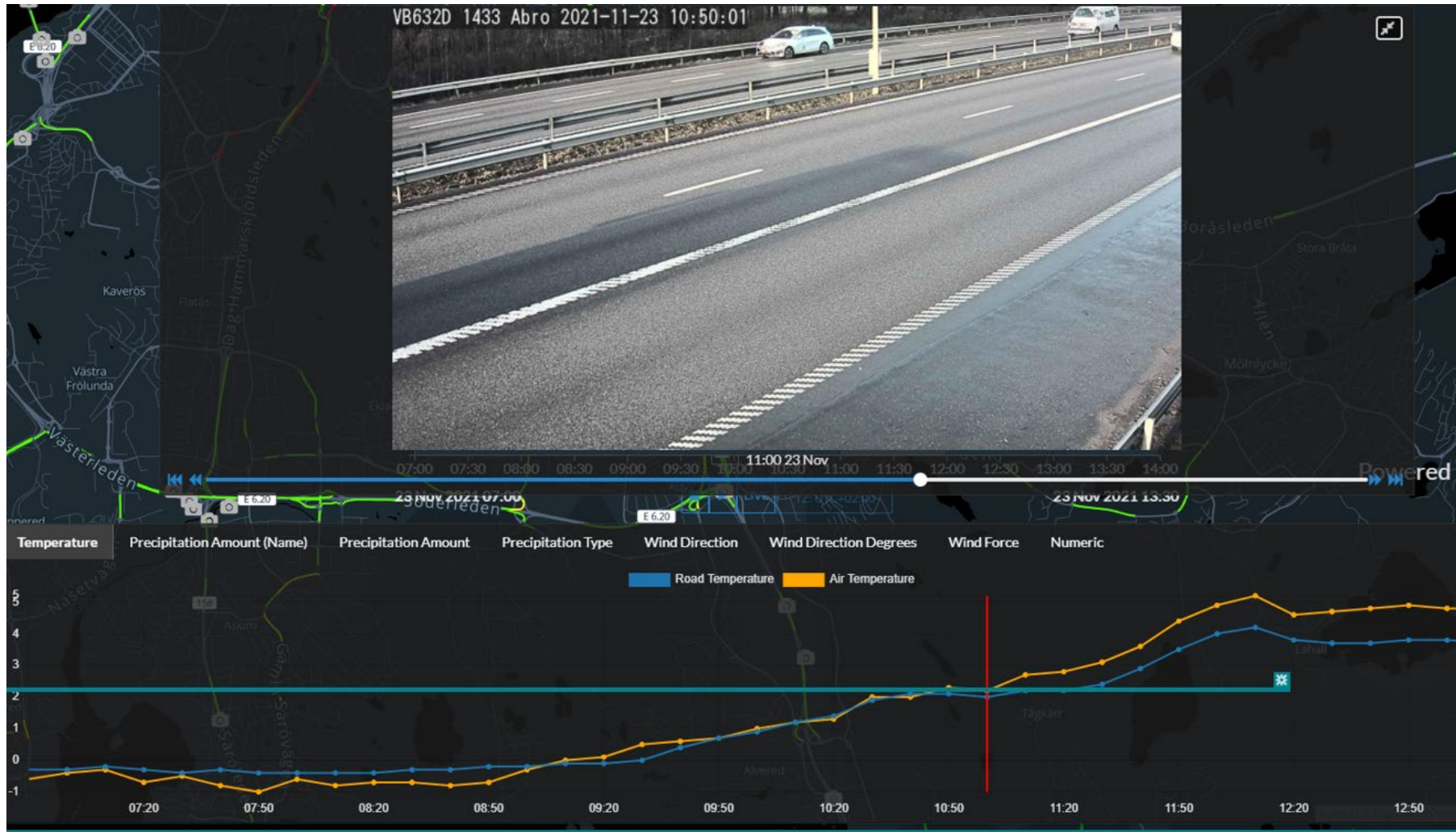




**Why
friction?**

11 am – Dry “warm” and good road condition



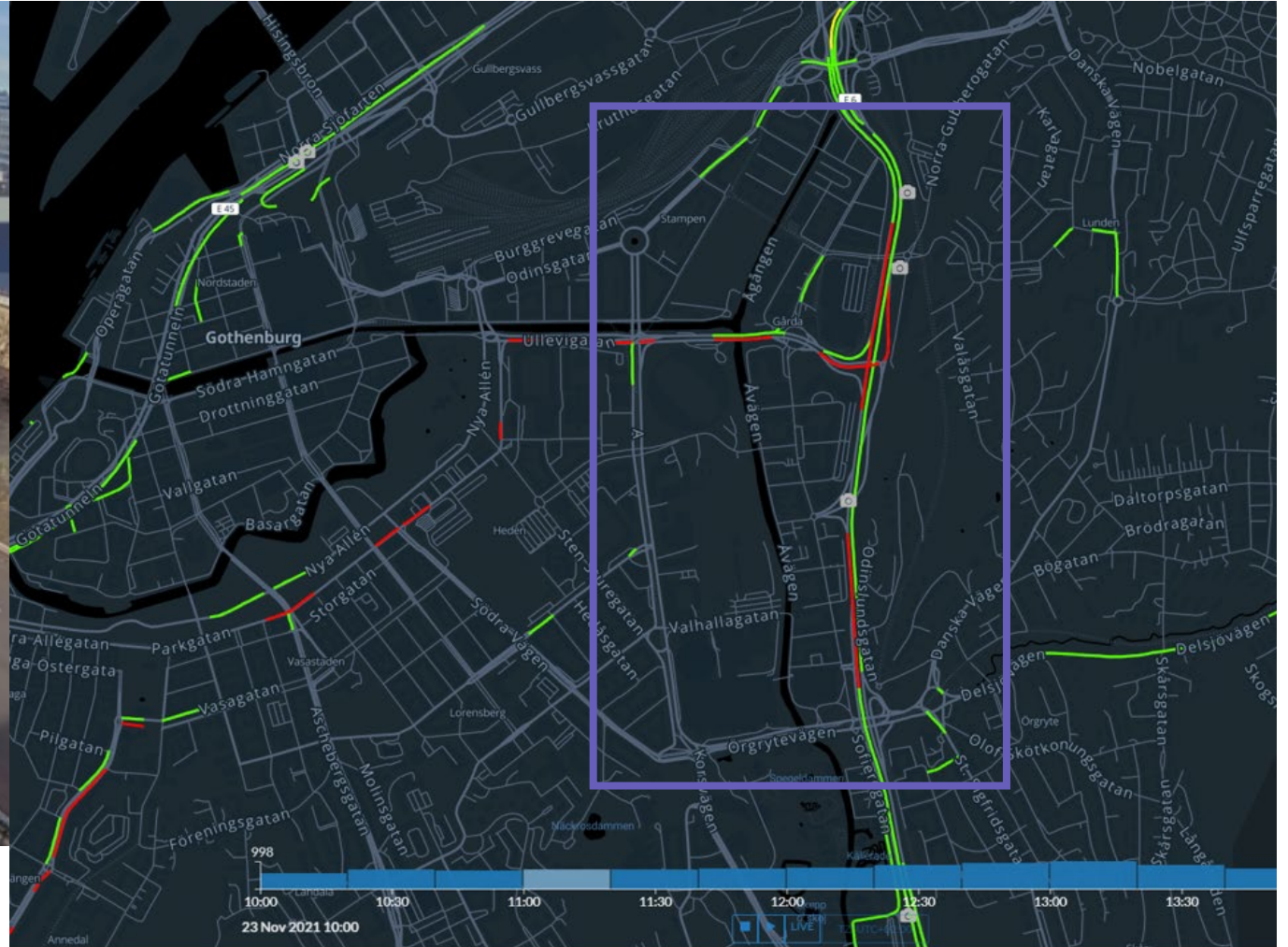
11 am – Potential wet condition

-23 10:58:09

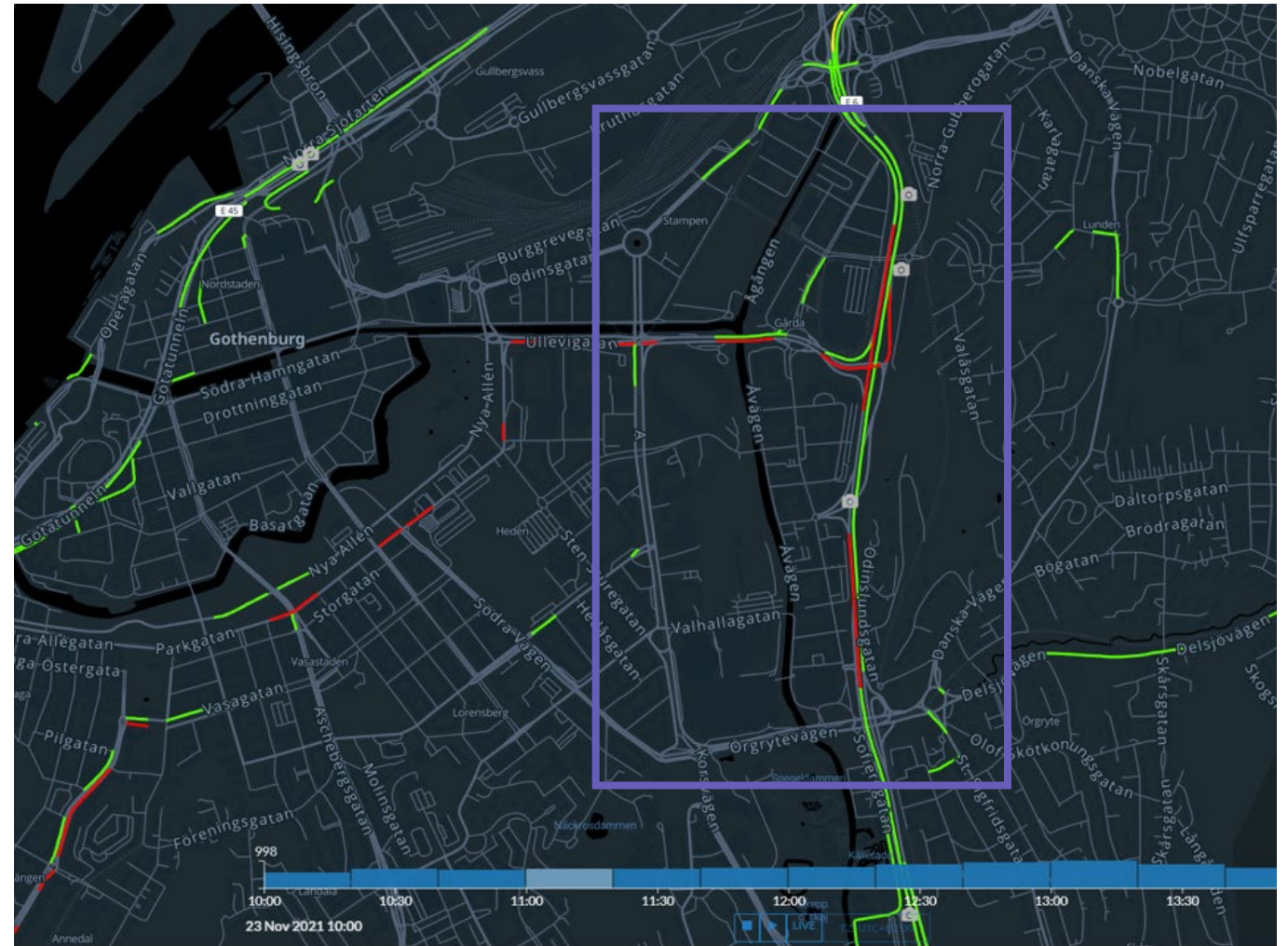
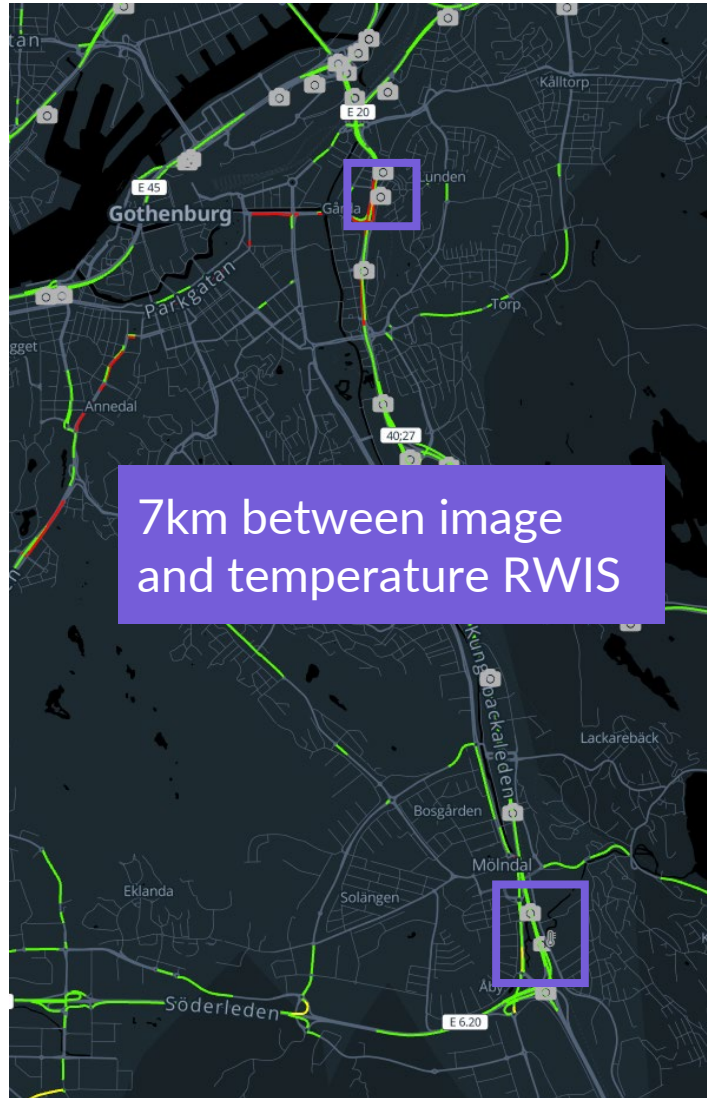


11 am – Wet and hazardous condition

-23 10:58:09



11 am – Good or hazardous condition?



NIRA Dynamics – Virtual sensor pioneers that digitalizes the road surface

Location based live road surface solutions

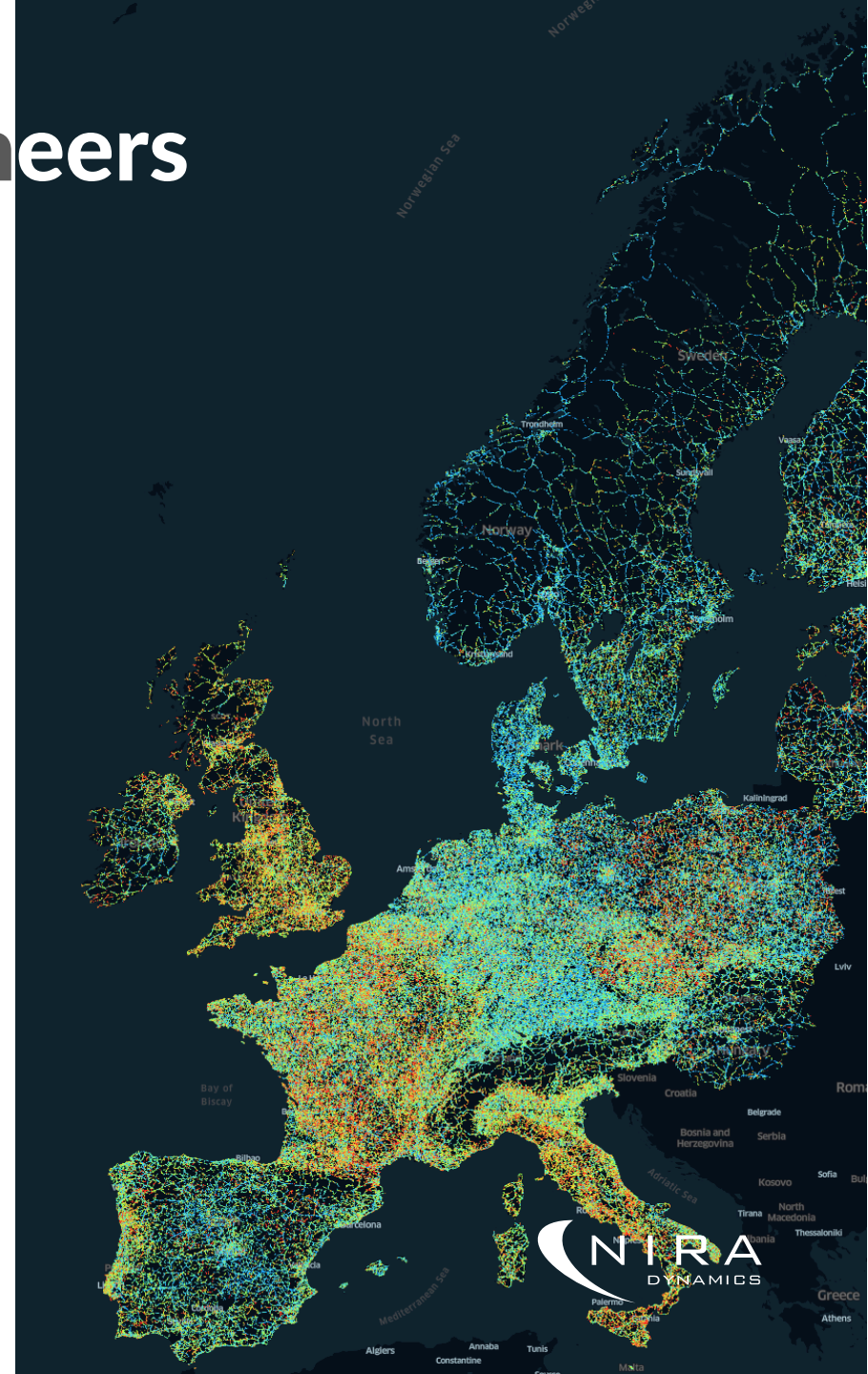
Created from data out of NIRA proprietary edge software that continuously measures the interaction between the tires and the road.

Edge software installed in high volume vehicle platforms



Our USP – hyper local measurements

In contrast to for example community-based data services and pure weather-based data services, NIRAs RSI is based on actual measurements from cars travelling on the roads, ensuring accurate and precise alerts and map layers.

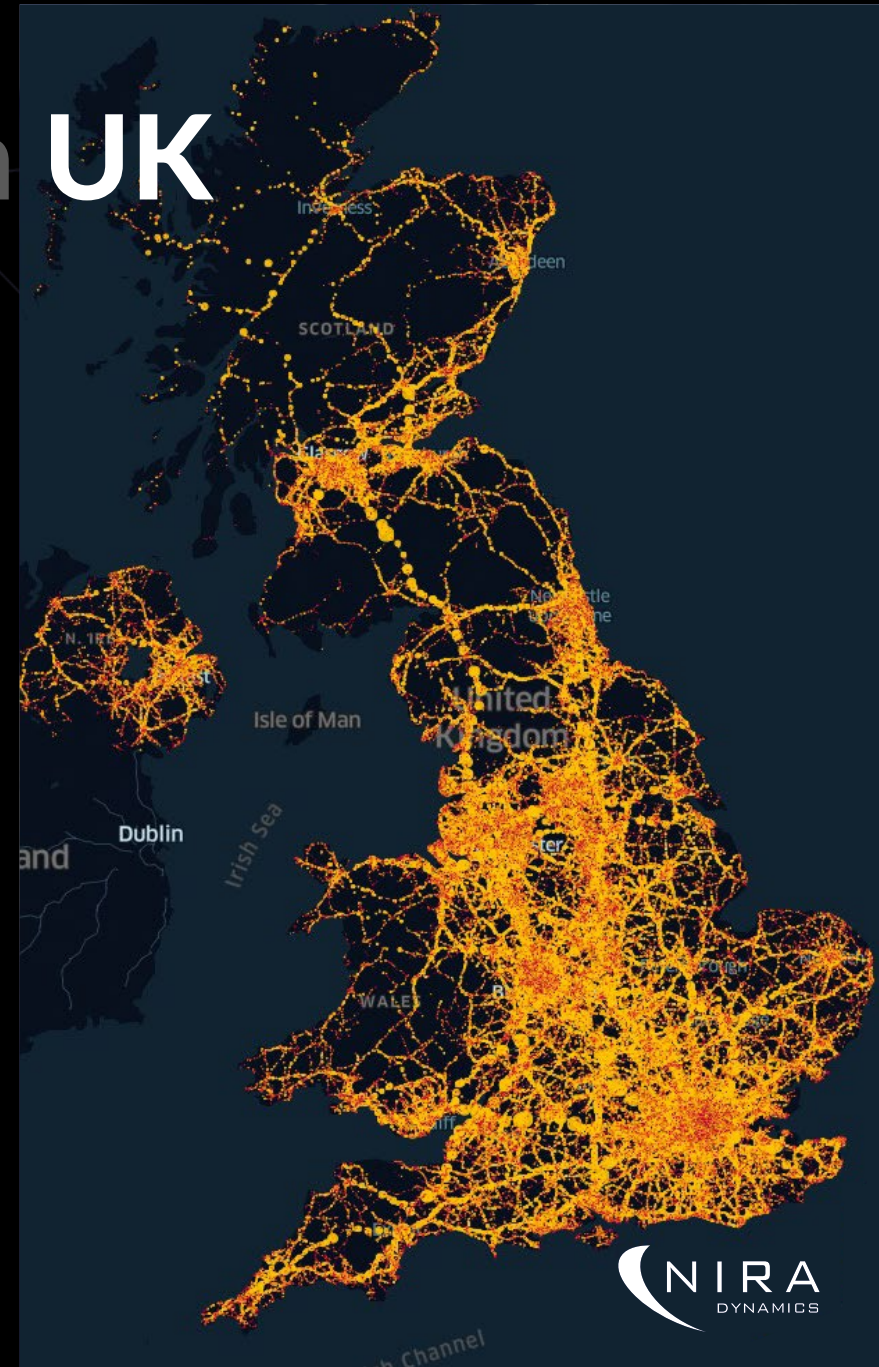


Measurements for one day in UK

About 100 000 Vehicles

Measured data

- Available Road Friction
- Ambient temperature
- Wet state
- Road Surface Temperature



The NIRA data types

A MULTITUDE OF ROAD CHARACTERISTICS POWERING A WIDE RANGE OF APPLICATIONS



Slippery road



Slippery when wet



Road state



Potholes



Wetness



Surface temperature

Winter Road Insights – KPI's & Historical evaluation

Establishing KPI's, based on actual road state

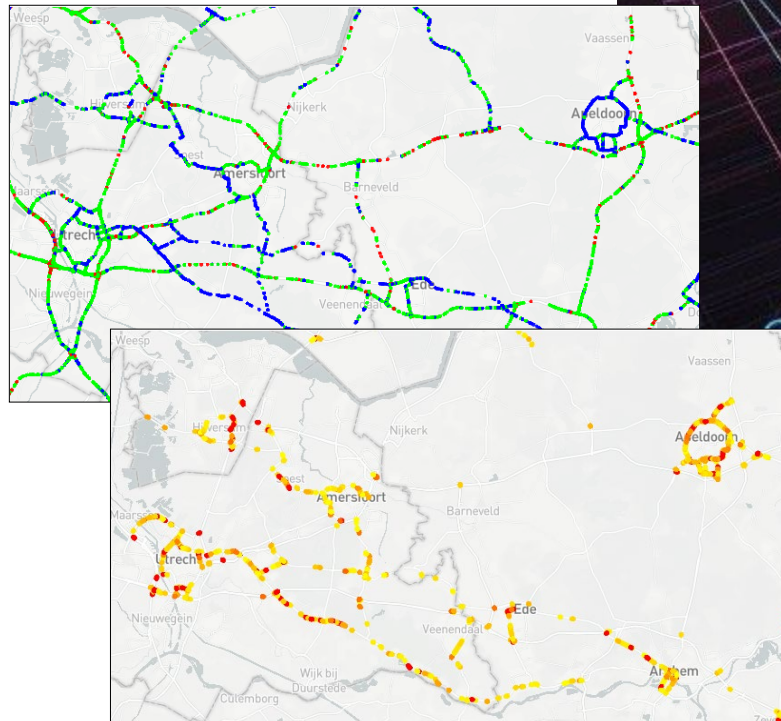
The NIRA vehicle fleet provides continuous ground truth in the entire area, based on what the drivers experience.

Use cases

Enables comparison of performance and evaluation methods and processes for optimization purposes.

Statical analysis to identify slippery prone areas as well as cold spots.

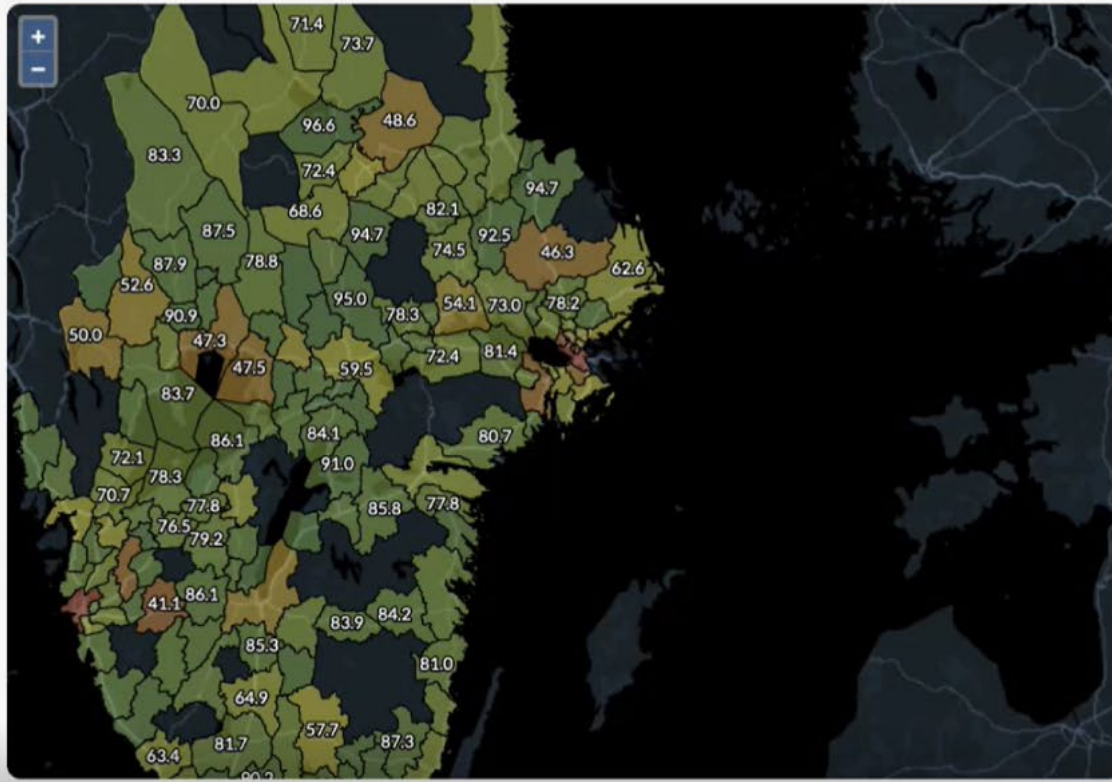
Season independent KPI
Full history of winter conditions
Replay of storms



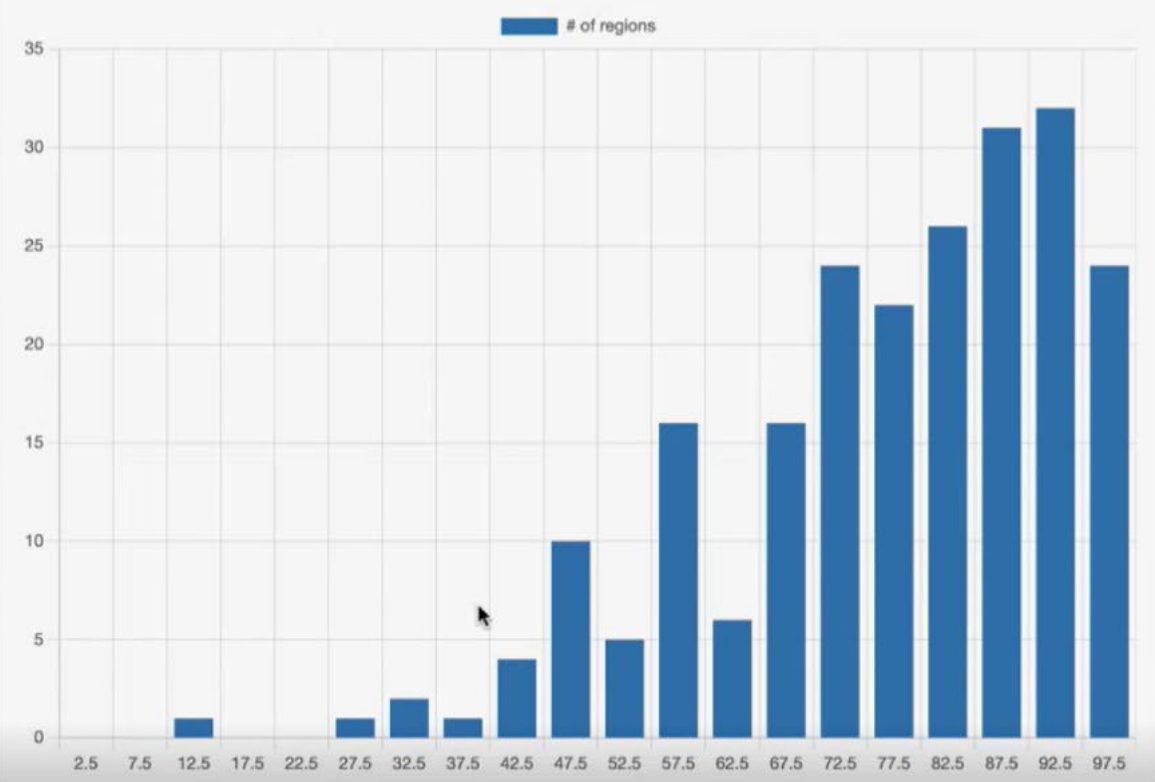
Preventive Underproduction Report 2021

Country Admin level Start time End time Road class

Preventive Maintenance Underproduction



Preventive Maintenance Underproduction Deviation Distribution



Winter Road Insights – Live network status

Road network surface conditions using floating car data

Real-time updates on the current road conditions. Allocate resources smarter and detect deviations instantaneously using the intuitive web-service map.

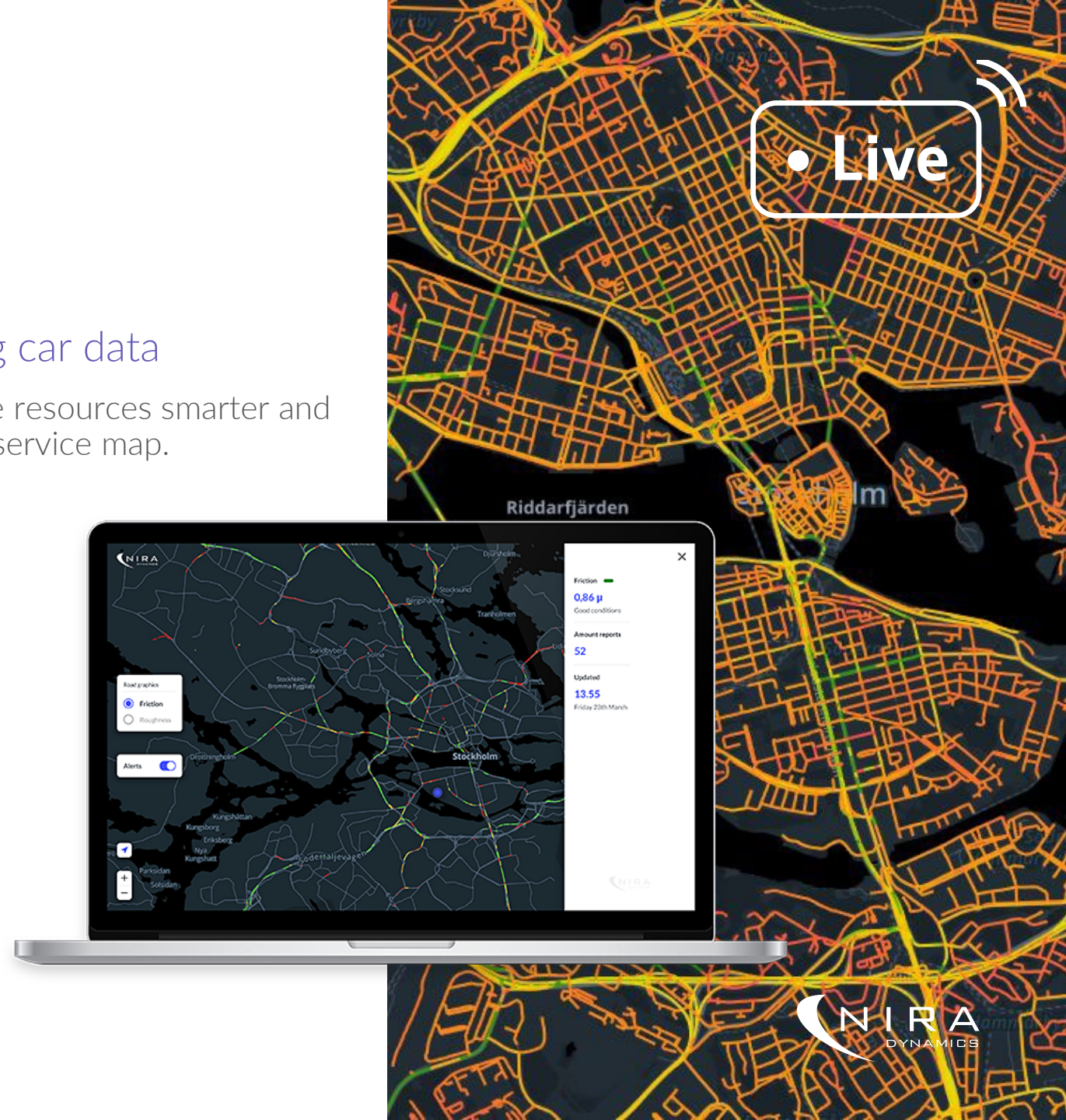
Use cases

Follow the road status in real-time and pinpoint regional slipperiness.

Instant feedback on successful actions.

Perform preventive actions based on neighboring regions status.

Online web service tool
Hazardous road warning
Live data from passenger cars



Winter Road Insights – Slipperiness Alerts

High confidence regional alerts for hazardous road conditions

Regional alerts based on multiple car measurements, enabling quick response to slippery conditions, preventing accidents.

Easily incorporated in operations

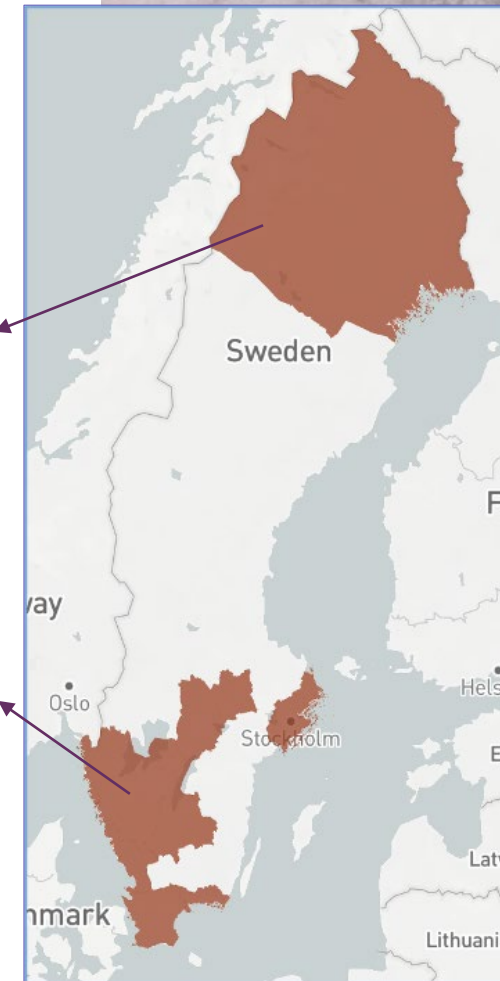
Available as a subscription, no limit in the number of receivers. Alerts are delivered through:

- Mail or text message (sms)
- NIRA Online Tool suite

Minimizing expensive monitoring
Negative grip trend monitoring
Adaptable region settings

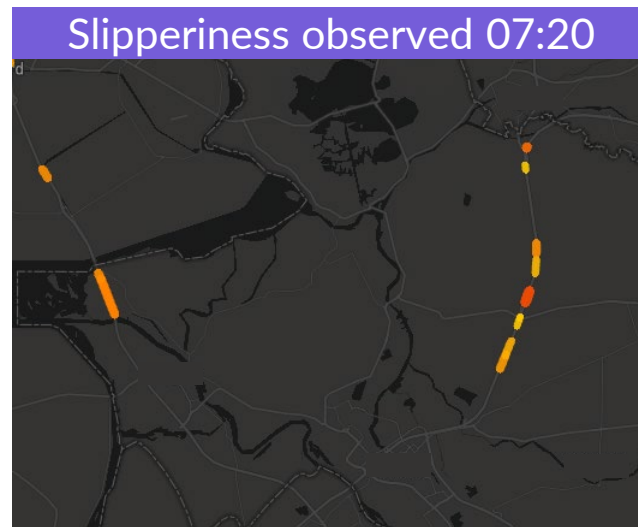
WRI Alerts> Low friction has been observed in Norrbottens län, SWE on primary roads
First observed at 2020-11-27 11:30

WRI Alerts> Low friction has been observed in Västra Götalands län, SWE on primary roads
First observed at 2020-11-27 11:20



Alerts and Live situations

Slipperiness February-21



Update 9:15 am

This morning, these cars slipped off the road at: due to the black ice.
This has happened in more places in the country. For the time being, it remains to beware of treacherous smoothness in the center and north of the country. Code orange also applies there, which, according to the KNMI, will remain in effect until 11:00 AM.



Slipperiness observed in the morning 1h40m prior to accidents

Winter Road Insights – Mobile RWIS

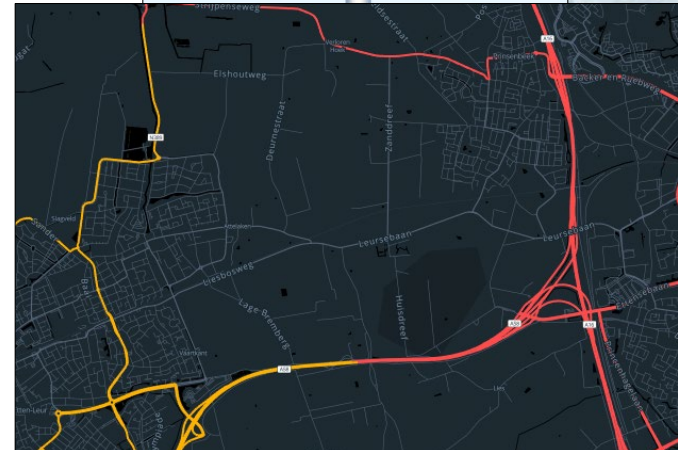
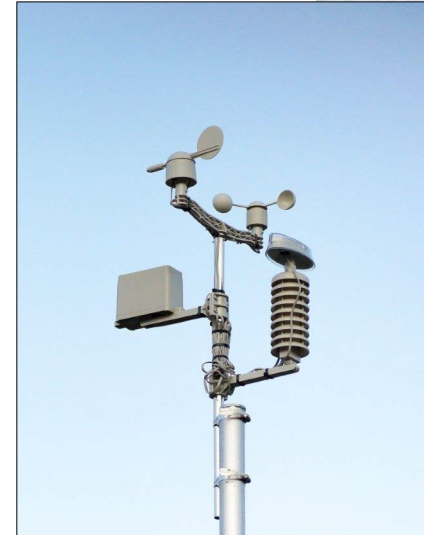
Real-time access to road weather properties

Connected car data fused with road weather models, NIRA Mobile RWIS gives a continuous coverage not limited to the location of sensor stations.

Available data types

- Road condition (Dry, wet, etc)
- Road grip
- Ambient temperature
- Modelled road surface temperature
- Humidity (prototype)

Continuous coverage
Minimize hardware investments
Replace or complement RWIS



Live Road Maintenance services across Europe

In Europe, NIRA customers have been consuming data for years:

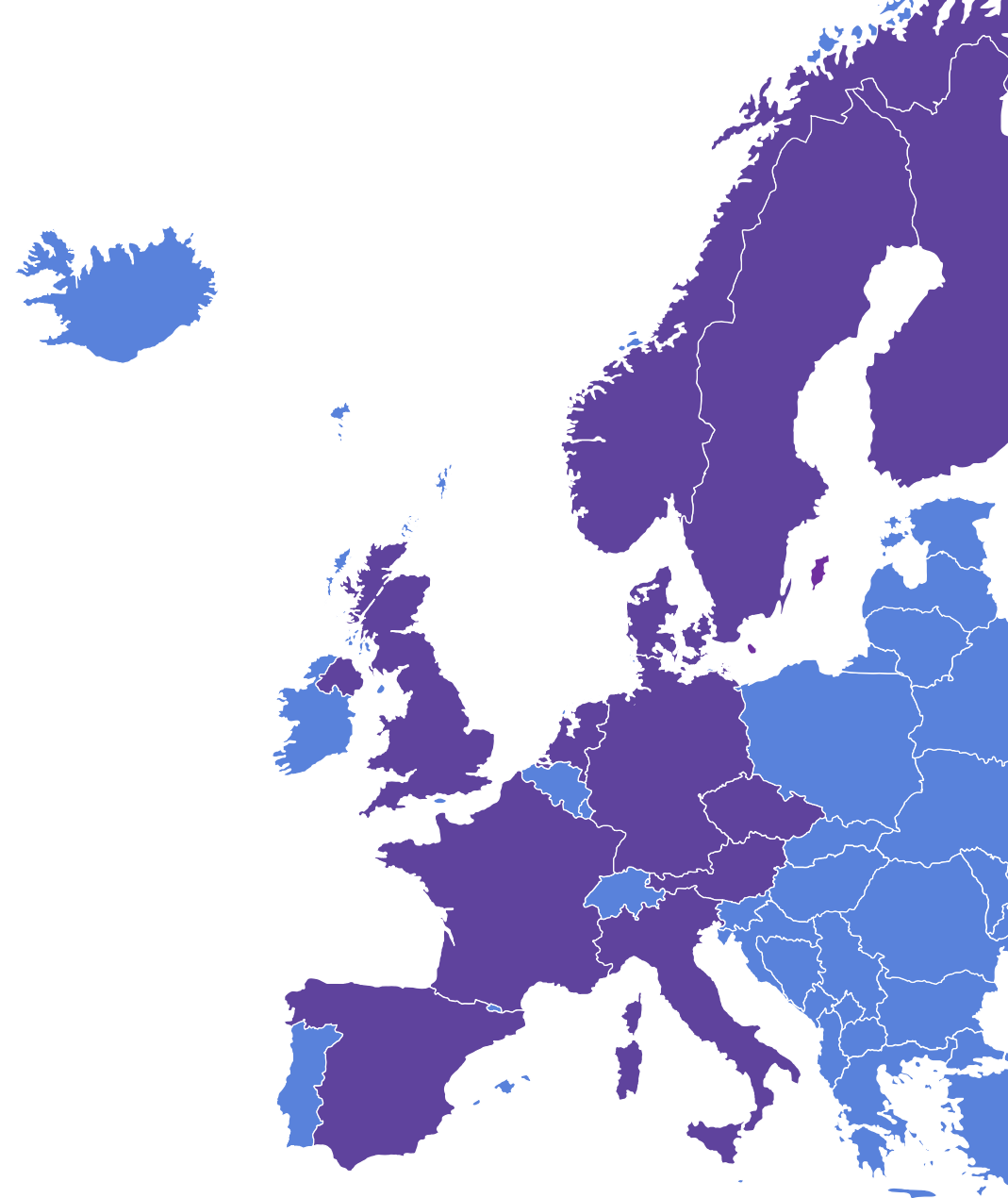
SVEVIA



PEAB



Autoliv





Why friction?



Why friction?

Friction is **THE KPI** for road safety during winter times