# CGS Road Weather Information System

## Optimization of road winter maintenance

Weather affects all modes of transportation. That is why Road Weather Information System (RWIS) technology provides vital information on road surface and weather conditions needed for roadway maintenance operations.

RWIS technology is typically used for monitoring snow and ice, but it can also be used for high winds, flooding, or visibility.
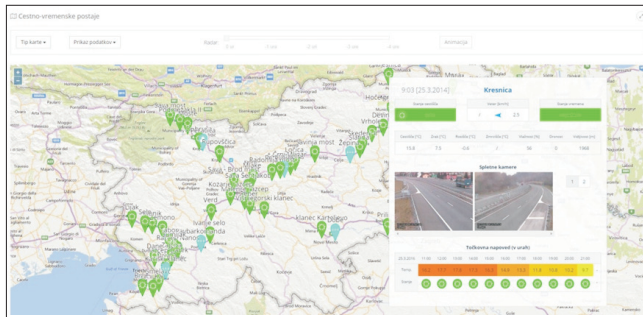
RWIS enables maintenance and operations personnel to monitor changing weather conditions in real time and make informed and timely decisions.
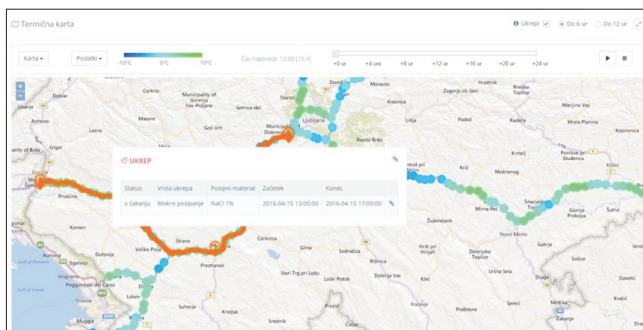
**Be Responsive!**
Save Lives,
save Environment,
save Money!
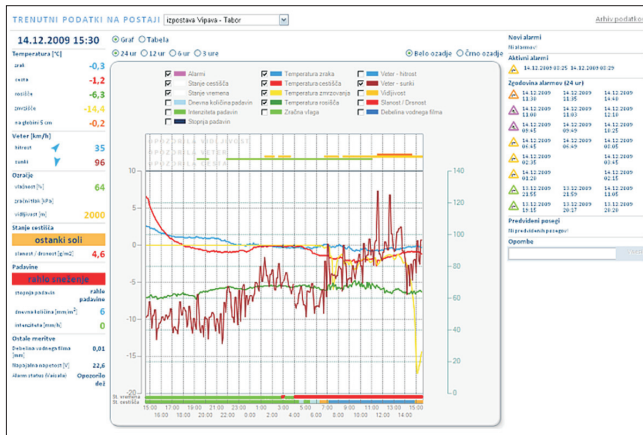
Detailed overview of events at a chosen RWS (Source: DARS d.d.)



RWIS - General view of the road weather stations (Source: DARS d.d.)



MDSS - Treatments recommendations (time, type, amount and place)
(Source: DARS d.d.)

## Features of Road Weather Stations (RWS)

- Remote monitoring of atmospheric and road (pavement) weather,
- Embedded and contactless road sensors,
- Full range of atmospheric sensors including air temperature, wind, dew point, precipitation, visibility detection, etc.,
- Supports standalone RWSs and mobile sensors,
- Open system supports sensors of different producers.

## Features of Road Weather Information System (RWIS)

- A modern cloud-ready mobile and web-based application,
- Supports IoT sensors and sensors of different producers,
- Various displays of current weather conditions at RWS locations and alarms,
- Novel micro forecasting, integration of different nowcasting products enabled,
- Treatment recommendations (time, type, amount and place) support winter maintenance decisions,
- Management of resources (spreading materials, available human resources, route planning),
- Custom-tailored solution,
- Provides connectivity for other systems (e.g. ITS, smart city…).

## Who can benefit from using CGS RWIS?

- Road, Airport and Railways maintenance services can significantly reduce maintenance costs, improve safety and responsiveness, and reduce environmental pollution.
- Traffic managers can take better decisions with help of CGS RWIS.
- Research organisations can use historical data for analysis.
- Drivers will be safer on the roads and have up to date road information available.
- Cooperative Intelligent Transport Systems (e.g. ITS, smart city).

# Description of CGS RWIS

## Road weather stations (RWS)

RWSs are equipped with embedded or contactless road sensors, meteorological sensors, and with digital cameras. Most common measurements on RWS are: road temperature (on surface and in different depth), thickness of water film, salt concentration, freezing point temperature, road condition, air temperature and humidity, dew point, air pressure, amount and type of precipitation, visibility, wind speed and direction. The measurements are stored in the station's logger.

## Road weather information system (RWIS)

From the RWSs or from the vehicles, the measurements are transferred by different telecommunications technologies to the central database of the RWIS, which is a cloud ready mobile and web-based application offering various displays of current measurements, displays of the archived data and the metadata on stations and sensors as well as alarms.
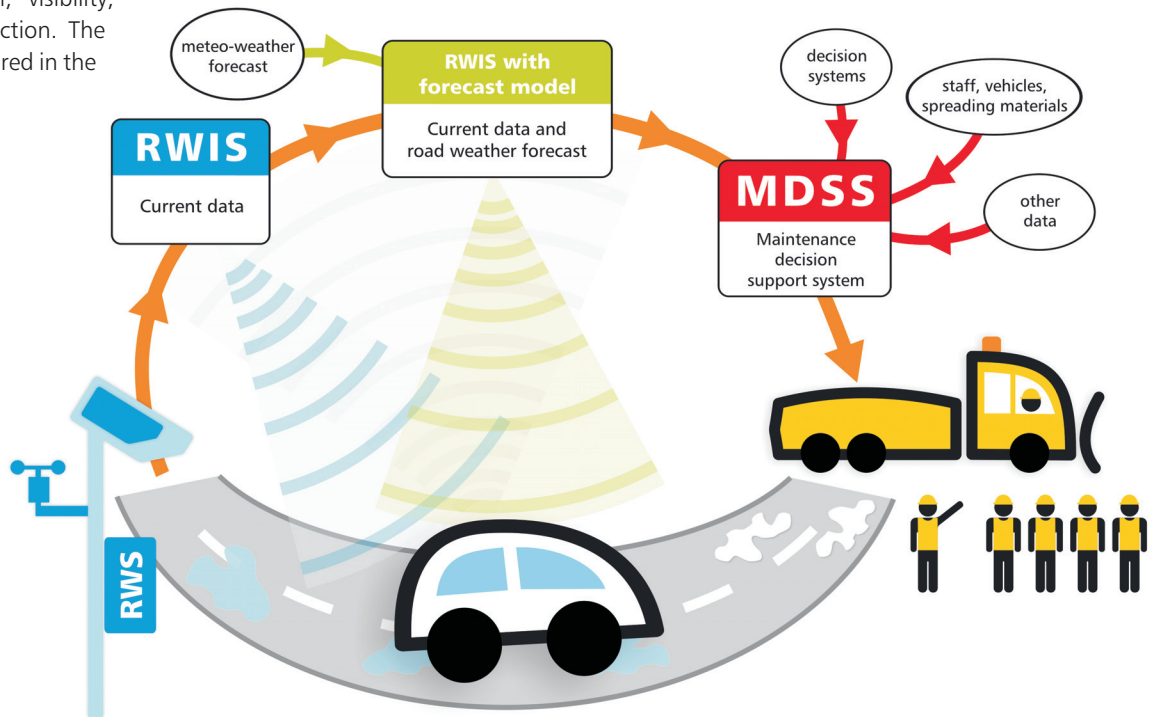


## Road weather forecast and MDSS

The RWIS is equipped with a novel and reliable forecasting model of road temperature and road surface conditions (e.g. dry, moist, wet, frost, ice, snow). High time and spatial resolution enable a microlocal, route-based weather forecasts on the whole road network. Different nowcasting products of meteo services could be integrated.

Weather forecasts support winter maintenance decisions with automatically treatments recommendation (time, type, amount and place of each treatment), resources management and system performance analysis.

Road Weather Station at mountain pass Predel, Slovenia (Foto: CGS Labs d.o.o.)


Installation of an embeded road sensor (Foto: CGS Labs d.o.o.)



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## Why do customers decide for CGS RWIS?

CGS RWIS is opened system which supports RWSs of different producers. It's custom-tailored solution. Our approach to microlocal and real time road weather forecast was recognised as highly innovative and was awarded with several EU funds for development. CGS RWIS supported IoT and connected cars. Due to microlocal weather forecasting it is an ideal solution also for smart cities and urban environment.

## Key Projects:

- Development and implementation of MDSS DARS, Slovenia (2016-2018).
- FrostD – Energy self-sustainable system for road conditions observation and reporting (Eurostars programme) (2016-2019).
- SmaRMS – The Smart Road Modular Sensor [H2020 SME Instrument] (2015-2016).
- Development and implementation of RWIS for state roads, Slovenia (2004- ).
- Development and implementation of RWIS for highways, Slovenia (2007- ).
- Development of RWIS for municipalities, Slovenia (2014- ).
- METRoSTAT – Reliable road condition forecast [Eurostars programme] (2011-2014).
- INCA Central Europe - Integrated Nowcasting System for the Central European area [Central Europe programme] (2010-2013).

## Key Publication:

- Decision support system for winter maintenance of the motorways in Slovenia. Transport Research Arena TRA 2018, Vienna, Austria, 2018.
- New MDSS in Slovenia. SIRWEC conference, Fort Collins, Colorado, USA, 2016.
- High Resolution Nowcasting and its Application in Road Maintenance: Experiences from the INCA-CE Project. IET Intelligent Transport Systems, 2015.
- Upgraded METRo Model Within the METRoSTAT Project. SIRWEC conference, La Massana, Andorra, 2014.
- Statistical Approach for Forecasting Road Surface Temperature. Meteorological Applications, 2013.