

Solutions for intelligent year- round road maintenance

eBook

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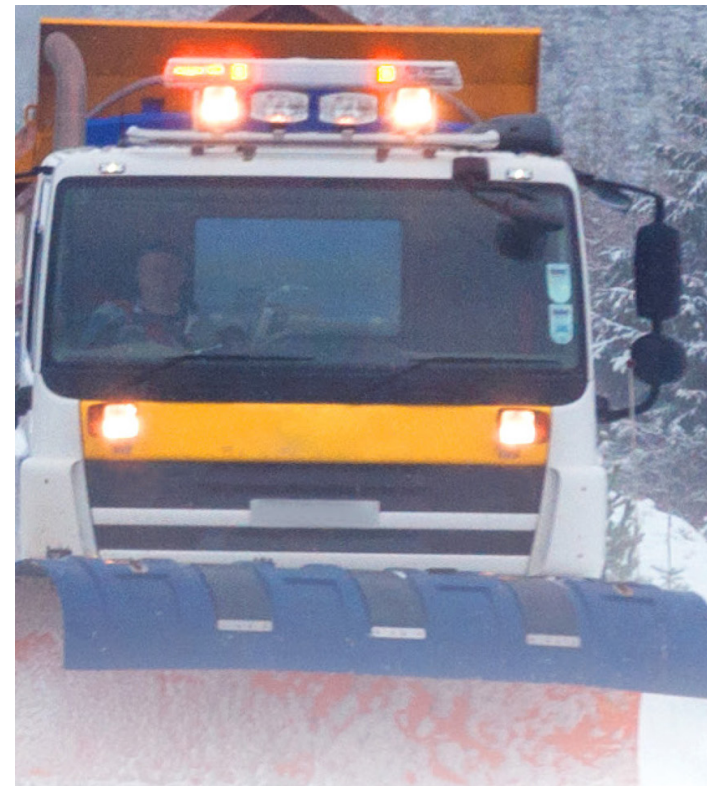
From pavement sensors to complete road weather systems – tools to support year-round road maintenance decisions

Increased road usage. More severe weather. Limited budgets. Ever-increasing public expectations. Road maintenance professionals are facing more year-round challenges than ever before.

Yet you still need to keep your road network safe and continuously available, even with these increased demands. From winter storms to summer maintenance, you can count on Vaisala's exclusive combination of hardware, software and services to provide you with the critical information required to make data-driven, realtime decisions.

Vaisala solutions arm you with the most accurate data and analysis available so you can:

- **Keep roads clear:** Road safety is the top priority in every season. Plan, mobilize, treat and monitor the effectiveness of winter maintenance actions with confidence. Multitask your summer maintenance activities with AI-powered road state analysis.
- **Prioritize your budget:** Act faster – and at lower costs – than traditional methods using datadriven road maintenance strategies. Extend the life span of your assets while improving both efficiency and safety.
- **Maximize road capacity and journey planning:** Control traffic flow and speed to minimize rapid acceleration/deceleration in areas with heavy traffic. Complement your decision-making with Vaisala's expert application know-how and accurate, reliable weather and air quality data.



Proven accuracy with fixed sensors

Accurate, reliable observation is at the heart of what we do

Every monitoring network begins with reliable sensors. Vaisala sensors are used by thousands of customers around the world in a variety of applications, both on their own and paired with Vaisala weather stations. They are designed to perform in the most austere environments, from extreme cold to sweltering, high-humidity conditions. Vaisala's sensors are so reliable, in fact, the company has twice been selected by NASA to place sensors on Mars Rover projects. They're fully weatherproof, and comprehensive self-diagnostics minimize downtime and maintenance visits.

One of the most convenient ways to measure the road surface is through non-invasive sensing. Vaisala's remote sensors enable accurate measurement of two key parameters – grip and surface temperature – without the need to stop traffic or cut into the road.

Certain measurements, such as road salinity and ground temperature, can only be measured through physical contact with the road. Vaisala's embedded sensors enable those measurements and complement the information provided by the non-invasive sensors.

Vaisala atmospheric weather sensors are built specifically for road applications and measure relative humidity, air temperature and dew point. Other sensors use ultrasonic technology to measure precipitation type, intensity, visibility and wind speed. With this wide range of proven technologies, your stations can be tailored to meet your climate and terrain.



Network wide coverage with mobile sensors

While roadside weather stations provide accurate and continuous observations from fixed locations, they can't provide information on road conditions between stations. Mobile sensors feeding Vaisala decision support systems provide an easy way to collect road weather data on those in-between locations, providing a more holistic view of weather conditions across the entire network.

With mobile sensors road crews can accurately optimize their chemical spread rates for different conditions, reducing unnecessary chemical spreading as well as the environmental impact and costs associated with inefficient chemical usage.

Vaisala Mobile Detector MD30

The MD30 mobile sensor tracks road conditions and transmits road weather data – including road surface state, grip, relative humidity, dew point and road and air temperature – from snow plows or other vehicles. The sensor provides live data for plow drivers to support local treatment decisions and data can be fed into spreader control and AVL systems. At the same time, it distributes precise data to supervisors and other decision-makers at the city, county and state levels – without disruption – to help ensure the best possible decisions. The MD30 works well as a stand-alone sensor or to help fill in the data gaps between stationary weather stations. When MD30 mobile sensor observations are integrated into Vaisala decision support systems, it continuously improves road network forecast accuracy.

Vaisala Surface Patrol Pavement Temperature Sensor DSP100

The DSP100 allows you to accurately detect the risk of freezing based on real-time road and air temperature observations. The sensor is easy to use, requires minimal maintenance and offers basic live data for winter maintenance operators. The data can also be fed to external systems such as spreader controllers and AVL-systems.



Road Weather Station RWS200

Reference grade roadside observation

With advanced algorithms, the RWS200 is intelligently designed to keep all paired sensors running reliably. It provides the flexibility to deploy a variety of sensors to ensure you have the reference grade road state information you need to make the right road maintenance decisions.

The RWS200 runs advanced Vaisala algorithms to combine information from multiple sensors and validates the data to provide the most accurate picture of current road states possible. With help of native integration of sensors, intelligence of RWS200 roadside unit data processing goes beyond a conventional data logger.

Flexibility to work today – and tomorrow

The RWS200 automatically provides information on the status and maintenance requirements of the unit itself and the sensors deployed with it, ensuring timely, cost-effective servicing. The station can be easily remotely managed and even reset either as a whole or sensor by sensor, boosting overall system uptime.

It is fully weatherproof and features integrated lightning protection, ensuring reliable operation for years after installation.

Additionally, the RWS200 is built to last up to 20 years, and Vaisala recognizes that over its lifetime, your data needs may evolve. That's why we built the RWS200 with flexibility in mind, enabling you to upgrade and expand the sensors you deploy as your needs change.

Easy installation and worry-free performance

Many of the problems with roadside weather stations stem from installation or calibration issues. By contrast, the RWS200 features a fast, easy installation procedure; factory-tested system components mean less hassle with the system overall and fewer worries about uptime when the weather becomes inclement. Native integrated sensors and graphical user interface ensure calibration and maintenance are enhanced over the product lifetime.



Observation Network Manager NM10

Remotely monitor, manage and control your road weather stations

Identify problems and minimize site visits

Monitor, manage and control your road weather observation networks remotely on one central, secure, automated platform. Observation Network Manager NM10 provides easy access to all essential information including alerts, observations, metadata, device status and maintenance requirements – enabling your observation network to operate more reliably while reducing the lifetime cost of management and maintenance.

Real-time problem-solving

Thanks to its alert and notification services, the NM10 can inform you about issues with your road weather station network in real time, 24/7. Access to all relevant information (e.g., site, device status, maintenance tasks) is available through a secure browser-based application, enabling real-time diagnosis should issues arise. The ability to integrate with

third-party management systems eliminates the need for full-time operators and maintenance engineers to monitor the system. Instead, the right people can be easily notified in real time, only when necessary.

Reduce operational costs

The NM10 enables remote firmware updates of multiple Vaisala road weather stations at the same time and resetting the connected stations when required minimizing the number of site visits required to manage your network. In addition, it enables detailed diagnosis of system issues to be performed remotely and reduces costs by ensuring the right parts, tools and personnel are deployed for repairs.

Constant monitoring of data availability and validity

The NM10 automatically provides continuous information about data availability and validity. Continuous flow of high-quality observation data from all stations and sensors across your network is always ensured. The result is a real-time view of the entire network's status, more reliable network performance and less manual work spent on maintenance and report generation.

Severity	Type	Time	Source	Message
Info	System	2020-05-28 13:21 +0200	1320/WHM7700_L1	Sensor operation OK (1310000)
Alarm	System	2020-05-28 13:21 +0200	1320/WHM7700_L1	Sensor data invalid (1310000)
Info	System	2020-05-28 13:16 +0200	1320/WHM7700_L1	Sensor operation OK (1310000)
Alarm	System	2020-05-28 13:16 +0200	1320/WHM7700_L1	Sensor data invalid (1310000)
Info	System	2020-05-28 13:13 +0200	1320/WHM7700_L1	Sensor operation OK (1310000)
Alarm	System	2020-05-28 13:13 +0200	1320/WHM7700_L1	Sensor data invalid (1310000)
Warning	System	2020-05-28 13:12 +0200	1320	From endpoint 914_9102
Info	Correction	2020-05-28 13:11 +0200	1320	Alert off: 'No observation'
Info	Correction	2020-05-28 13:11 +0200	1320	Alert off: 'Web service not available'
Alarm	Alert	2020-05-28 13:08 +0200	1320	Alert on: 'No observation'

Site	Update completed	Current software version	Software update status	Actions
<input type="checkbox"/>	227	2020-05-07 09:45 +0200	4.1.0	Details
<input type="checkbox"/>	323			
<input type="checkbox"/>	399	2020-05-05 16:43 +0200	244	Update completed
<input type="checkbox"/>	640			
<input type="checkbox"/>	640		Software file: RW5200_release_4.1.2_2020-09-11_full-ewupdate_image	
<input type="checkbox"/>	814		Update requested by: John Smith (john.smith@example.com)	
<input type="checkbox"/>	826		Update completed: 2020-09-14 10:54 +0200	

Thermal Mapping

Observation-based temperature profiles of your entire road network

Thermal Mapping helps road authorities ensure that they treat when and where it is needed on their network with an observation-based solution to create thermal road profiles. It provides you with quality information when locating weather stations and is valuable when making treatment decisions.

Intelligence-based road weather station positioning

You need to locate your weather station in the most effective location to get a full picture across your network so you can make decisions based on the best information possible. In the absence of a full understanding of the temperature profile of your network weather stations may not be located optimally and therefore you will not get the best value from your investment and potentially make decisions based on unrepresentative information.

Thermal Mapping gives you a full picture of how your network behaves using actual temperature measurements, enabling you to locate stations in the most appropriate locations. Using the thermal temperature profiles, we will make recommendations on where weather stations should be located.

Forecast network wide based information

When making a treatment decision you need to understand how your entire network is currently behaving and will behave in the future, so you can make the best call to ensure your network is treated when and where needed. You may have forecast information at fixed locations across your network or a forecast of the minimum temperature on your network, but not a full picture of the network wide temperature variations. This leads to parts of your network being over treated and others not being treated when needed, increasing the potential for increased number of accidents.

Using the measured thermal road profile, Thermal Mapping extends forecast temperatures from individual locations across the whole network to provide a dynamic network wide map. This displays the minimum road temperatures and also a time-step view, showing how the network temperatures vary at different times across the night.

Wx Horizon

The best situational awareness and weather impact forecasts in one cloud-hosted application to ensure road safety

When it comes to winter maintenance, better decisions can save lives. Understanding the potential impact of weather on your network is critical for maintaining transportation safety and mobility.

Observation-driven data for better accuracy

Vaisala Wx Horizon provides observation driven data from fixed weather stations, mobile sensors and forecast inputs to determine future conditions on the road network. Developed in collaboration with input from the public works community, Wx Horizon is a first-of-its-kind service that helps you stay ahead of weather changes and make accurate decisions on when—and how—to keep your roads safer.

There is no substitute for real-time measurement. The combination of accurate measurements and powerful modeling provides the best situational awareness of current conditions plus a forecast of how the weather will impact road network mobility – giving you the ability to make timely, targeted decisions more easily.



Designed with mobile sensing in mind

We set out to produce the strongest, most efficient solution for helping customers keep their roads safer—which meant research and community input. Not only did we work closely with the public works community, we also sought feedback from users of the Vaisala Mobile Detector MD30.

The result of this research is a solution that has the needs of winter maintenance experts as a fundamental building block to its design.

Maintain safer roads with all the information you need—current conditions, precipitation levels, and near-term forecast data—to decide when and where to deploy your fleet.

Simplify and save time with a single interface that analyzes and visualizes data from fixed and mobile sensors.

Drive efficient treatment practices that save time and money by optimizing winter maintenance resources.

Provide consistent Level of Service with the power of a single, accurate and reliable source of data.

RoadDSS

Access your road weather data anytime, anywhere

Vaisala's RoadDSS software suite is designed to provide you with an effective solution for the storage and display of both historic and current road weather data, ensuring you have access to your information anytime and anywhere, from any device.

With RoadDSS you:

- Don't need to maintain a local IT infrastructure for road weather data
- Have access to road weather data – no VPN connection required
- Can store, maintain and retrieve weather data, treatment plans and other crucial data – all from one centralized place
- Get relevant information about treatment decisions quickly to counter traffic accident claims
- Can set tiered user levels to meet the needs of any organization

Know the road conditions before the weather hits

Being able to predict and potentially prevent the impact of weather hazards before they occur is crucial. RoadDSS offers pavement temperature and road weather forecasts so you can view predicted and historical information in a single view. You can better plan for approaching weather events and freezing temperatures while monitoring and targeting historic trouble areas to minimize risks.

Optimize road crew performance

Just as RoadDSS offers the ability to track the performance of road treatments by using a performance index, it can also track crew performance relative to conditions by comparing crews to a storm severity index and using grip and friction readings from Vaisala sensors.



RoadAI

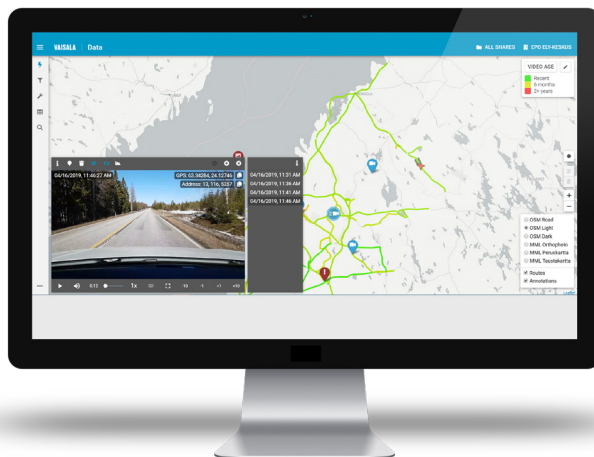
Comprehensive and objective analysis of road assets for enhanced road management

Vaisala's artificial intelligence (AI)-powered data collection platform, RoadAI, leverages wireless connectivity and cloud technology to make safe, continuous data generation possible for entire road teams or fleets of vehicles through real-time visual information – at a fraction of the price of manual evaluations.

Same-day delivery of geospatial videos and best-in-class pavement defect detection empowers everyone from highway engineers to policy makers to make better, more informed decisions.

Complete road repairs proactively

With RoadAI's computer vision technology, you can perform timely and well-targeted road repairs by automatically identifying and assessing issues and assets on your road network. RoadAI enables inspectors to work independently to multitask, resulting in decreased costs associated with data collection for pavement surveys. The result is extended asset life span, greater efficiency and safety, and fewer driver claims.



Speed up response times

With a fleet vehicle equipped with a Vaisala sensor or an independent connected vehicle, RoadAI captures visual data so operators can manually flag and share issues across the road network. This helps speed up response times and improves maintenance procedure efficiency throughout your network.

Simplify sign management

RoadAI simplifies labor-intensive sign management by detecting, mapping and classifying each road sign and providing tools to mark sign condition. These features allow operators to perform a traffic sign condition assessment for more than 10,000 traffic signs in less than one week. In continuous use, road video data collection can be easily integrated into everyday operations, enabling tracking of changes including missing or damaged signs.

Anonymize images and protect privacy

If you need to anonymize video or camera imagery and want to remove all private data from material used for asset management, maintenance or monitoring purposes; RoadAI makes it easy through our computer vision platform. Anonymization of your material can be accomplished both online and offline according to your needs.

Solutions for intelligent year-round road maintenance



Why Vaisala?

Vaisala's weather and environmental technologies take every measure for unrivaled road network awareness – keeping roadways safe and efficient in any season.

Our instruments and intelligence are built on 85+ years of innovation and are known as the gold standard for precision and reliability. We understand how accurate data and insights do even more by driving sustainable road operations and climate action. Our holistic approach provides customers with end-to-end simplicity, valuable partnership, and a comprehensive portfolio that is constantly evolving.

As recognized experts in transportation, we continue to channel our curiosity into new ways of making roadways safer and more efficient than ever.

