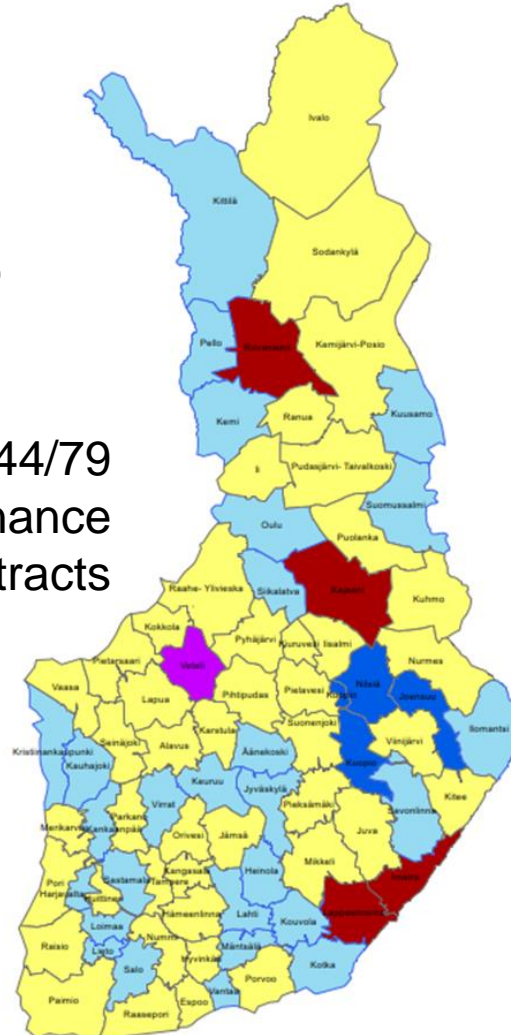
# FMI – Destia Partnership

DESTIA Maintenance areas 

- ✓ Partnership for over 20 years
- ✓ Side by side for 17 winters (2002->)
- ✓ Digital services
- ✓ Daily consultation

- ✓ Mutual benefits
- ✓ Training sessions
- ✓ Joint development
- ✓ Easy piloting

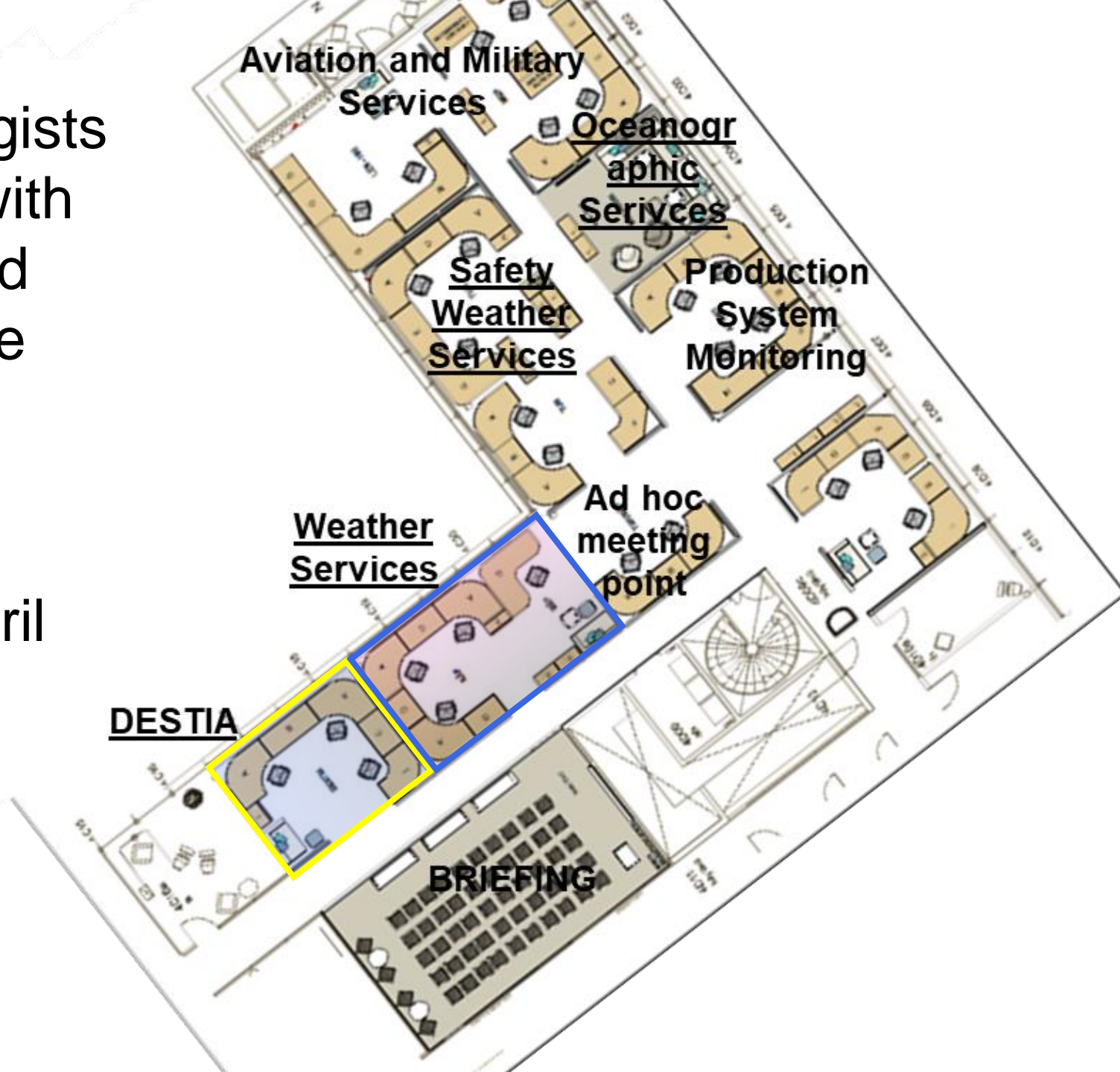
44/79  
maintenance  
contracts



FMI meteorologists  
side by side with  
Destia's road  
maintenance  
operators

24/7/212

October - April





# Winter Road Maintenance Policy in Finland

Winter maintenance class	Is	I	Ib and Tib	II	III
Maximum depth of snow during snowfall	4cm	4cm	4cm	8cm	10cm
Time to clear after the end of snowfall	2.5h (slush 2h)	3h (slush 2.5 h)	3h	4h	6h

- Ploughing must be started at the latest when half of the maximum depth has accumulated on the ground (so-called 'threshold')
- Maximum snow depth must not be exceeded during snowfall and after that while the measure is being carried out.
- Only half of the snow can be slush.
- The time to carry out the measure starts when the snowfall ends and ends when the traffic lanes have been cleared.







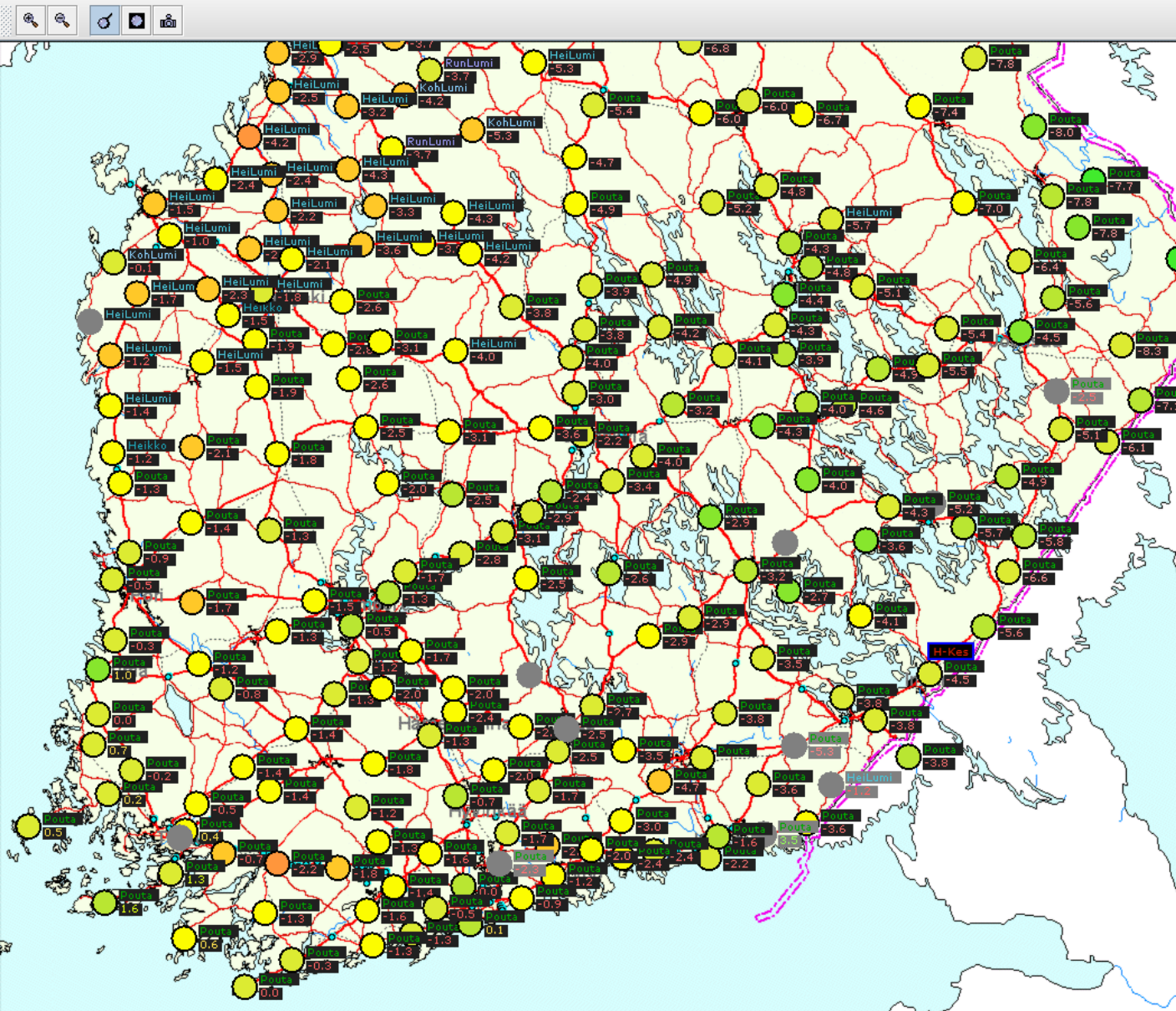
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# FMI's data on Destia's decision support system

- Observations from ITMF's RWSs
  - Wind speed **mx/mean**
  - Wind **direction**
  - **Air** temperature
  - **Road** temperature
  - **Dewpoint** temperature
- Precipitation
  - **Accumulation**
  - Form
  - Road condition
  - Cloudiness
- Observations 10-15 min resolution
- Forecasts created hourly







~400 RWS locations  
 ~800 Cameras

Kooste Kelikeskus\_HKI EPoh+KeS+KaS: vt3\_Laihia\_01 11.12.2019 kello 09:05 - Tila: OK

Kuva Muokkaa Näytä Animaatio

Tie 3 Laihia

The video frame shows a night-time view of a snowy road. The road is covered in snow and has a few vehicles visible in the distance. The scene is illuminated by streetlights, creating a blue and white color palette. The camera angle is from an elevated position, looking down the road.

- st724\_Raippaluoto\_saari\_01
- st724\_Raippaluoto\_01
- st724\_Raippaluoto\_manner\_01
- vt8\_Koivulahti\_01
- vt8\_Vaasa\_Kotiranta\_01
- vt3\_Vaasa\_Puomi\_00
- vt3\_Vaasa\_02
- (vt3\_Laihia\_Ruto\_01)
- vt3\_Laihia\_01
- vt18\_Tervajoki\_02
- vt18\_Nurmo\_Munakka\_02
- vt19\_Nurmo\_02
- kt87\_Ilmajoki\_01
- vt3\_Tuiskula\_01
- vt19\_Rengonkylä\_01
- vt3\_Jalasjärvi\_01
- vt9\_Muurame\_01
- vt9\_Himos\_01
- vt9\_Jyväskylä\_Korpilahti\_01
- vt9\_Partalanmäki\_02
- vt9\_Jämsä\_Länkipohja\_01
- vt5\_Kuortti\_01
- vt5\_Vihantasalmi\_01
- vt5\_Mikkeli\_01
- kt82\_Antola\_01
- vt13\_Ostolahti\_02
- vt15\_Laivalahti\_02
- kt72\_Haukivuori\_01
- (vt13\_Kangasniemi\_Häppälä\_K\_00)
- st435\_Sulkava\_K\_00
- st438\_Lohilahti\_01
- vt5\_Joroinen\_Tahkoranta\_01
- vt5\_Juva\_Kielkallio\_01





# R'n'D with Destia



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# R&D

- 5G-network and –services development
  - Hybrid 5G and VANET (V2X)
- Intelligent Transport Services
  - Weather services for automated driving
  - Machine-vision in the road weather services
- ITS-G5 –communication scenarios
  - Test track development for advanced arctic road weather services



# 5G-SAFE

5gsafe.fmi.fi/



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SITOWISE



KALTIOT

DESTIA



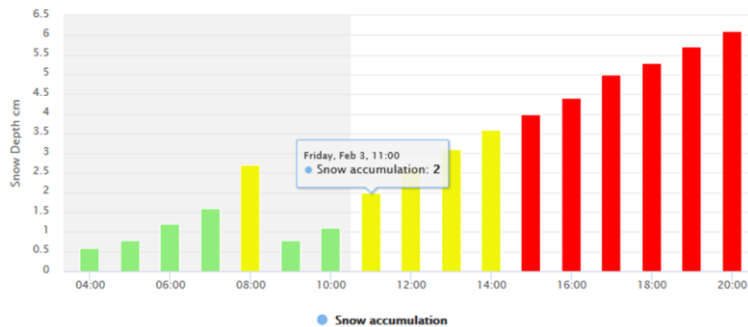
Inkind  
SUNIT NOKIA

FMI developed services

- Snow plough Scheduling service

11 am forecast

Snow Plough Chart



- Hard packed snow forecast
- Blowing snow application



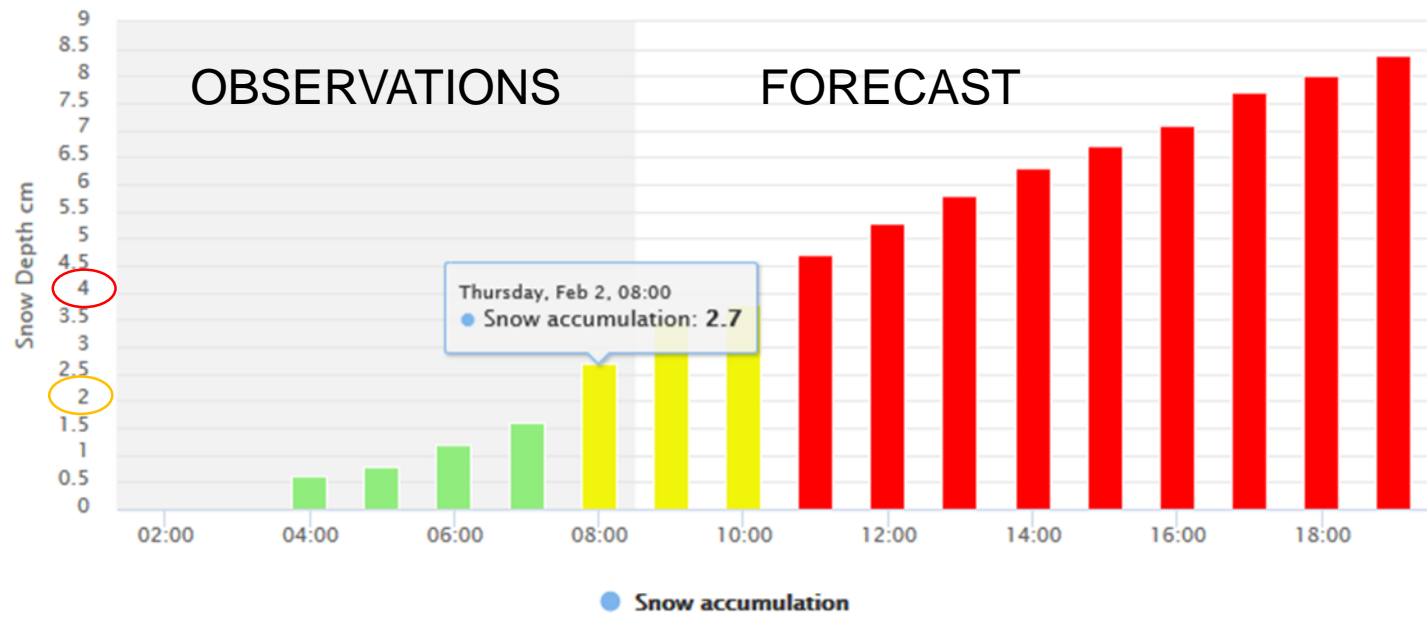
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# SNOW PLOUGH SCHEDULING APPLICATION

## 9 am forecast

Snow Plough Chart



MAXIMUM  
VALUE  
TRESHOLD  
VALUE



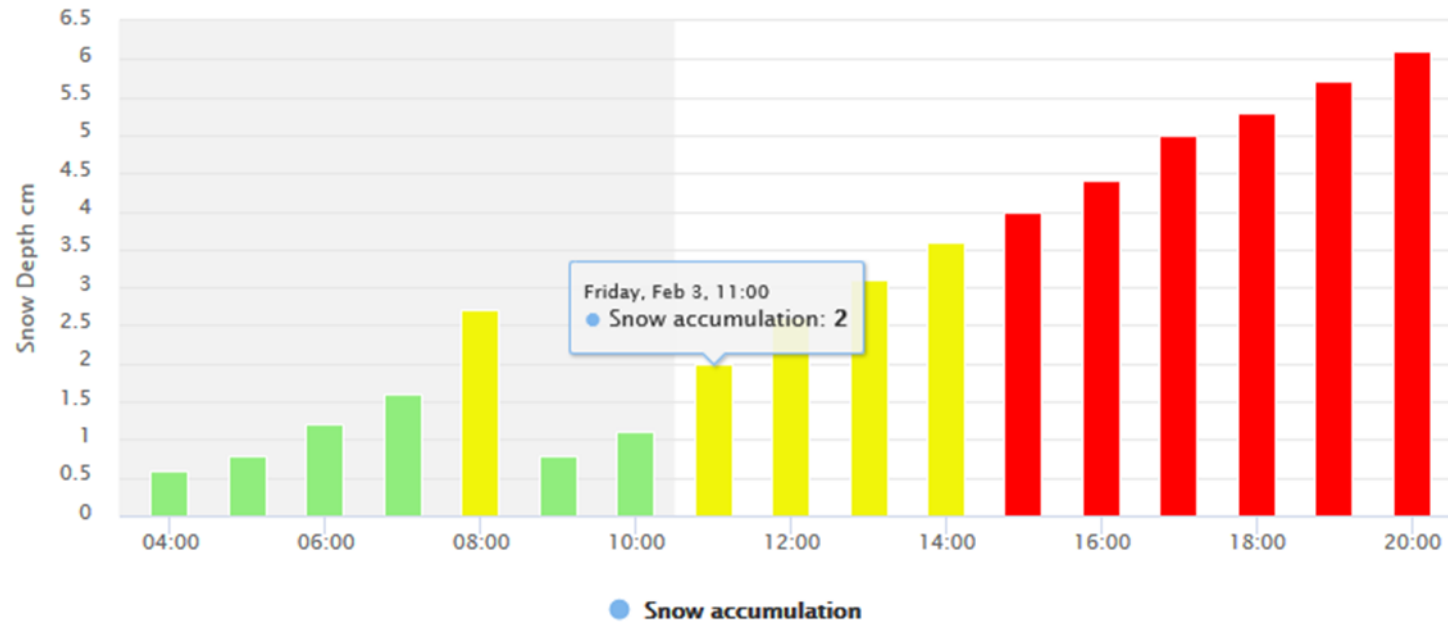




# SNOW PLOUGH SCHEDULING APPLICATION

## 11 am forecast

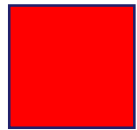
Snow Plough Chart





# Risk of Blowing Snow

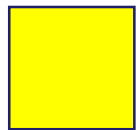
24 Hour animation based on FMI's operative forecast parameters



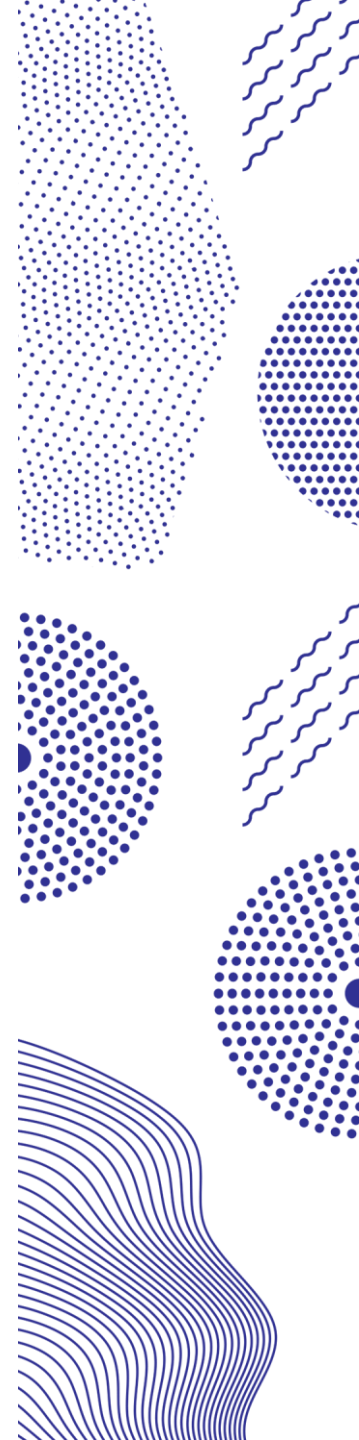
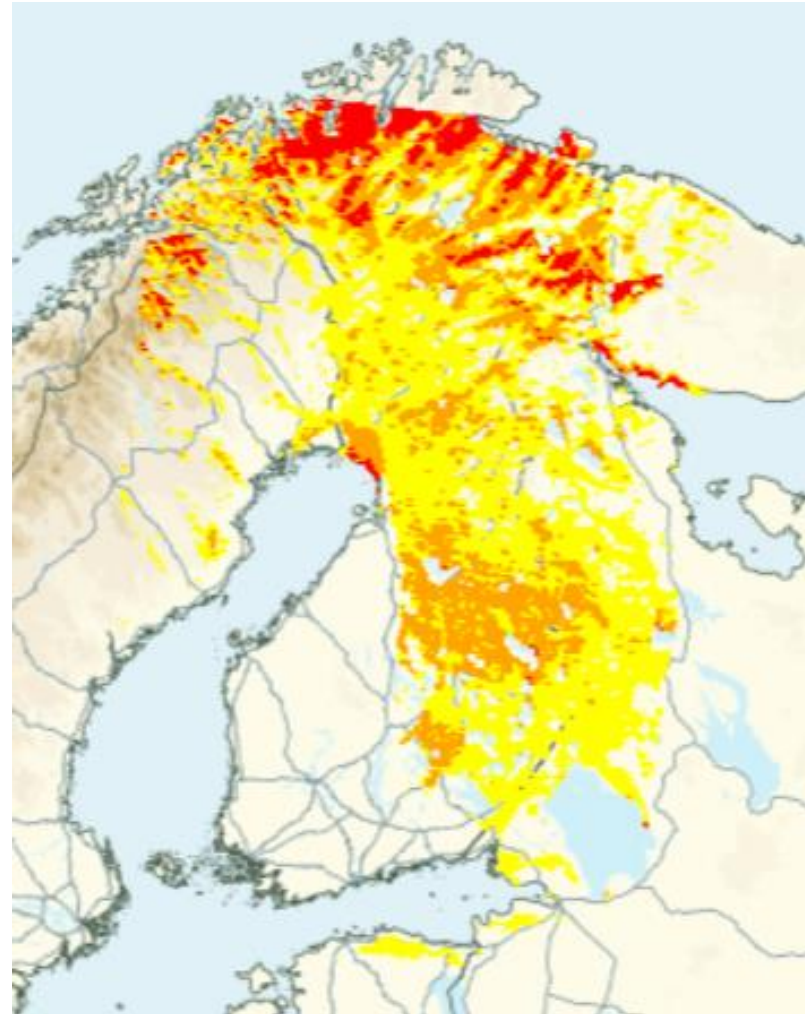
High Risk



Moderate Risk

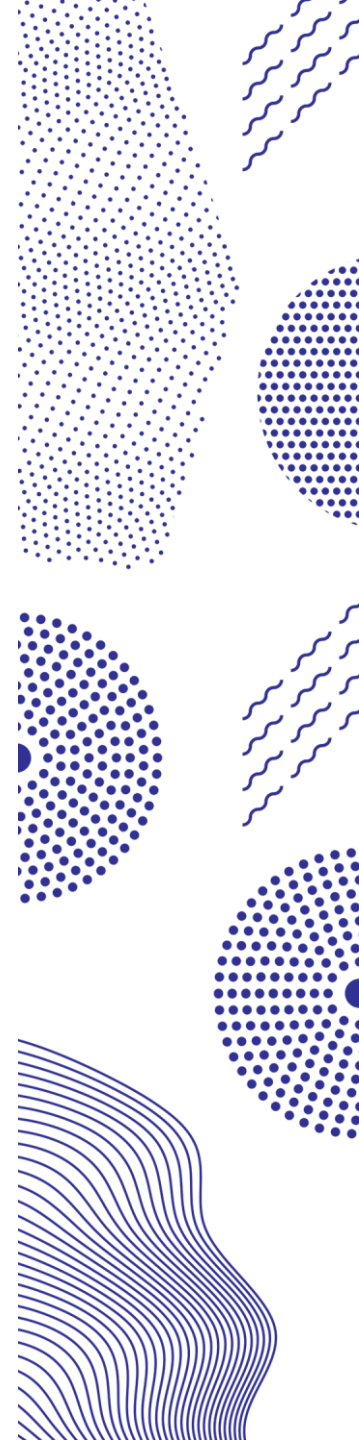
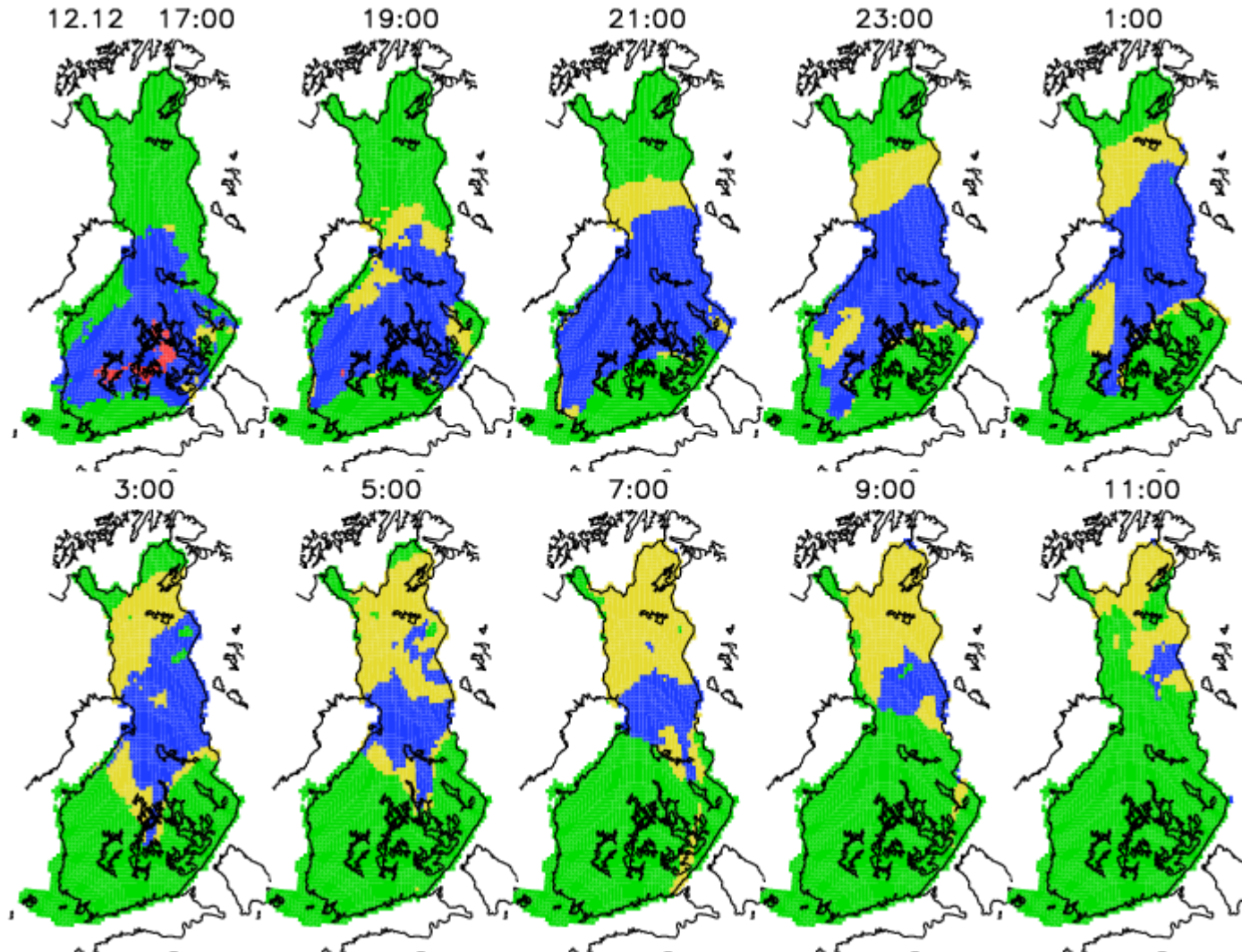


Low Risk



# Hard Packed Snow Forecast

-  No hard packed snow forming
-  Forming of hard packed snow possible
-  Forming of hard packed snow probable
-  Forming of hard packed snow very probable







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**Thank You!**  
janne.miettinen@fmi.fi

## Upcoming events 2020

#TRA2020

### Rethinking transport

Towards clean and inclusive mobility  
27-30 April 2020



Join us in building the future of transport and mobility:

- climate change and transport
- data-driven mobility
- intelligent infrastructure
- European competitiveness

> Read more and subscribe to the newsletter: [traconference.eu](http://traconference.eu)

Write down the date and register from 1 October 2019.


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**EUROPEAN CONGRESS**  
LISBON, PORTUGAL  
18-20 MAY 2020  
ITS: The Game Changer



**SIRWEC**

SIRWEC2020 DRUSKININKAI, LITHUANIA  
The 20th International Road Weather Conference, 2-4th of June, 2020