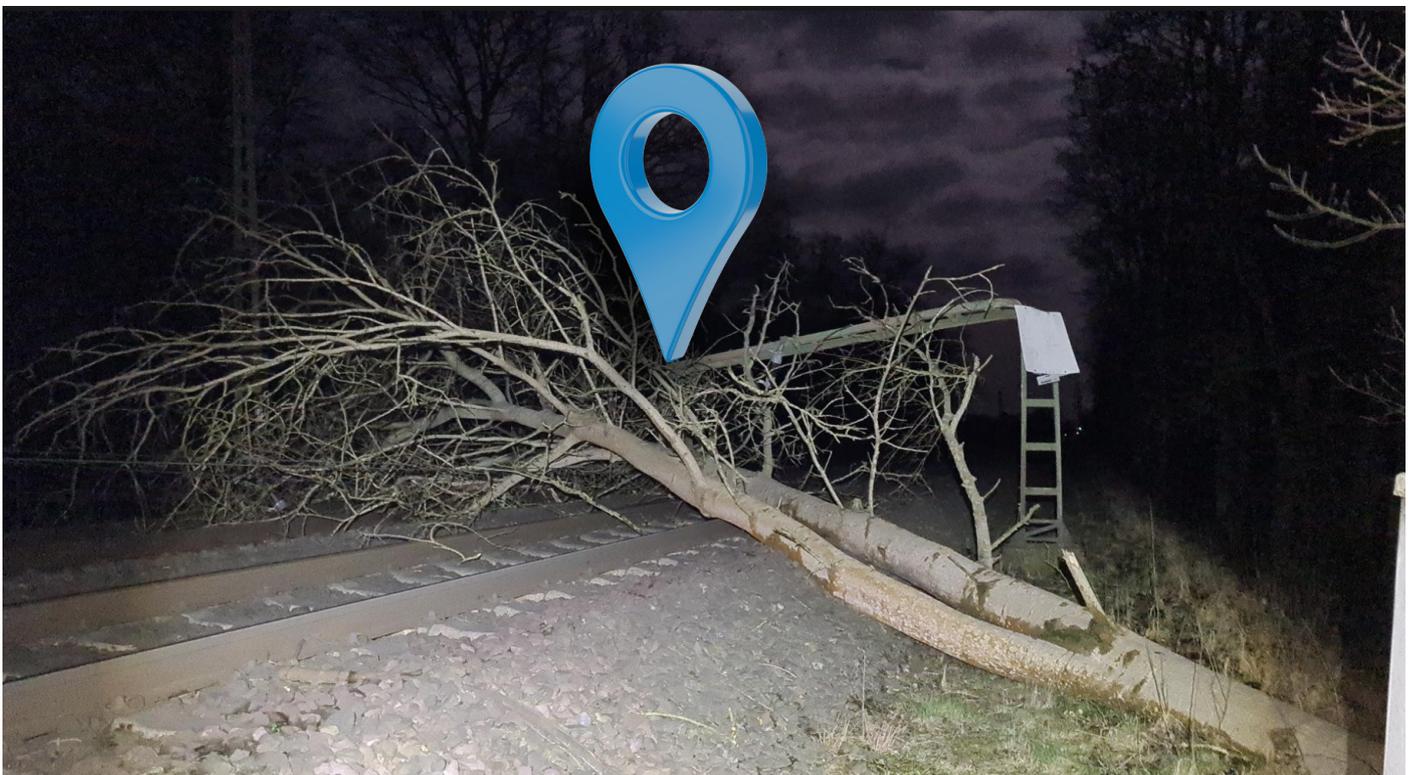




World Premiere at InnoTrans: Lightning-Fast Storm Damage Assessment



Climate change requires railway operators to make their networks more resilient and mitigate risks from weather events.

If the network is impacted by heavy storms, it is imperative to react swiftly and restore service as quickly as possible. At InnoTrans, LiveEO will showcase its product that identifies storm damage locations in near-

real-time, based on satellite data and AI.

This summer has been a wake-up call for many who had taken climate change lightly. An unprecedented heatwave swept over Europe and, in fact, the whole world. 42°C in London convinced many who, if not neglected, did not spend much time and energy on climate activism. The heatwave came almost exactly one year after the most drastic floods

central Europe has ever witnessed.

Harsher Weather Conditions Are Here to Stay

According to scientists, things will simply get worse until 2060 because all action we take now has a delayed effect. Our weather for the next few decades has been



determined by our societies' actions in the past. Heat and floods are two symptoms of our ailing climate, storms are another.

This is a grim outlook indeed. We know storms are going to increase, putting stress on our infrastructure networks. Trees to the left and right of the tracks pose a risk if in declining health. Large networks are hard to monitor on such a granular level from the ground, and carbon-intensive helicopter inspections arguably worsen the situation. Given the situation of us being stuck in this hot mess is here for the years to come – how do we deal with it? Technology is our best chance.

Satellite Data Is More Available than Ever

Satellite technology has come a long way. The commercialisation of the space industry has brought us not only space tourism for billionaires but has also led to significant reductions in the cost of bringing payloads into orbit. This, in turn, has made it possible for a whole new industry of satellite operating companies to emerge. With the constellations of hundreds

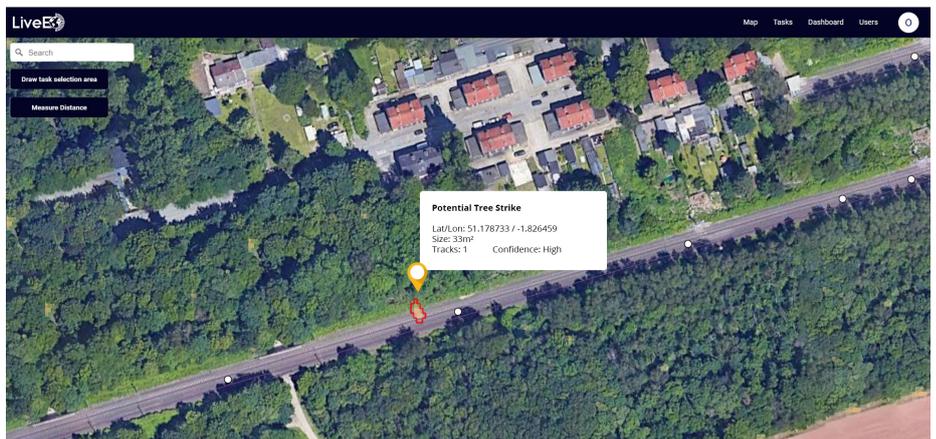
of satellites, companies like Planet Labs or ICEYE capture raw imagery of every location on Earth every single day. Machine-learning and cloud-computing advances make it possible to use this data to solve problems in track maintenance.

World Premiere: Near-Real-Time Storm Damage Detection

Trees falling on to the tracks or overhead lines during storms are dangerous and costly for railway operators as they cause service interruptions. At InnoTrans 2022, LiveEO will premiere its product for near-real-time damage detection for railway companies at **Booth 440 in Hall 7.1A**.

The software uses sophisticated change-detection algorithms and imagery from satellites equipped with synthetic-aperture radar (SAR) to detect objects on the tracks following storms automatically. SAR satellites penetrate clouds and rapidly deliver high-resolution data, even in bad weather conditions.

The system provides the location of the detected damage events in a user-friendly GIS application a few hours after the storm. The new solution allows operators to react quickly to natural disasters and restore service sooner than ever. The product launch comes after a pilot phase with several infrastructure operators. The product has been used to quickly assess storm damage in real-life conditions.



A Complete Rail Monitoring Suite

The new product enhances LiveEO's existing rail monitoring suite comprising its satellite-based vegetation management solution and LiveEO's product for monitoring continuous ground deformation. The complete suite enables railway operators to minimise the environmental risk to their assets.

Data-Driven Vegetation Management

LiveEO's satellite-based vegetation management solution delivers the user value on three levels. First, they get an overview of all vegetation along their asset. The analysis includes the trees' location, the canopy height, the vegetation species and their vitality. Vegetation managers can better plan their budget and inspections based on this information.

On the second level, the software takes that information and combines it with risk models to determine the high-risk areas. This enables the operators to act on a condition-based rather than a cycle-based approach and minimise vegetation risk.

Thirdly, the product generates prioritised work orders based on the risk assessment. The whole analysis, including the work order, can be accessed via LiveEO's intuitive web app, which requires no GIS knowledge. Managers assign work orders to field workers, who access them via LiveEO's mobile app. They can use the app to navigate to the locations and document their work.

Ground Deformation Detection

Detection of ground deformation is another important application of satellite analysis for railway operators. Ground deformation is not visible to the naked eye but can cause significant damage to railway tracks and even lead to derailments. Even slight elevation changes can be the first sign of seriously concerning events such as dam failures or landslides. Most research indicates that half of all train derailments are caused by bent or damaged rails. In the US, there are, on average, 3.7 derailments per day. In the EU, there were 68 such derailments in 2016. Not only are these derailments a cause of fiscal concern, but they also come with an increased risk to passengers.

To combat this problem, LiveEO utilises satellite-supported radar data monitoring. SAR (synthetic-aperture radar) is the technology used for this process. It can cover massive areas and pinpoint problems down to millimetres. The method provides a comprehensive overview of larger

areas and can detect trends to make railways safer and more reliable.

Monitoring 34,000km of Rail Network for Deutsche Bahn

LiveEO has worked with German railway operator Deutsche Bahn since 2018. Its 34,000km rail network consists of a dense tree population, which has proven to be an essential factor in passenger and freight traffic operability. Because of a lack of manual solutions to properly analyse the entire network quickly, and a lack of reliable data for determining the appropriate budget, strategy and personnel management, LiveEO was commissioned to determine the number of track kilometres directly impacted by trees. For their innovative solution, LiveEO has been awarded Deutsche Bahn's Supplier Innovation Award 2021.

LiveEO will premiere its near-real-time storm damage detection solution at InnoTrans: Booth 440, Hall 7.1A.

