BiFi

Bearing information through vehicle intelligence

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Liikennevirasto

semcon

KLIMATOR

posti

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KLIMATOR

Welcome to Klimator

Klimator is a knowledge based company linked to the University of Gothenburg. Since 1999 we have been working with consultancy work within applied climatology. Our goal is to provide increased knowledge in this field for our customers. We are especially focusing on projects within traffic safety, climate mapping and forecasting of road conditions.

We work both in Sweden and internationally with the development of new solutions for road climate monitoring, intelligent transport solutions using ITS and projects related to an increased energy efficiency and sustainability.

We are also working in the field of urban design with special focus on comfort climate, wind issues and environmental factors.

Road Weather

Klimator provide forecasts that help the maintenance people to perform effective actions that keep the roads safe and spare the environment from excessive salt use, which is also economically beneficial. Our forecasts are used in Norway, Czech Republic, Russia and Sweden.

ITS

Intelligent transport systems (ITS) are advanced applications which aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

Urban Climate

We study wind climate in urban areas and how the wind varies with terrain and architecture. We focus on three areas: qualitative assessment of Comfort climate, effectivisation of indoor climate control systems and optimal placement assessment for local wind power stations

- Founded in 1980 in Gothenburg, Sweden

- Largest operations in Sweden, Germany, Brazil, India & UK

- Growing revenue outside Sweden, currently approx. 50%

- Approx. 3000 employees (1500 located in Sweden)

- Operating profit 2012: SEK 193 million (111)

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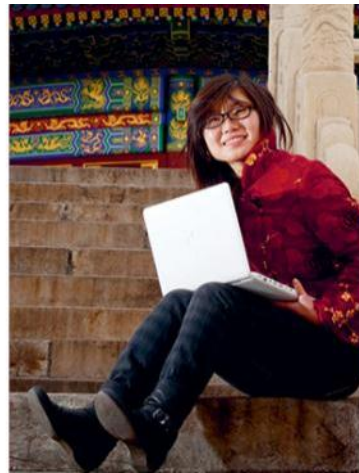
Goal

- Increased product availability for the lumber industries
  - Shorter periods where roads are closed or declassified
  - Aid entrepreneurs when handing out exemptions
- Decreased maintenance cost for the Transport Administration
  - Fewer spring thaw related damages on the road network
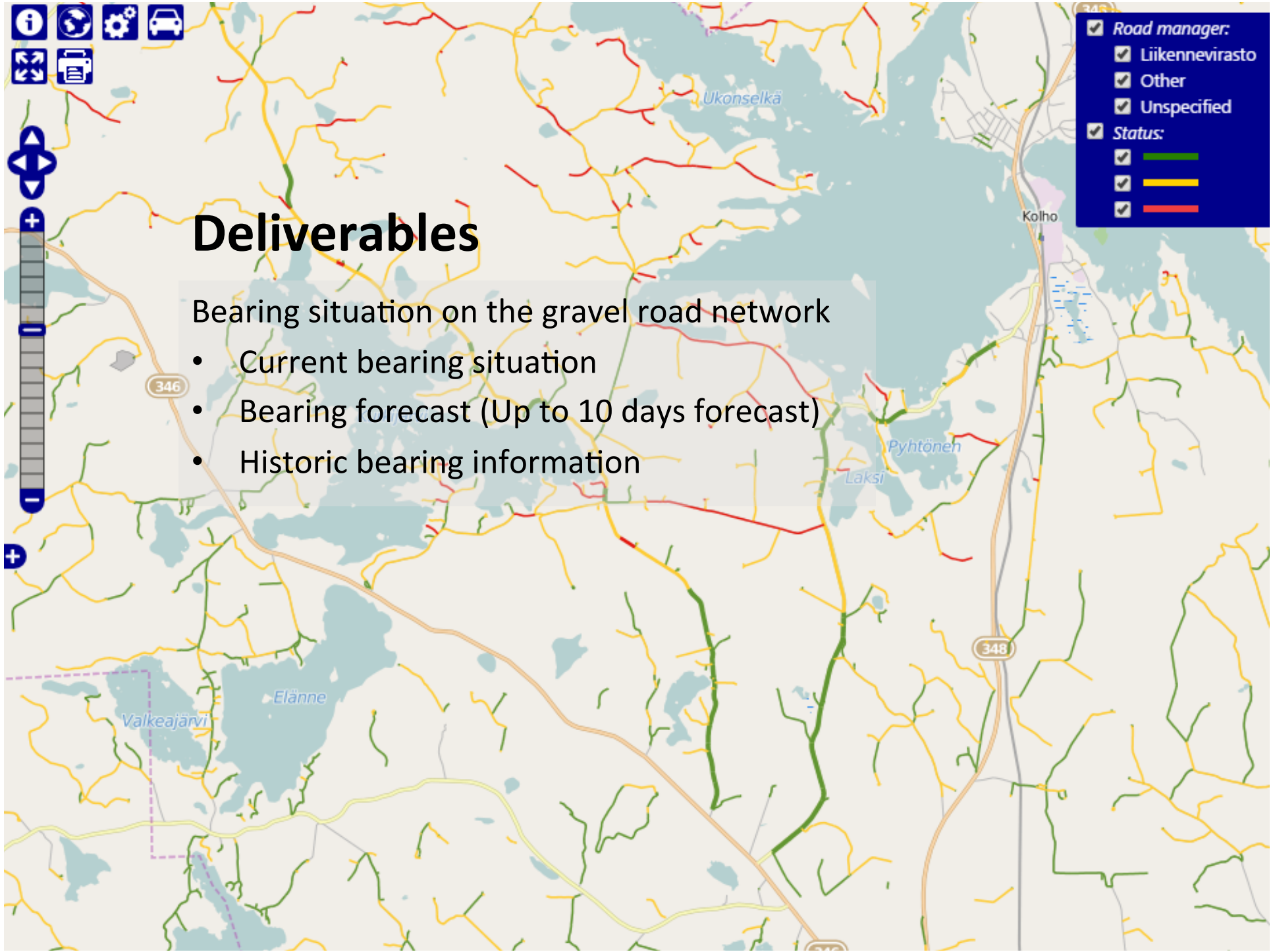- Increased road availability for ordinary road users
- Decreased environmental effects

Deliverables

Bearing situation on the gravel road network

- Current bearing situation
- Bearing forecast (Up to 10 days forecast)
- Historic bearing information

User Cases – Examples

- The lumber industries are able to use BiFi during retrieval of lumber by directing the heavy lumber trucks to areas with good load bearing capacity. Road damages are kept at a minimum and the trucks do not risk getting stuck.

- Entrepreneurs use the information as input when handing out exemptions. By using the forecast they are able to see that the bearing situation on the specific road will be good enough on Tuesday morning.

- Historic bearing information are used as input during long term maintenance planning. Get a better overview of problem areas and weak spots within the road network.

Current Project in Finland

- BiFi Finland

- Spring thaw season 2015

- 15 measurement units in Posti postal vehicles

- Bearing information on road level (segments)

- Orivesi area

The project covers an area of about 2375 km^2 that contains about 3990 km of both privately and state owned gravel roads
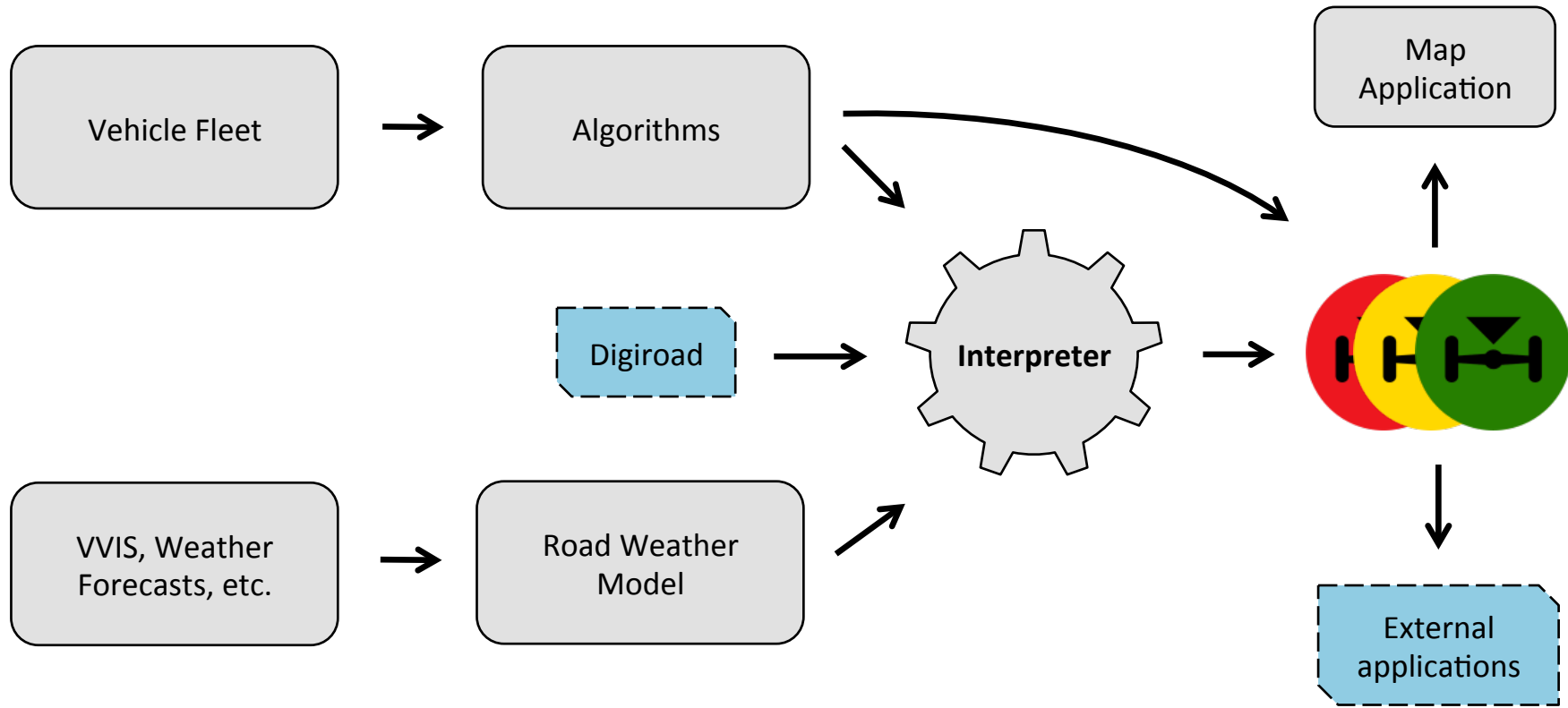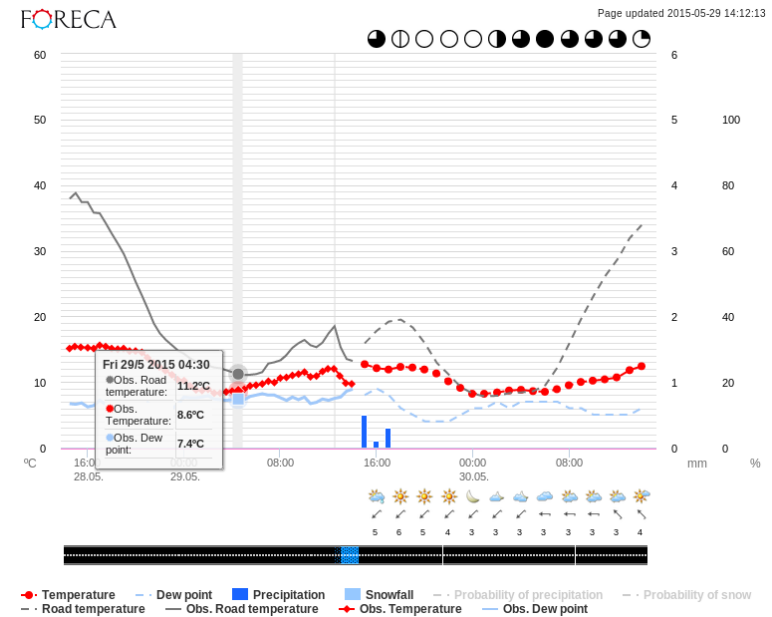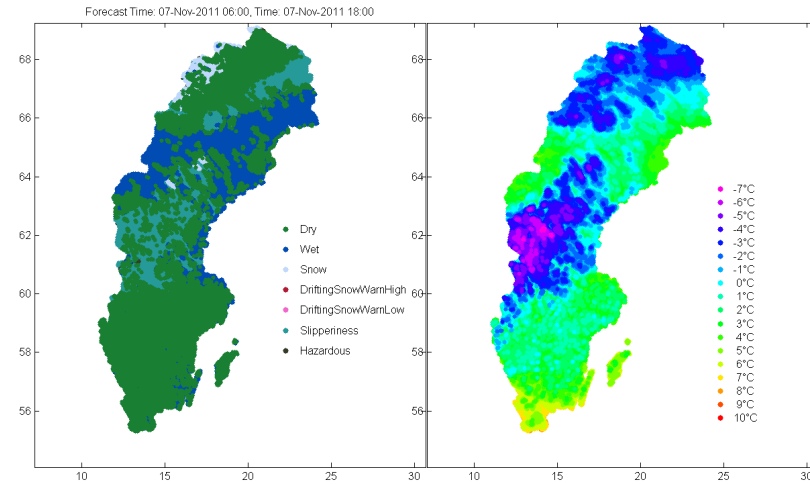
Technology

Vehicle Fleet

Road weather model

The road weather model calculates the temperature in the road.

Input

- Forecast (Foreca)
- RWIS

Output

- Road temperature
- Precipitation
- Insolation

Interpreter

The interpreter: Combines vehicle data and weather information to produce a risk assessment of reduced bearing capacity.

Input

- Road weather model
    - Historical data: 30, 10, 2 days
- Vehicle data
    - Historical data: 48 hours
- National Road Database

- Insolation model for each segment

Road manager:
- Liikennevirasto
- Other
- Unspecified

Status:

Tuesday Afternoon 14/4/2015

© OpenStreetMap
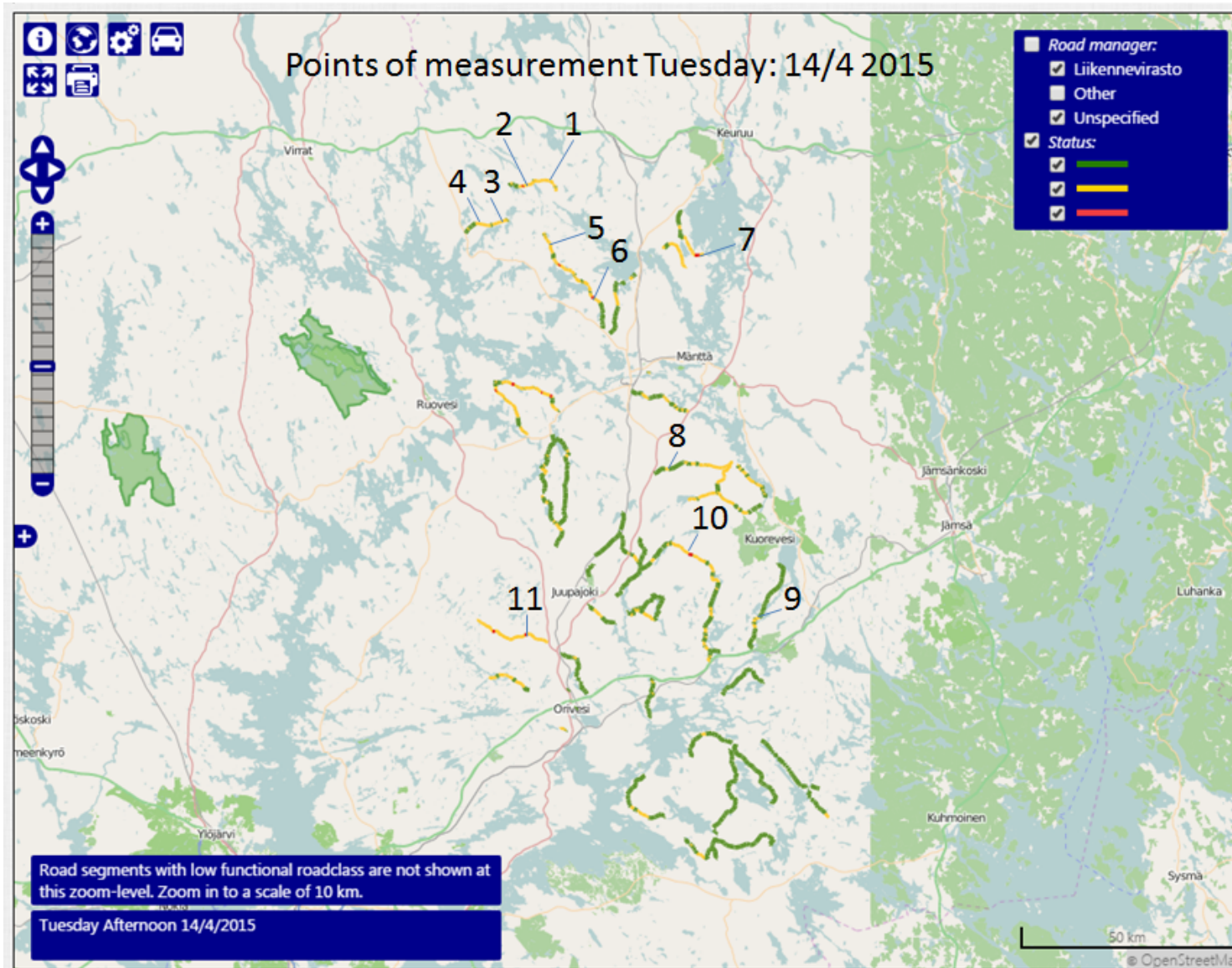
5 km

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Validation – Field evaluation 2015-04-14

- **Dynamic Cone Penetrometer**
  - Measurements at preselected points
  - Produces a bearing capacity measurement, CBR
  - Can measure to 50cm in depth
  - Able to pick up variations within the road construction.
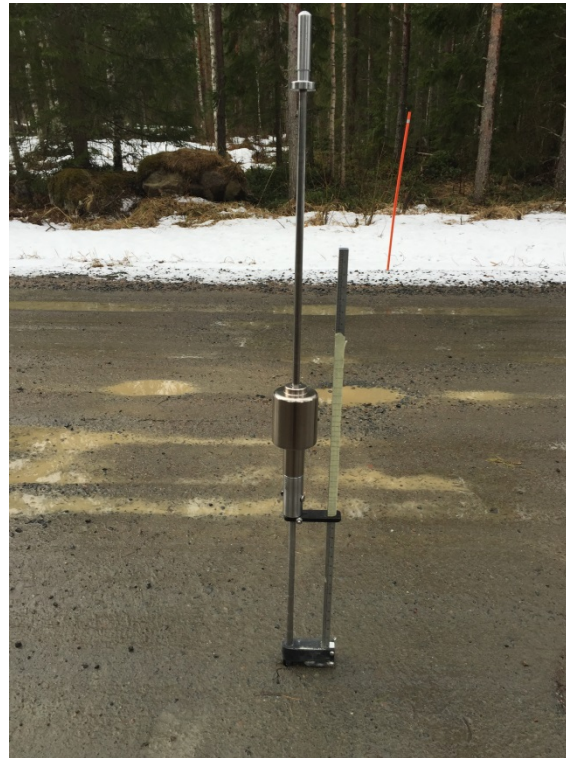- **Visual inspections**
  - Overview of a large area

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Points of measurement Tuesday: 14/4 2015

- Point 1&2
- Low bearing capacity
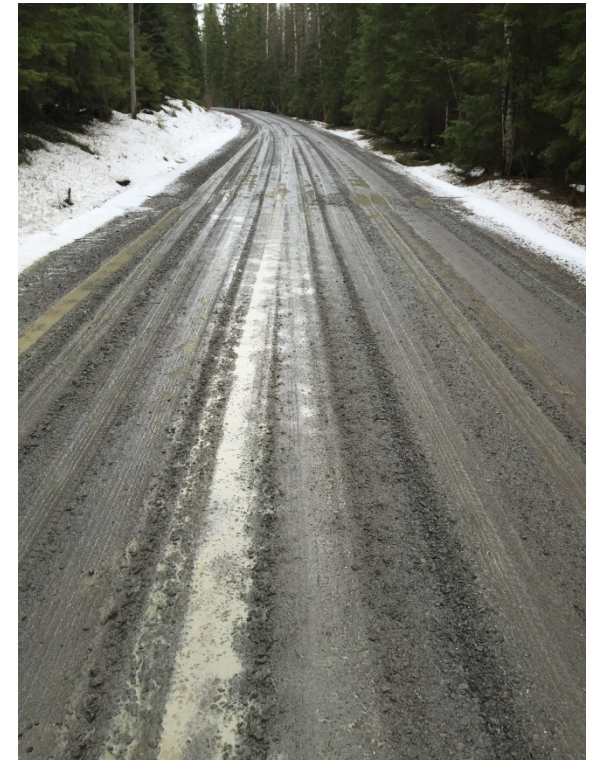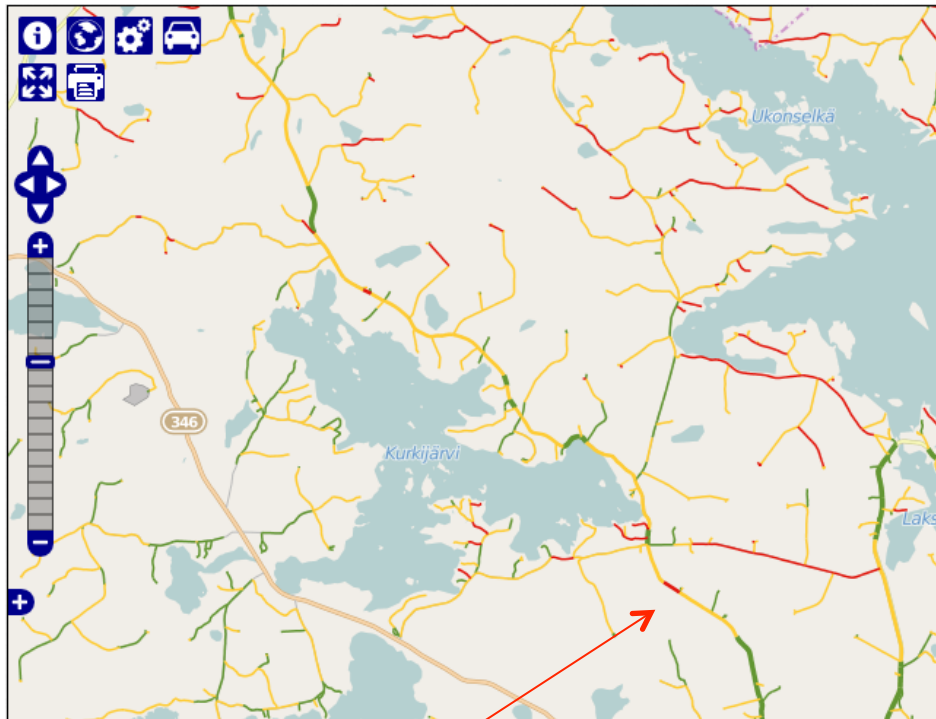
- Point 3, 4 and 5 Medium bearing capacity
- Good correlation to BiFi.se classification

- Point 6
- Low bearing capacity, extremely hard to see with the naked eye.
- Good correlation, Red – High Risk

Point 6

Measurement	Mean CBR%	Bearing capacity	BiFi-Output	Results
Point 1	15	Low	Yellow	-1
Point 2	18	Low	Yellow	-1
Point 3	53	Medium	Yellow	0
Point 4	57	Medium	Yellow	0
Point 5	64	Medium	Yellow	0
Point 6	18	Low	Red	0
Point 7	31	Medium	Red	+1
Point 8	38	Medium	Yellow	0
Point 9	35	Medium	Yellow	0
Point 10	54	Medium	Yellow	0
Point 11	25	Low	Red	0

DCP Classification		Output		Sum
High	= -1	Green	= 1	0
Medium	= -2	Yellow	= 2	0
Low	= -3	Red	= 3	0

Bearing Capacity		CBR%
High		≥70
Medium		30-69
Low		0-29

- Point 1&2 underestimates with one step.

- Point 3-6 correlate

- Point 7 Overestimates the risk with one step.

  - CBR value is right on the boundary to low.

- Point 8-11 correlate

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Conclusions from this season

- BiFi Finland is up and running
- Posti Vehicle coverage is adequate
- **BiFi classifications show good correlations with real world measurements**
- BiFi works well for predicting bearing capacity in Orivesi

Thank you.