DMT SAFEGUARD

MONITORING SOLUTIONS

Agenda

01. DMT at a Glance

02. DMT SAFEGUARD Monitoring Platform

03. Markets & Projects

DMT as part of the TÜV NORD GROUP

TÜV NORD GROUP

Headquarters in Hannover, Germany

Industrial Service, Mobility, Education	Engineering and Natural Resources	Aerospace	Information Technology
TÜVNORD	DMT	ALTER	TÜVIT

Facts and Figures

We create **sustainable value** for our customers **through quality-assured, specialized and innovative services in engineering and consulting.**

We provide independent services in the areas of **civil engineering and infrastructure, industrial plant engineering, natural resources, plant & product safety.**

DMT´s roots date back to **1737**

Approx. **1,100** employees mainly with academic background

DMT comprises **13** operational engineering and consulting companies and more than **30** branches worldwide

DMT´s attitude is dedicated to **excellence, responsibility & innovation**

Approx. **€130 million** turnover

Today DMT is a **core brand** of **TÜV NORD GROUP**

Locations and Availability

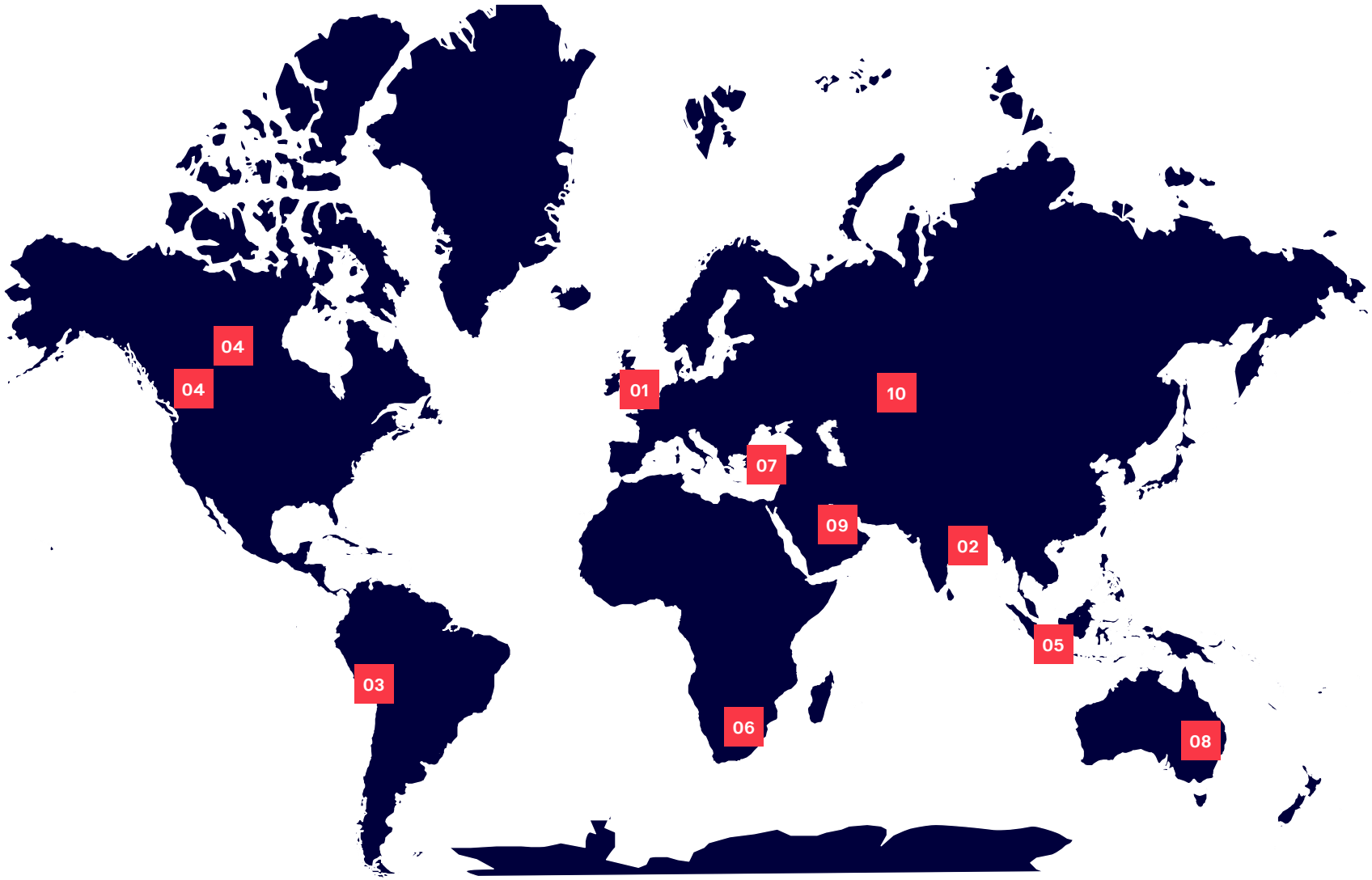
Branch Offices throughout Germany

Locations and Availability

International Presence

Local representations

01. UK
02. India
03. Peru
04. Canada
05. Indonesia
06. South Africa
07. Turkey
08. Australia
09. Middle East
10. Kazakhstan



Focus Markets

Plant Engineering & Process Engineering

Civil Engineering & Infrastructure

Mining

Energy

The campaign “Engineering Performance”

Electromobility

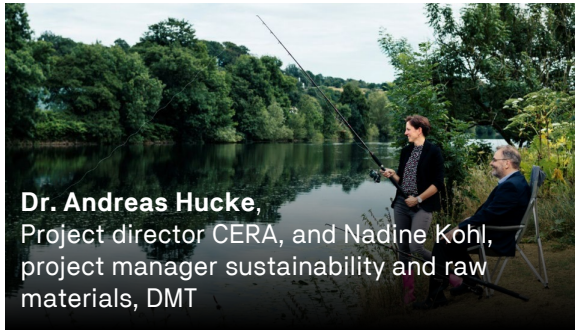
Water

Monitoring

Operator Responsibility Management

Industrial Engineering

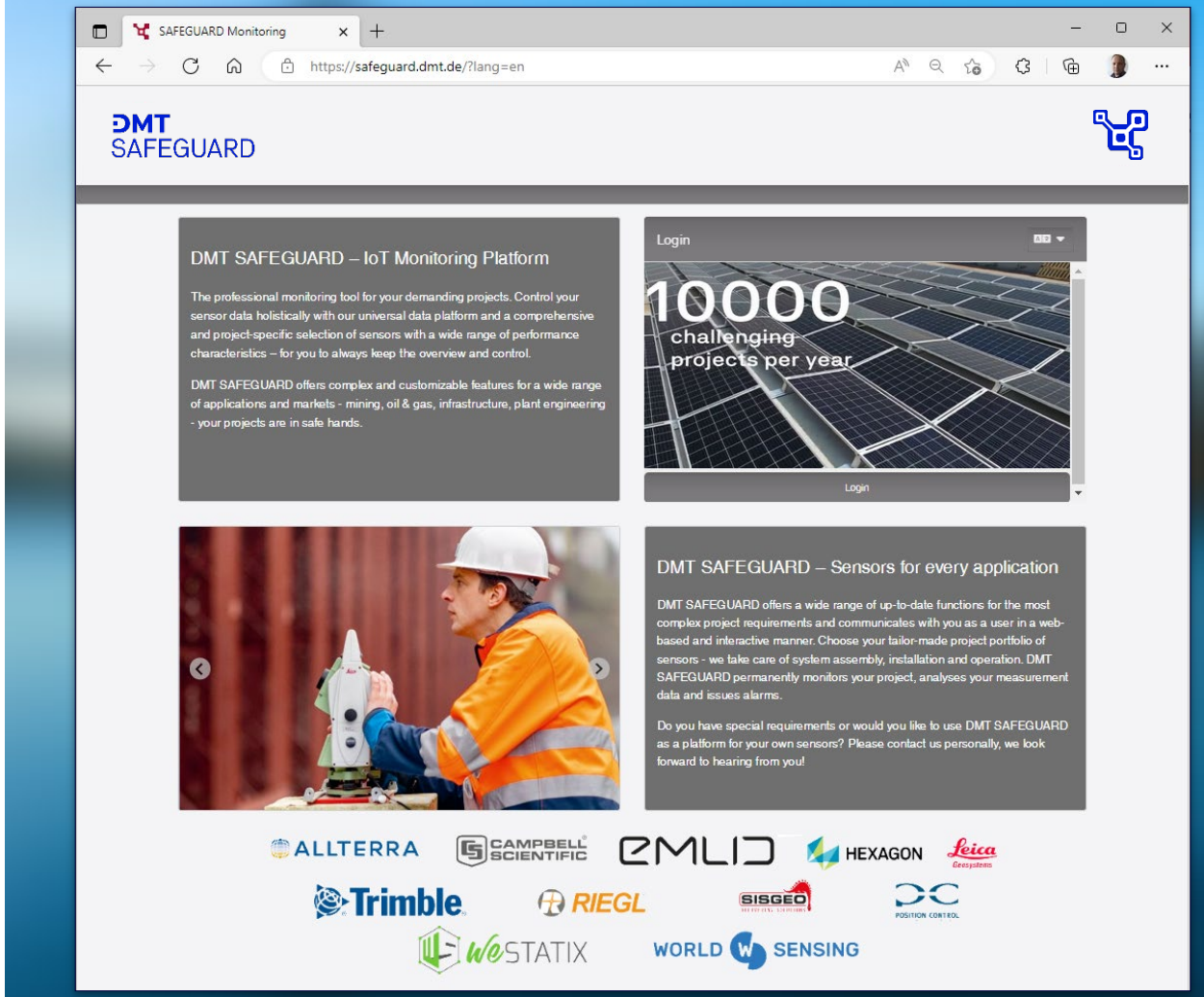
Sustainability



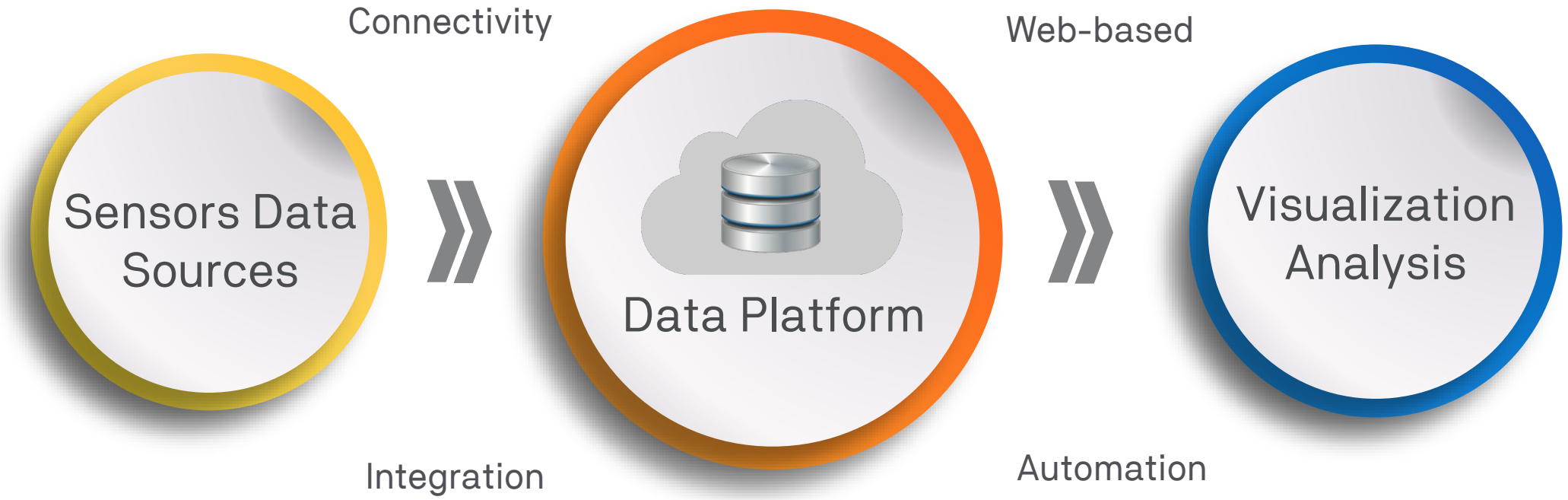
Electromobility

Industrial Engineering

02. DMT SAFEGUARD



System Introduction



System Introduction

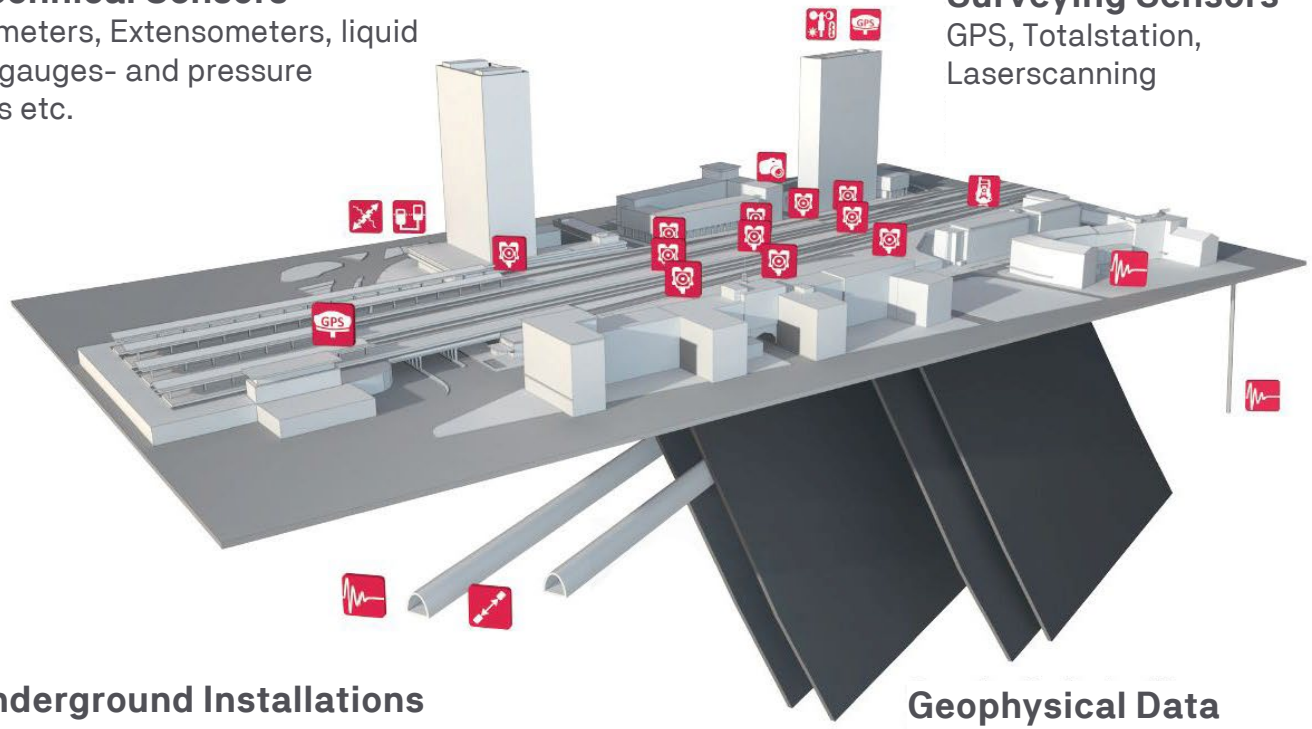
Sensors Data Sources

Data-Platform

Multimedia Information
Cameras, Microphones

Geotechnical Sensors
Inclinometers, Extensometers, liquid levels, gauges- and pressure sensors etc.

Surveying Sensors
GPS, Totalstation, Laserscanning



Underground Installations
Tunnel driving - blasting works, surveying, ATEX measuring systems

Geophysical Data
Geophones for vibration monitoring, seismology

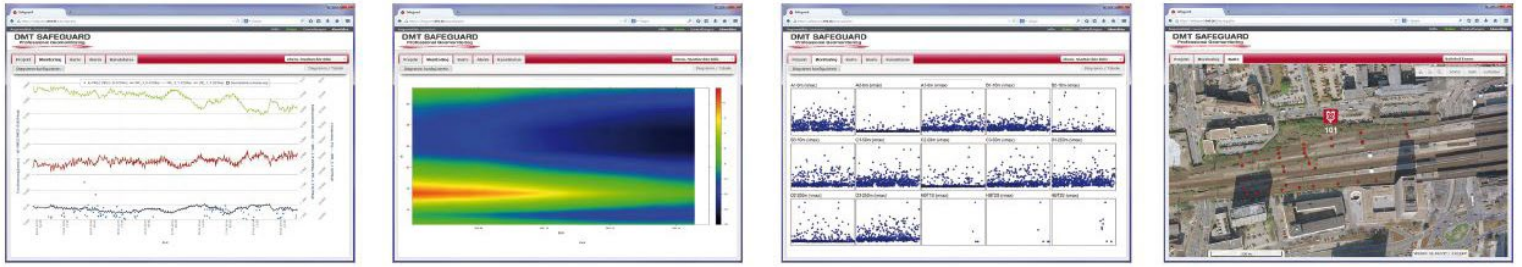
System Introduction

Data-Platform

Visualization
Analysis

Flexible data integration (format, type, manufacturer)

Data storage and management

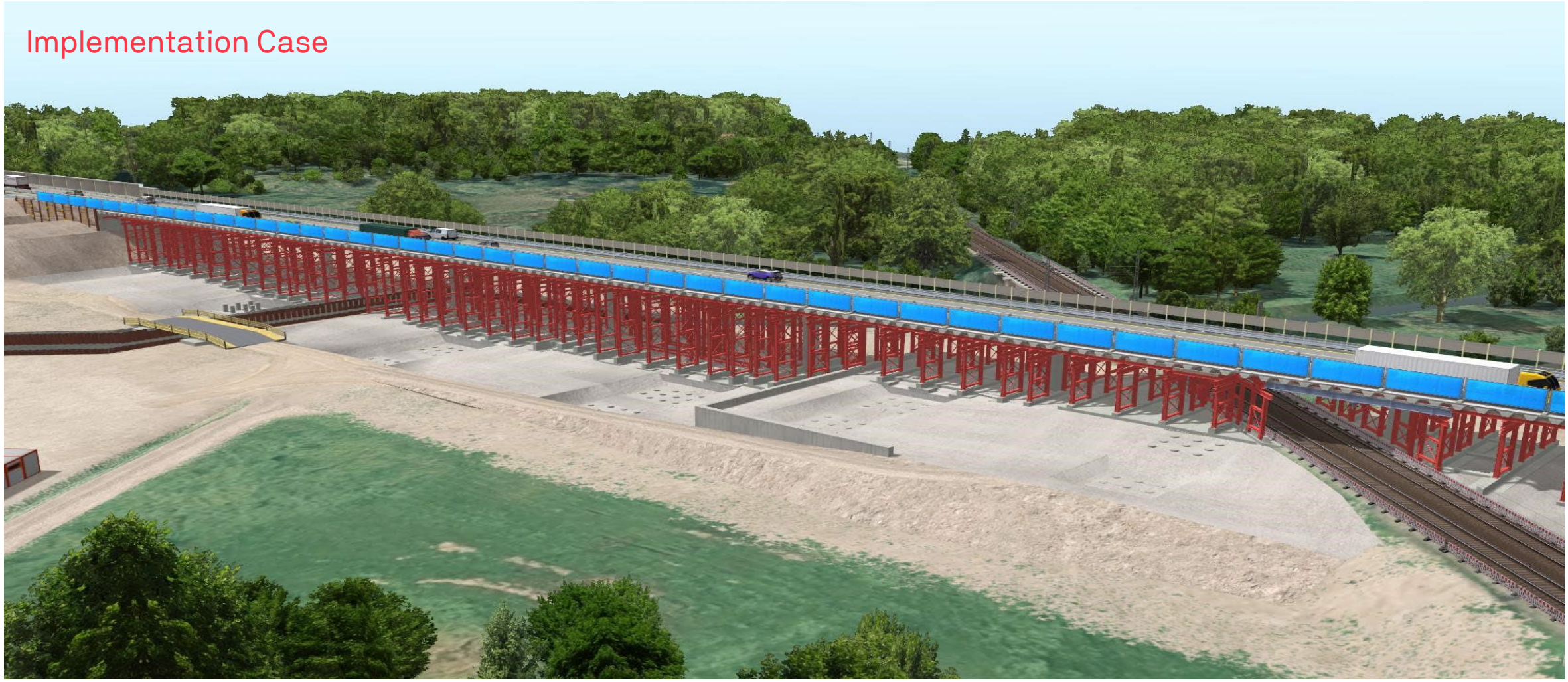


Online - Visualization

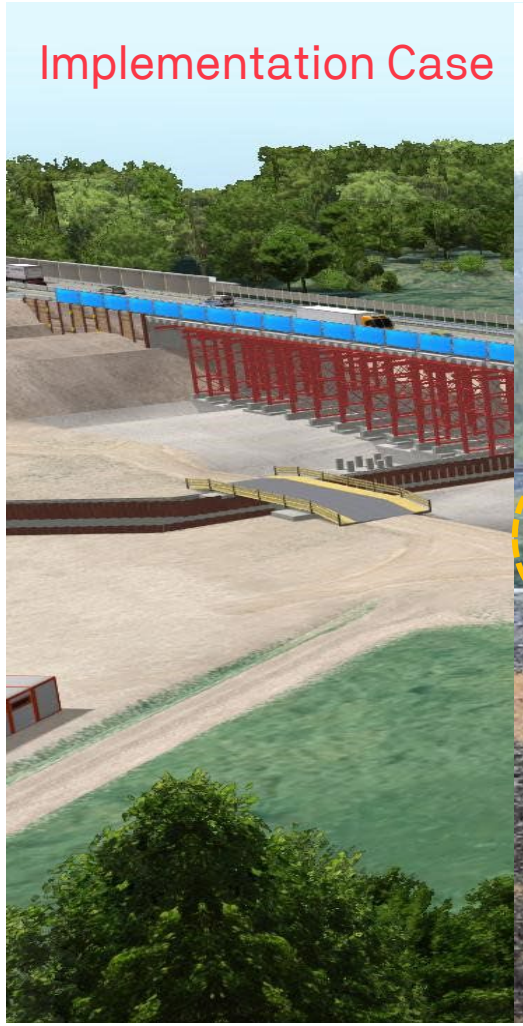
Alarming and Support

System Introduction

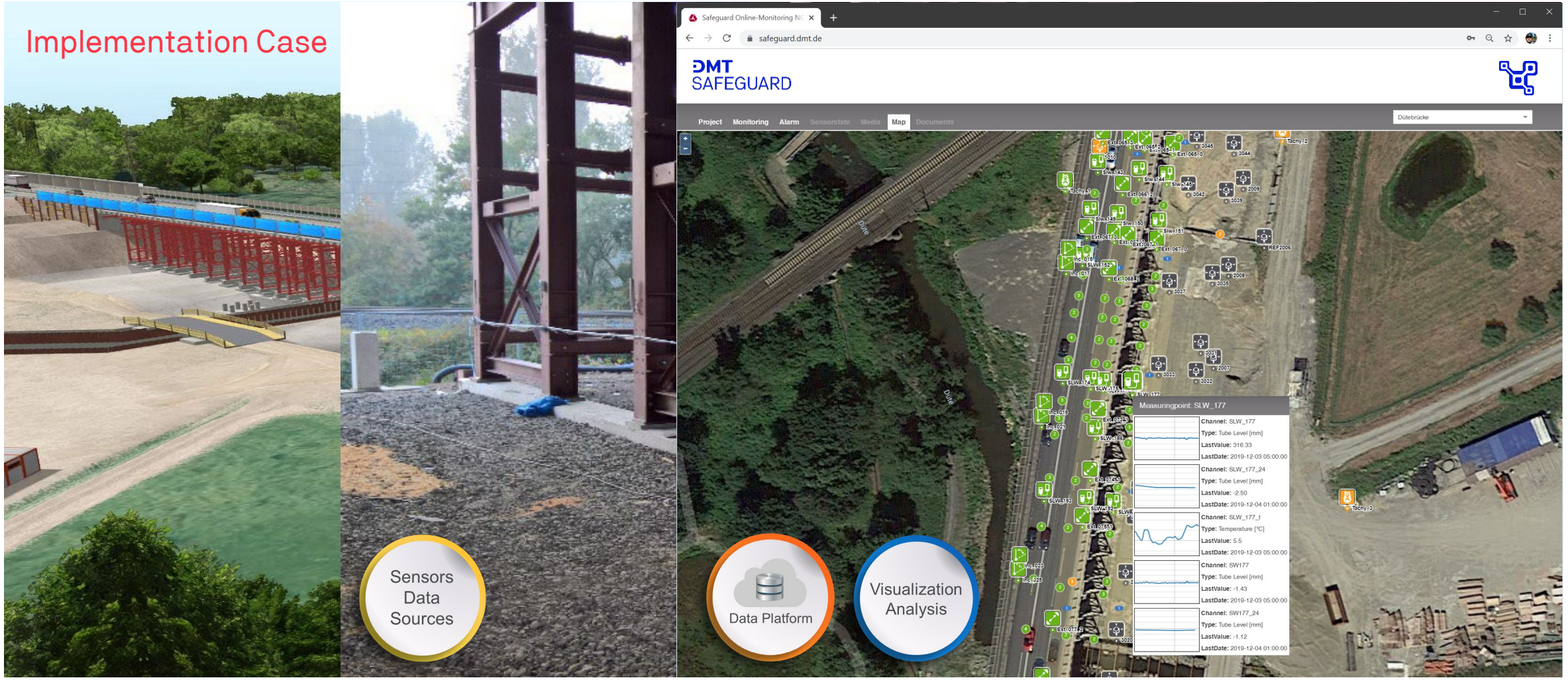
Implementation Case



System Introduction



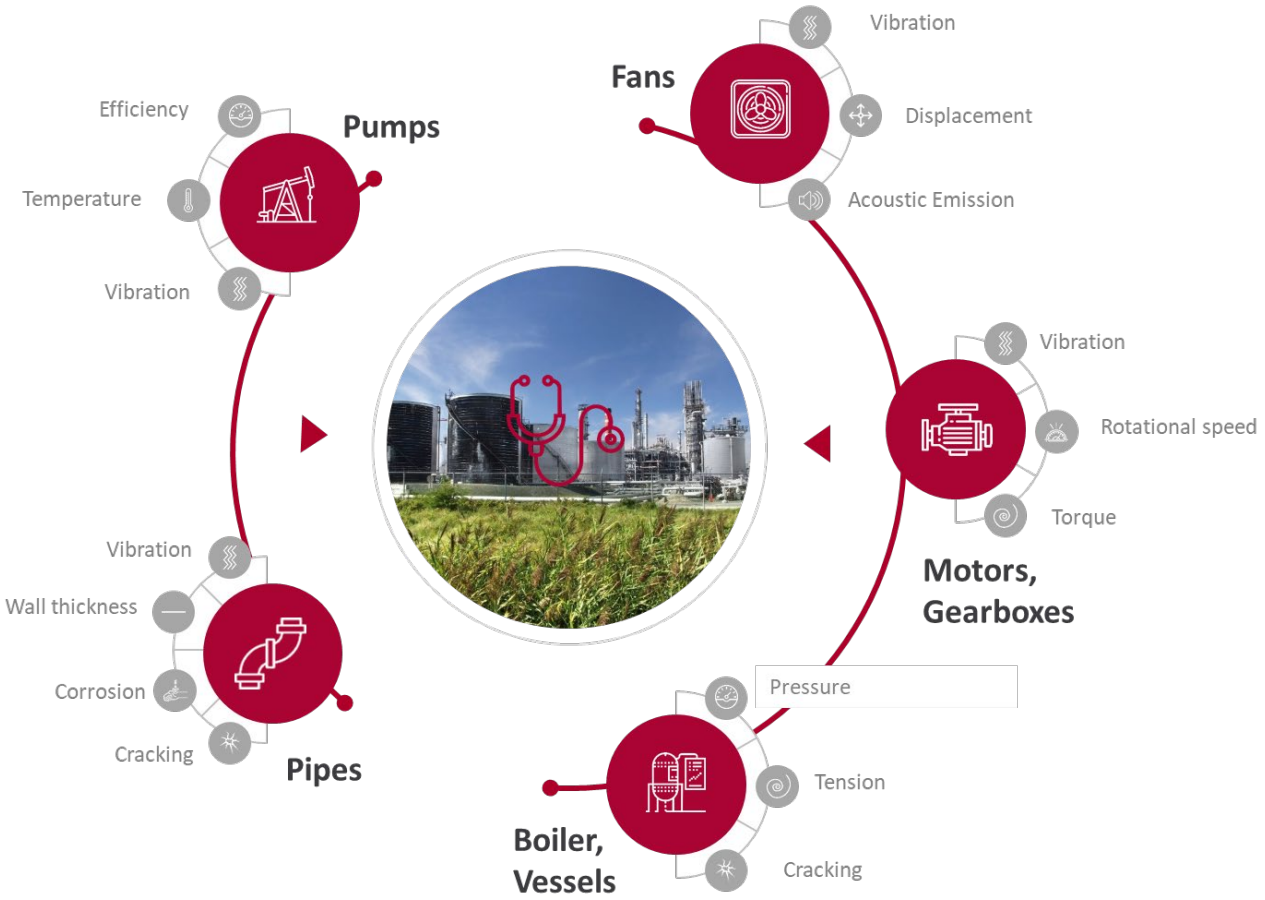
System Introduction



System Introduction

Condition monitoring application case

Surveillance of industrial plant operations



Generation of testing data

- Increase in plant and operational safety
- Recurring inspections
- Lifetime extension

Optimization of operations

- Optimization of maintenance (material, personnel)
- Avoidance / early detection of damages
- Extension of inspection intervals

1. Status Quo assessment
2. Computation / Simulation
3. Condition assessment + prediction
4. Remaining lifetime + testing concept

System Introduction

Platform Technology – Webserver, API, Data Base

- NGINX: Web Server, Reverse Proxy, Load Balancer
- MSSQL and PostgreSQL in various application scenarios
- PostgreSQL with Timescale and PostGIS Extension
- ExpressJS flexible Node.js web framework in conjunction with Sequelize
- Restful API secured with Keycloak

Key Functions

Connectivity

Advanced device management control, diagnostics and analysis for distributed sensor networks

Maps & Geolocation

Sensor data in geospatial context, direct integration of GIS services

Data Visualization

Powerful visualizations with customized time series, bar charts, distribution graphs etc.

Reporting & Tables

Create data tables that are available from raw and calculated metrics for easy viewing, comparison, export and reporting. Comprehensive AUTO-Report functionality.

Analytics & Alerting

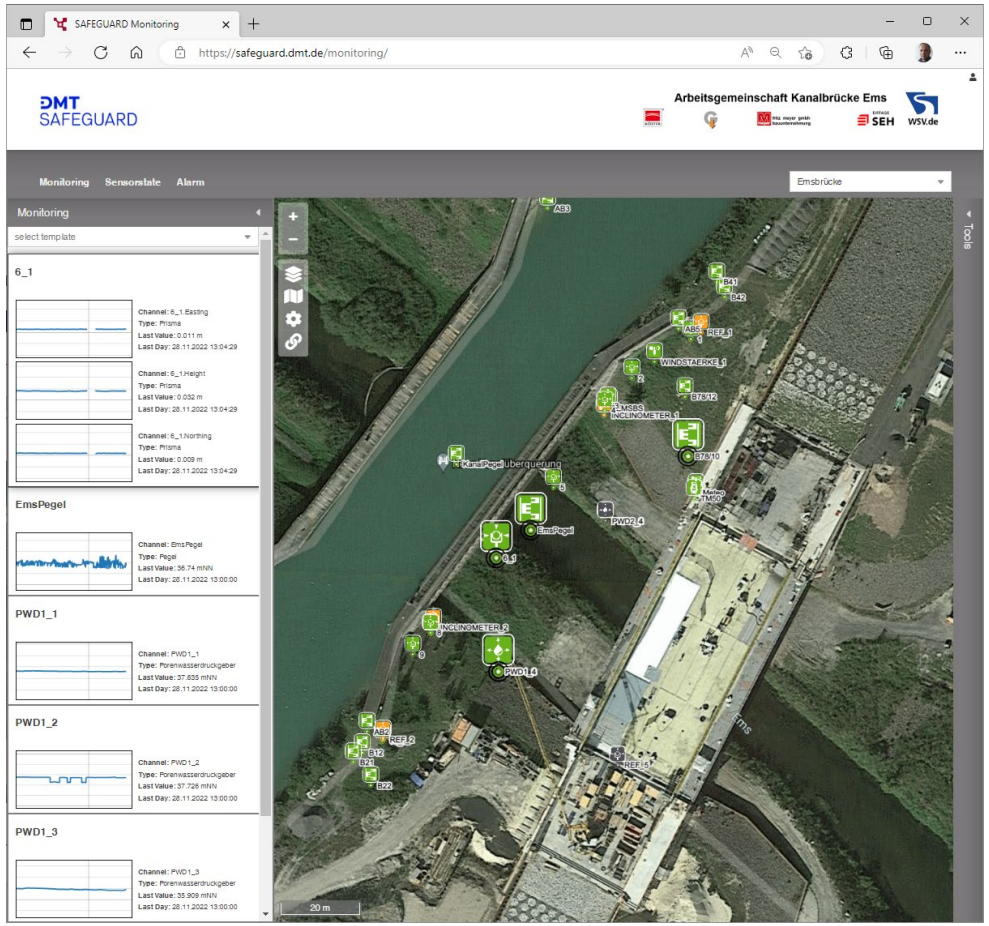
User-defined, multi-level threshold values and notifications (text message, e-mail, push)

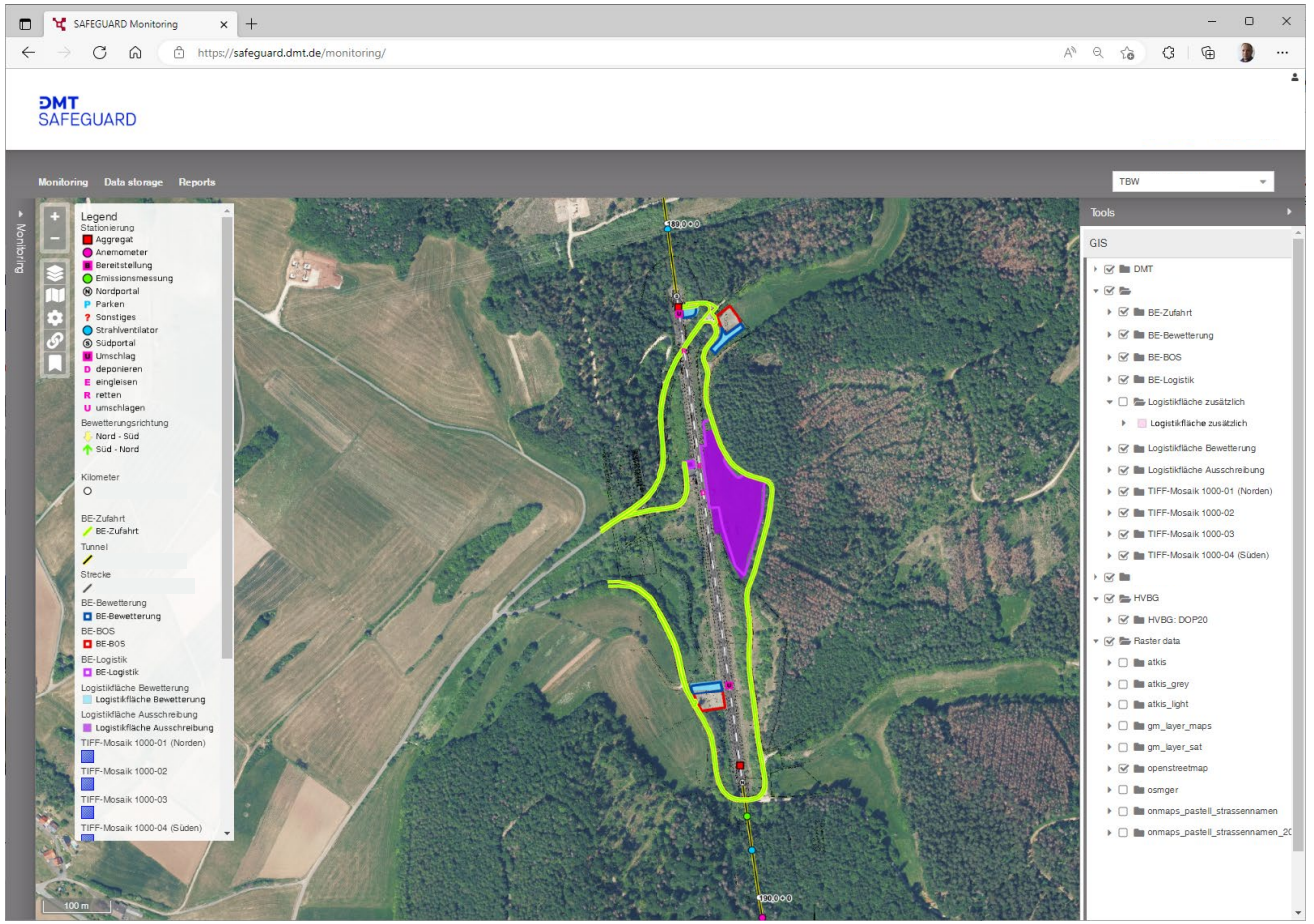
Documents & Wiki

Import of critical documents, photos, inspection records and event data to demonstrate project progress and performance.

Key Functions

Sensor Data & GIS Integration – Highly Customizable

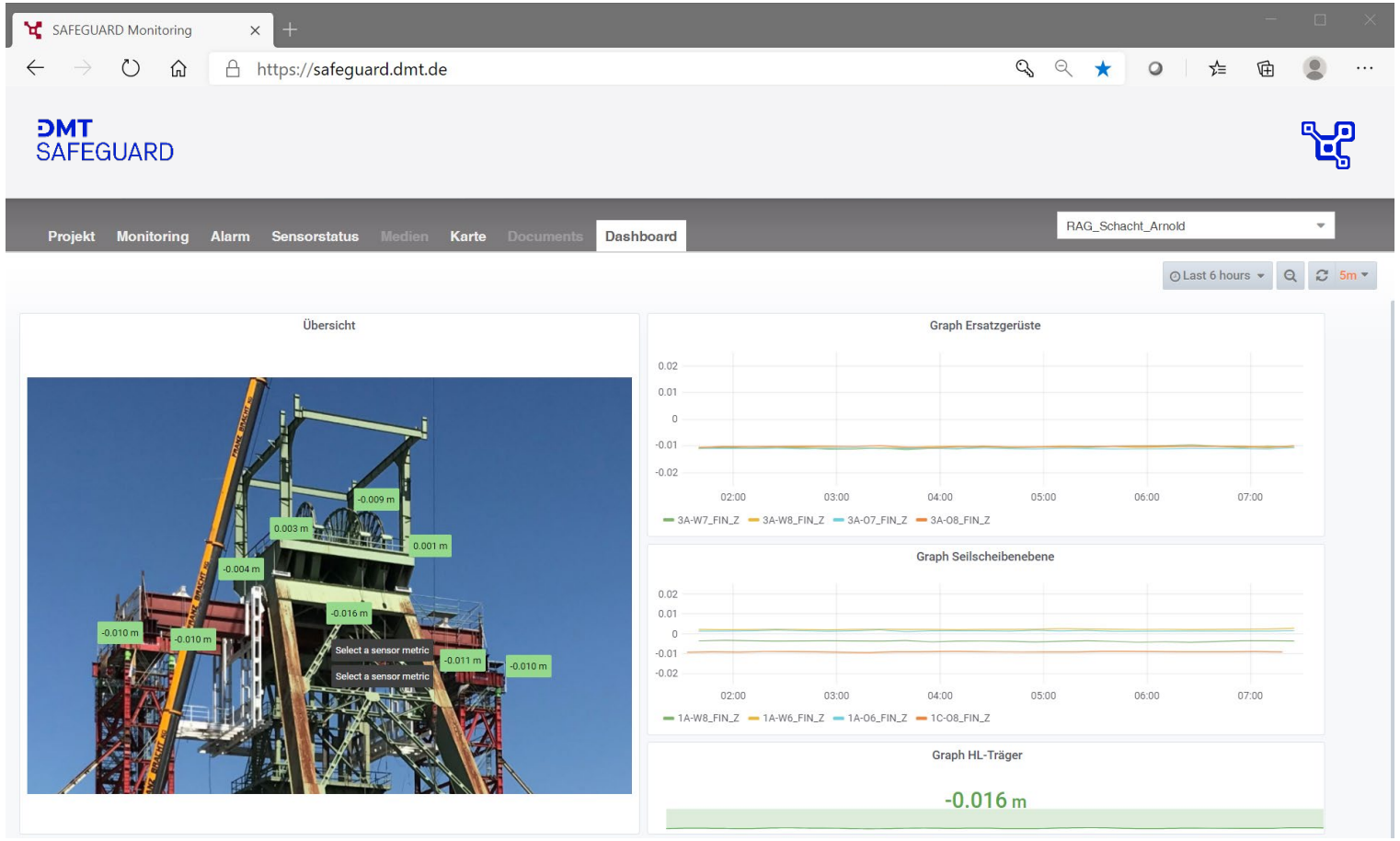




Dortmund-Ems-Kanal Construction (left); High Speed Railway Project - Tunnel Ventilation (right)

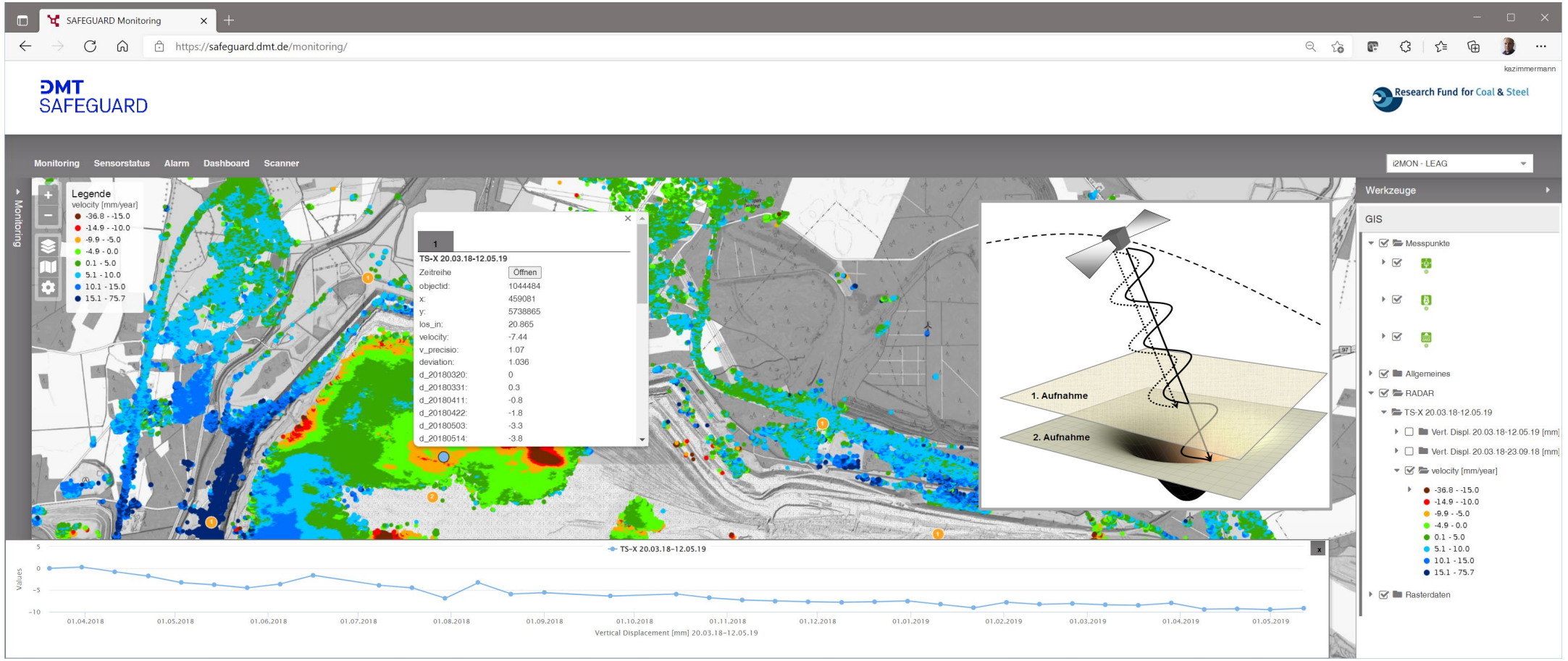
Key Functions

Data Dashboard Integration – Highly Customizable



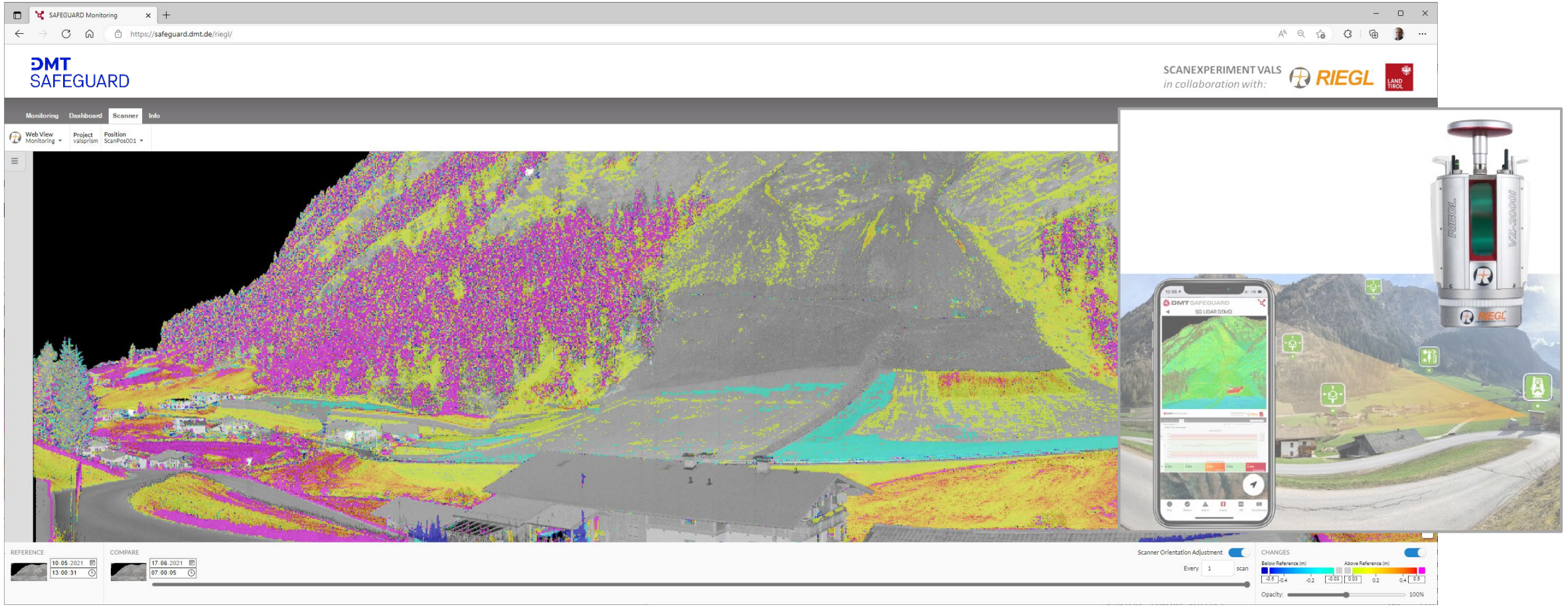
Key Functions

GIS - Remote Sensing/InSAR Integration - Interactive



Key Functions

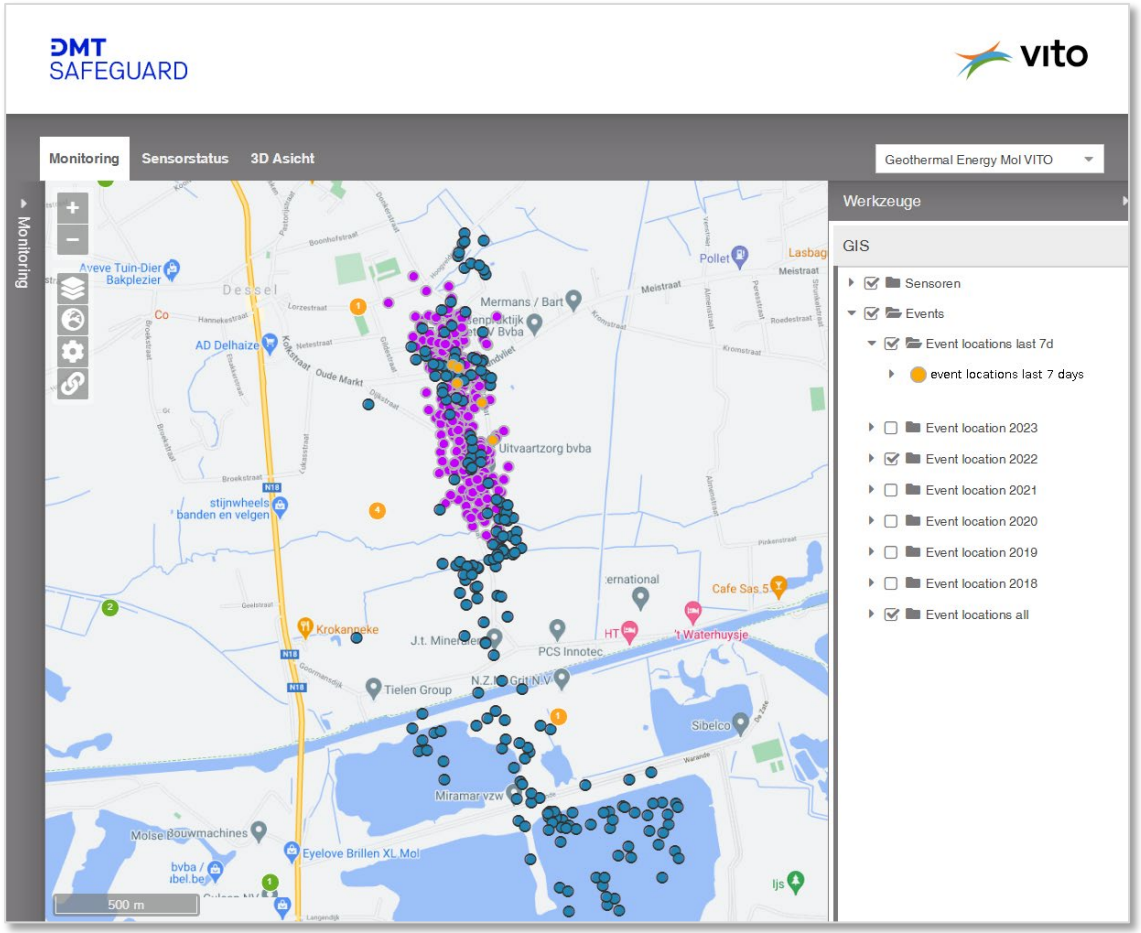
LiDAR Long-Range Laserscanning Integration - Interactive



Key Functions

3D Data Management & Visualization - Interactive

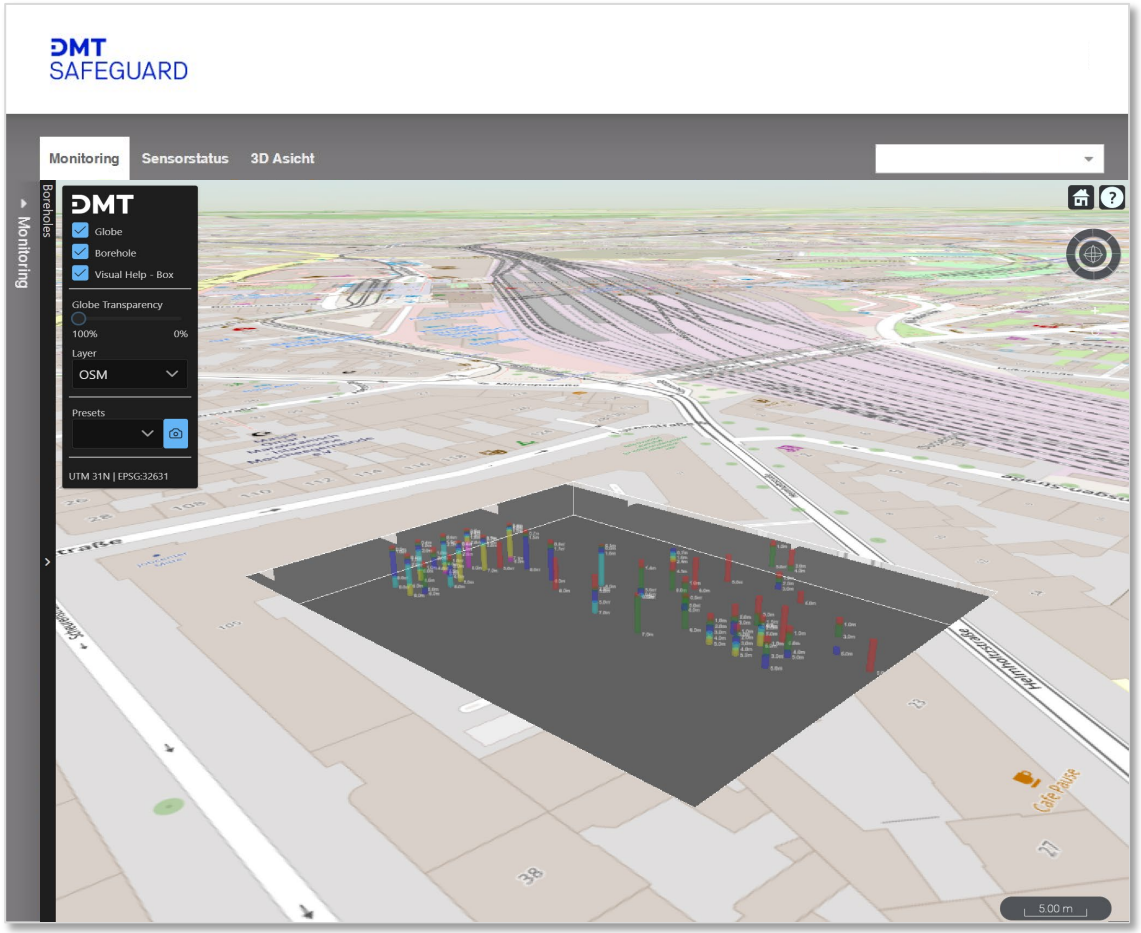
CESIUM

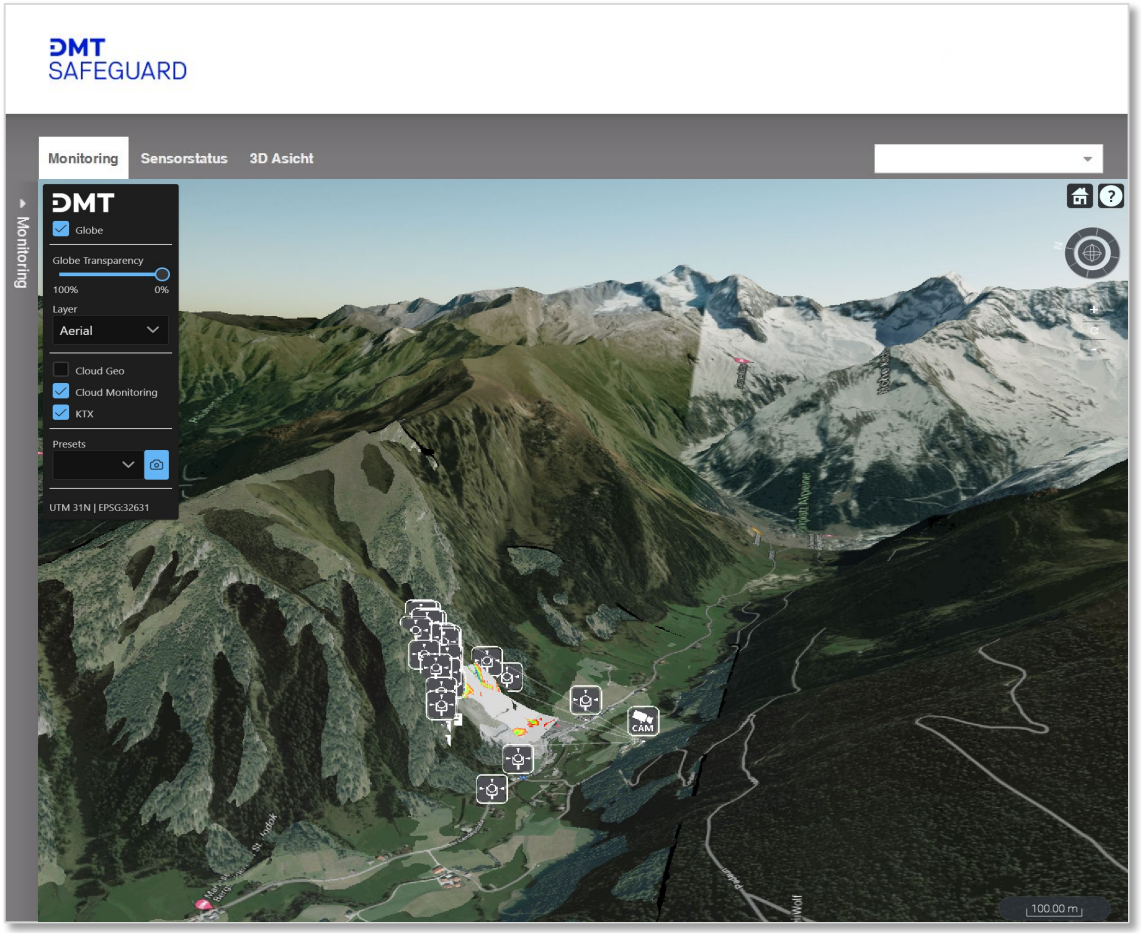


Key Functions

3D Data Management & Visualization – Interactive <> Import/Export to BIM

CESIUM



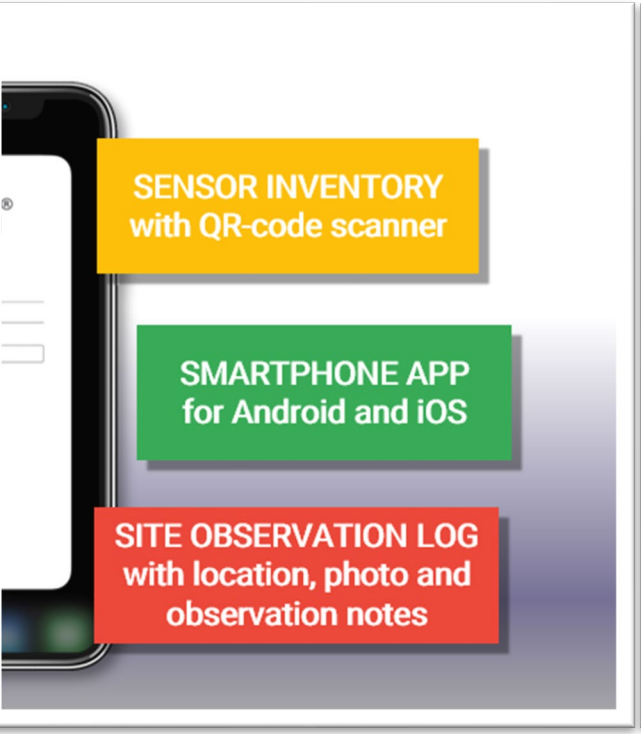


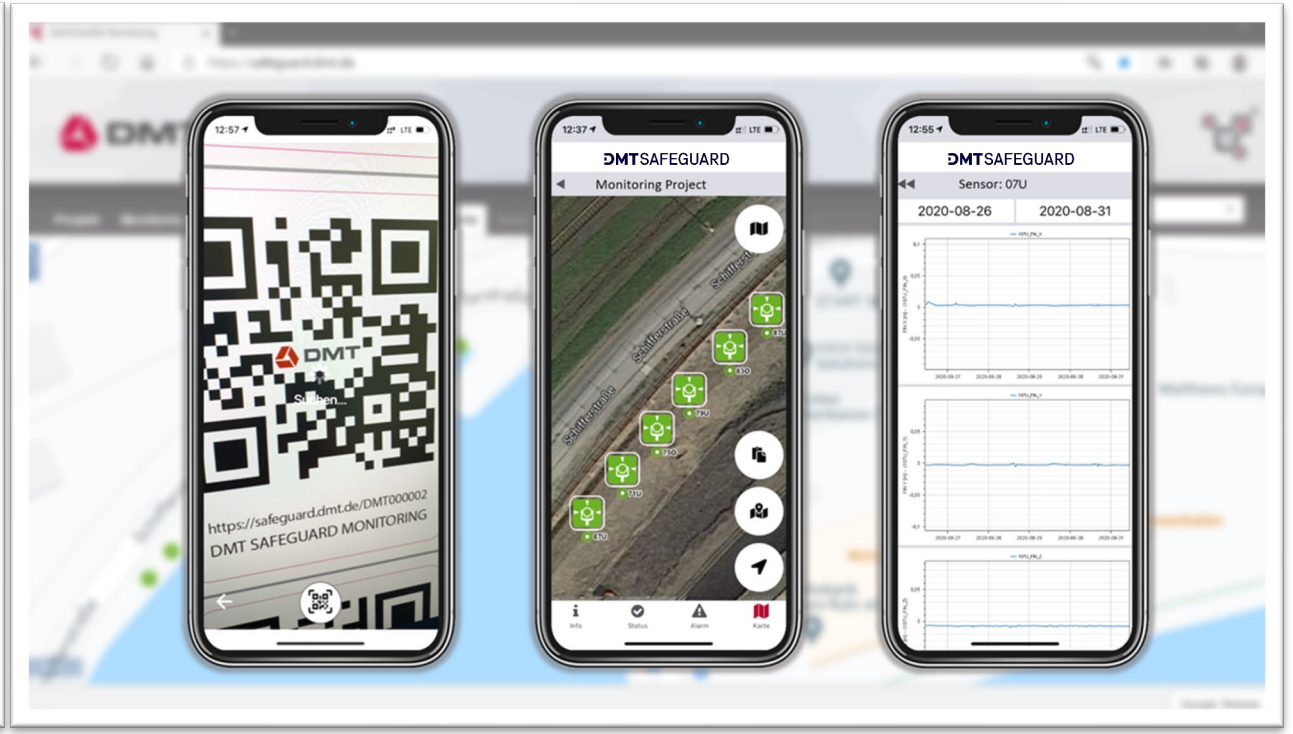
3D borehole map at construction site – Germany (left); Lidar slope monitoring – Alps, Austria (right)

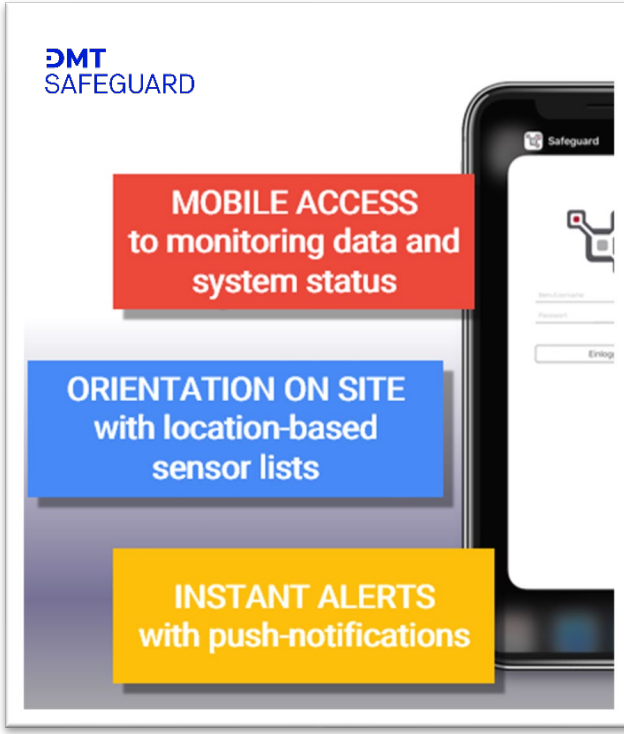
Key Functions

Mobile Applications

android iOS

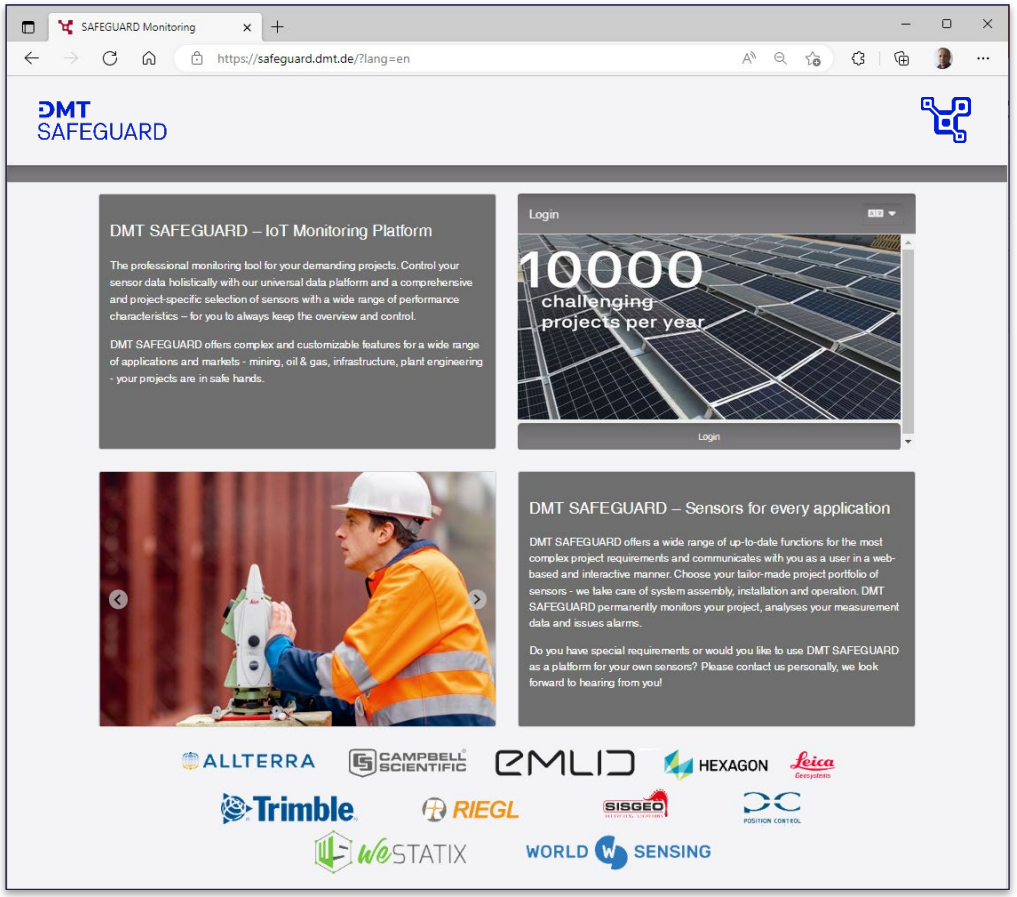






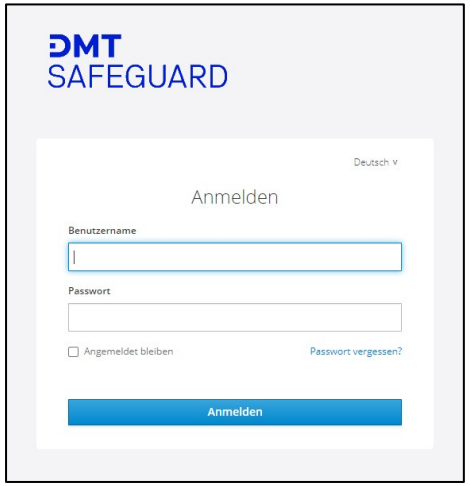
Key Functions

Identity and Access Management

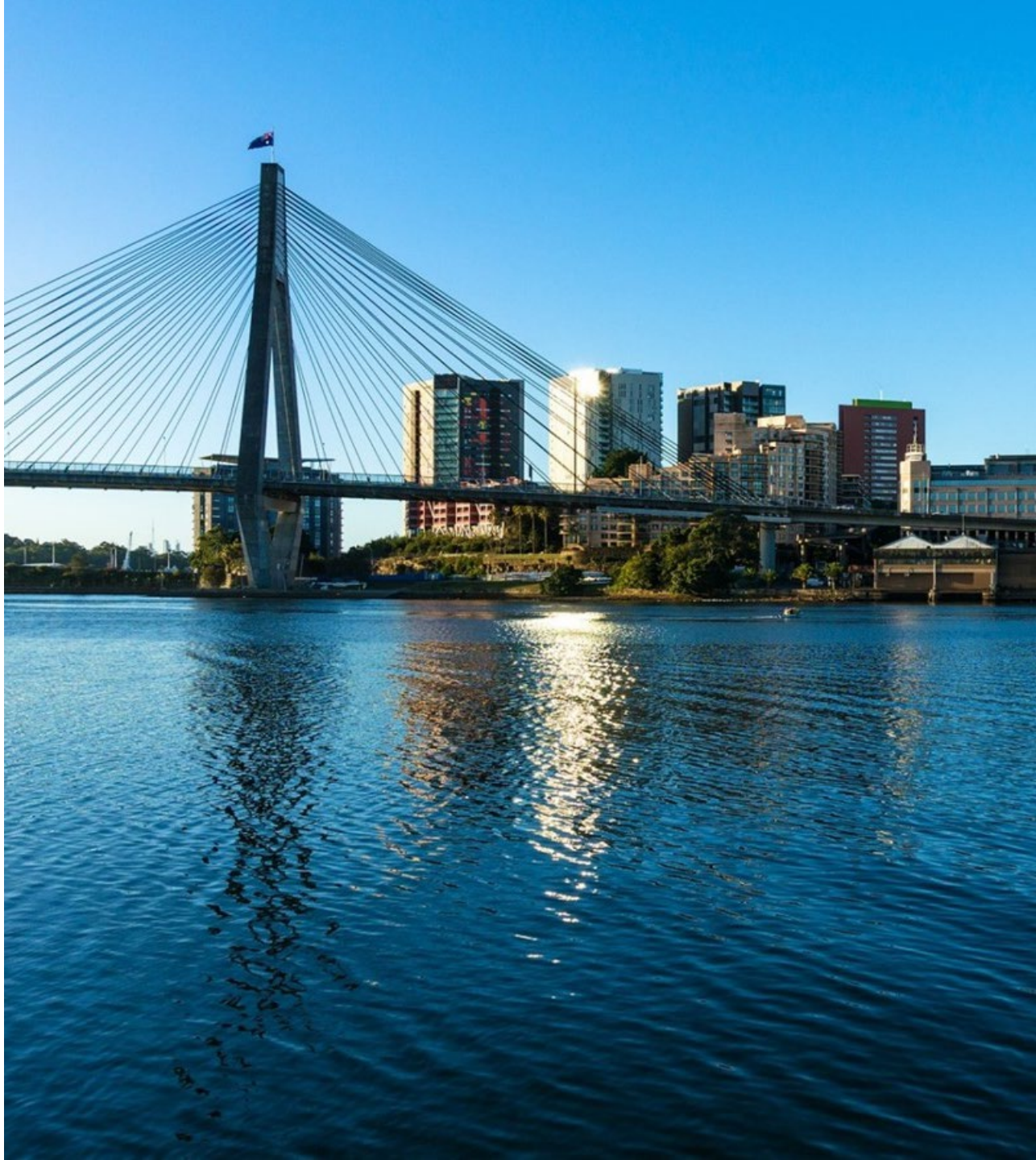


KEYCLOAK

- Single Sign-On
- User Federation Enterprise AD / LDAP
- OpenID Connect, OAuth 2.0 and SAML
- Account-Management
- Client-Adapter



03. Markets & Projects



Fields of Application

- Mining (subsidence, stability, deformation)
- Tunneling (convergence, ventilation, blasting vibrations)
- Infrastructure (excavation pits, bridge monitoring)
- Hydraulic engineering (groundwater, filling levels)
- Natural hazards (slopes, seismicity)
- Industry plant surveillance (cranes, power plants, refineries)

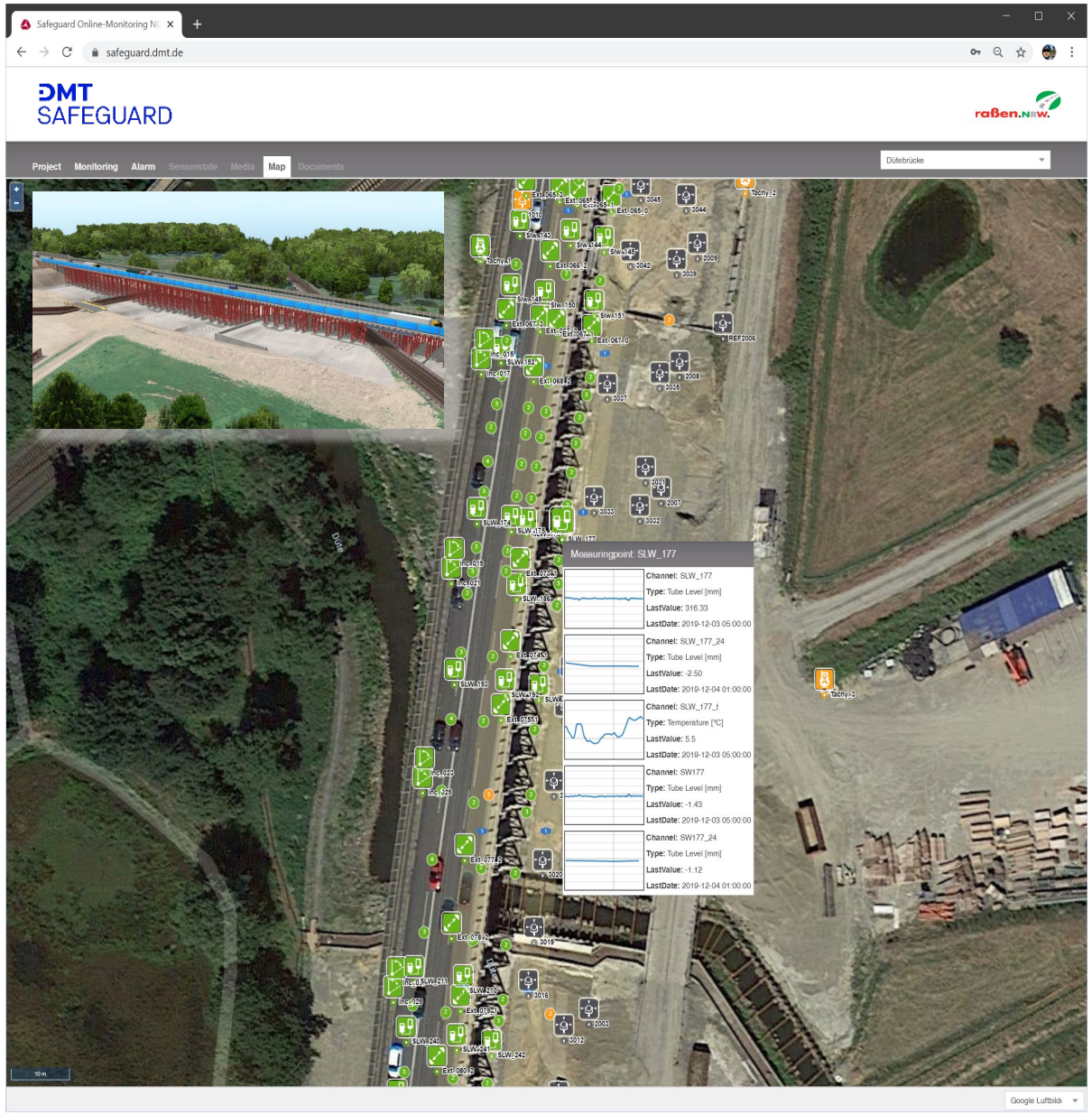
Fields of Application

DMT – ONE STOP SERVICE

DMT uses the platform as part of its own monitoring projects

PLATFORM AS A SERVICE

CUSTOMERS use the platform as part of their own monitoring projects



Infrastructure Civil Engineering

Bridge Monitoring – Dütebrücke Autobahn A1 near Osnabrück, Germany

PORR Bauunternehmen, Straßen NRW

- Permanent monitoring of the movement and deformations of bridge and auxiliary structures
- Provision of information for the assessment of structural stability and planning specifications

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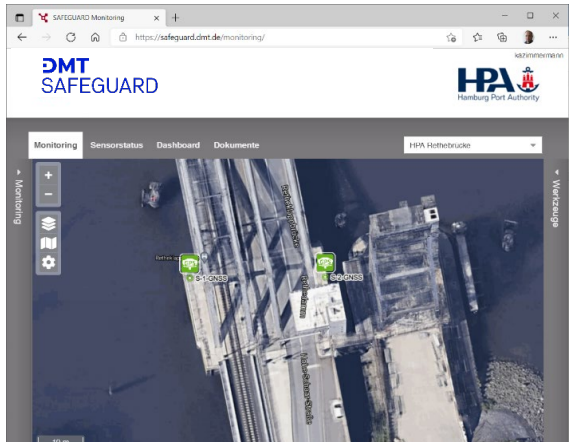
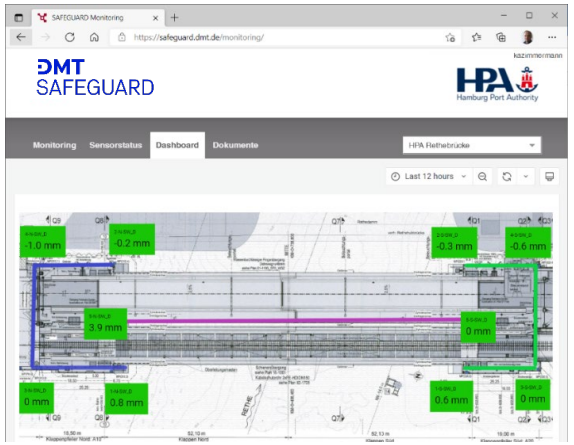
- Engineering of the system > 500 sensors
- Provision of measurement technology, installation
- All sensors are networked and operated online
- Data management and web-based client access via DMT SAFEGUARD Monitoring Platform
- Automated notification (text-message, E-Mail) when threshold values are exceeded

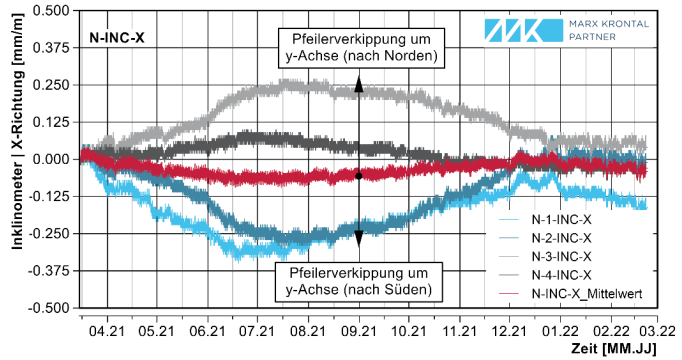
Infrastructure Civil Engineering

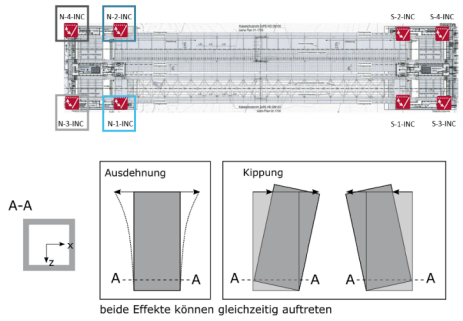
Bridge Monitoring – Rethebrücke Hamburg, Germany

Hamburg Port Authority









- Permanent monitoring of the movement and deformations of bridge and auxiliary structures
- Provision of information for the assessment of structural stability, load-bearing capacity, serviceability and durability

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- Engineering of the system: liquid level gauges, laser distance sensors, inclination sensors, ultrasonic distance sensors, total stations, GPS, meteo stations, water level gauge, partly SPS - controlled
- Provision of measurement technology, installation
- All sensors are networked and operated online
- Data management and web-based client access via DMT SAFEGUARD Monitoring Platform
- Automated notification (text-message, E-Mail) when threshold values are exceeded

Industry
Large Components

Crane beam monitoring – Meyer Werft Papenburg, Germany

Meyer Werft

- Monitoring to determine the deflection of an 800t gantry overhead beam crane during operation
- Provision of information for the assessment of plant condition, operation and optimization

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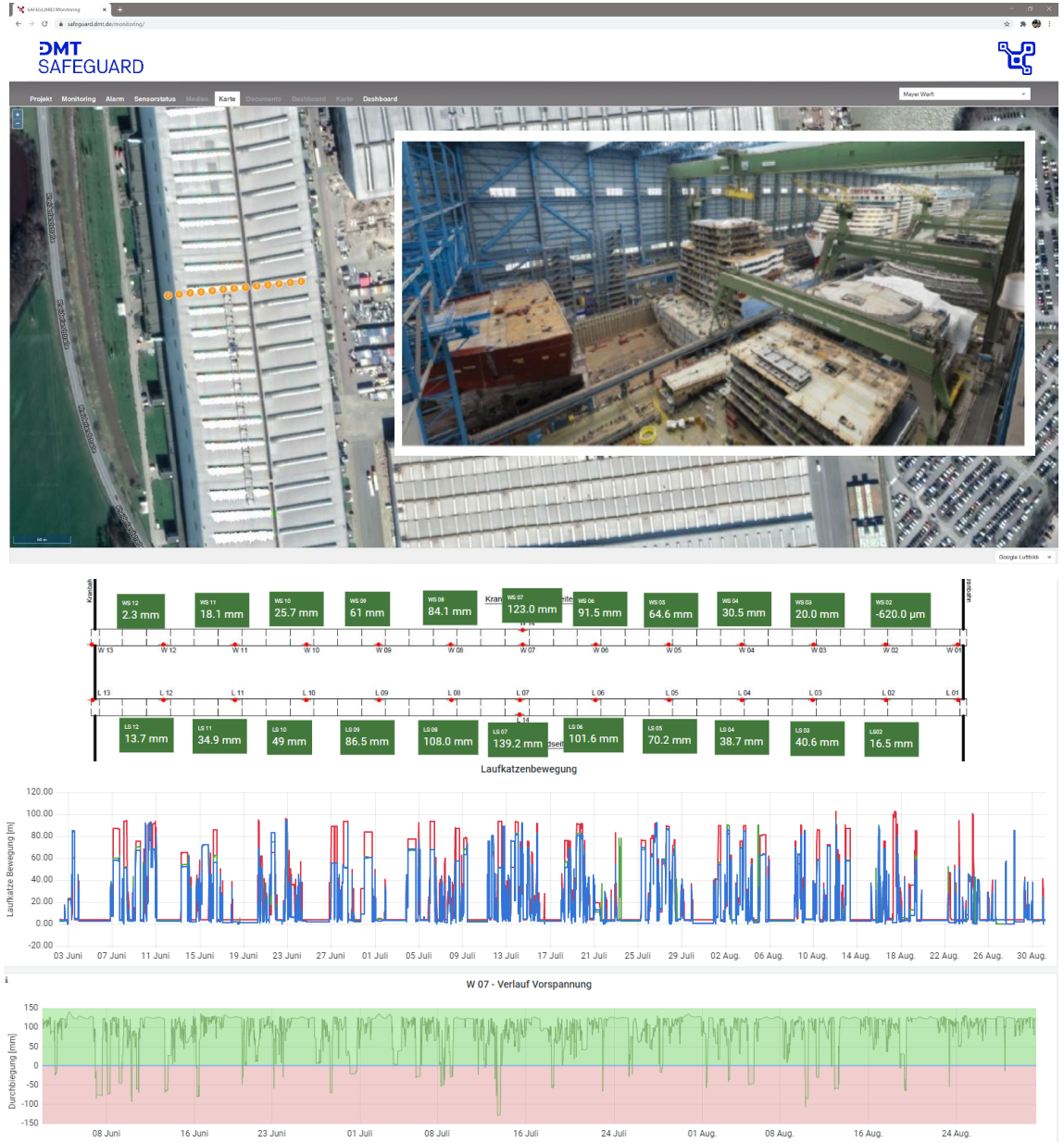
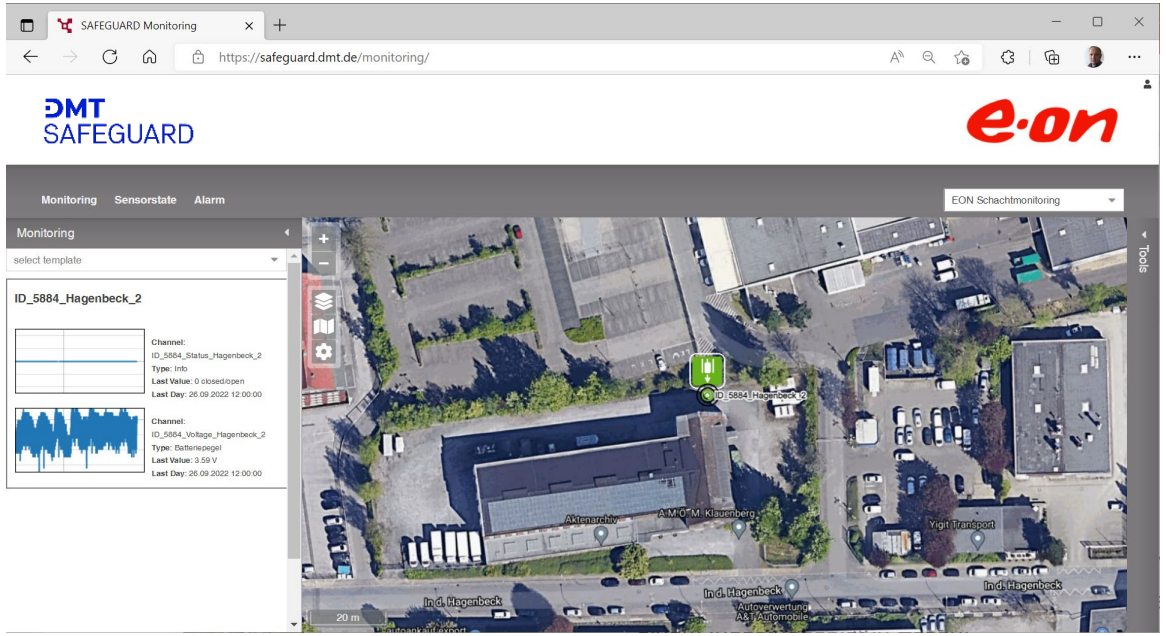
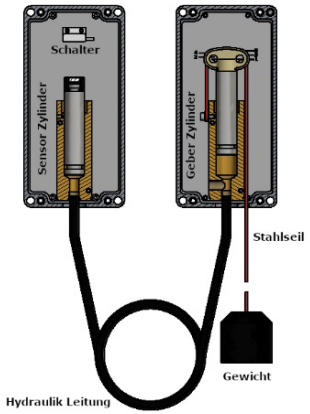
- Engineering of the system > liquid level gauges
- Provision of measurement technology, installation
- All sensors are networked and operated online
- Data management and web-based client access via DMT SAFEGUARD Monitoring Platform
- Automated notification (text-message, E-Mail) when threshold values are exceeded



Mining
Abandoned Shafts

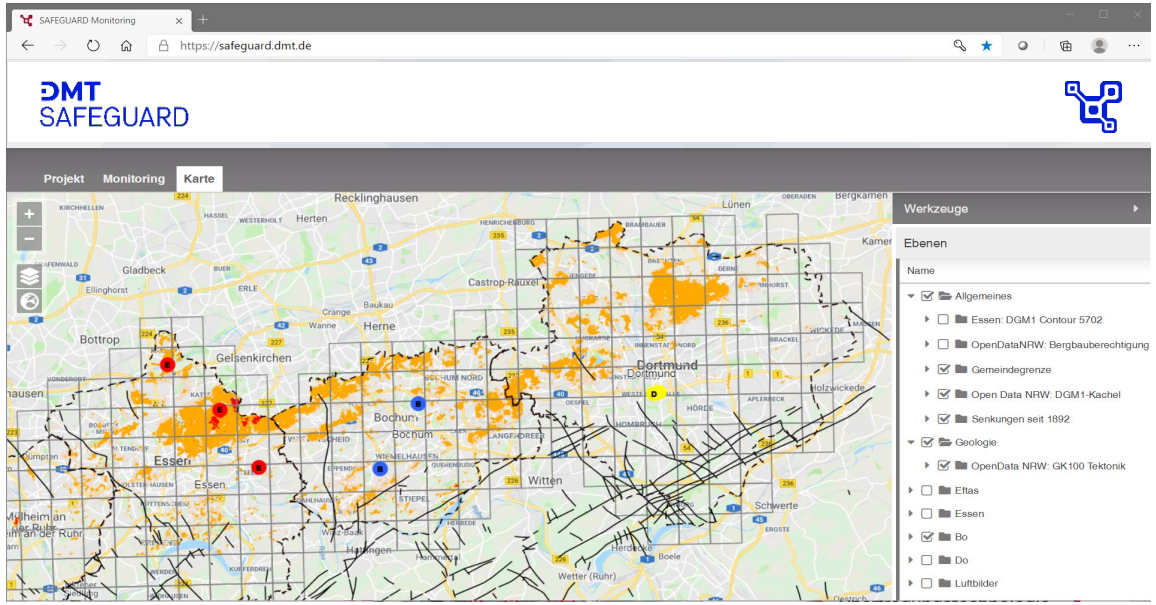


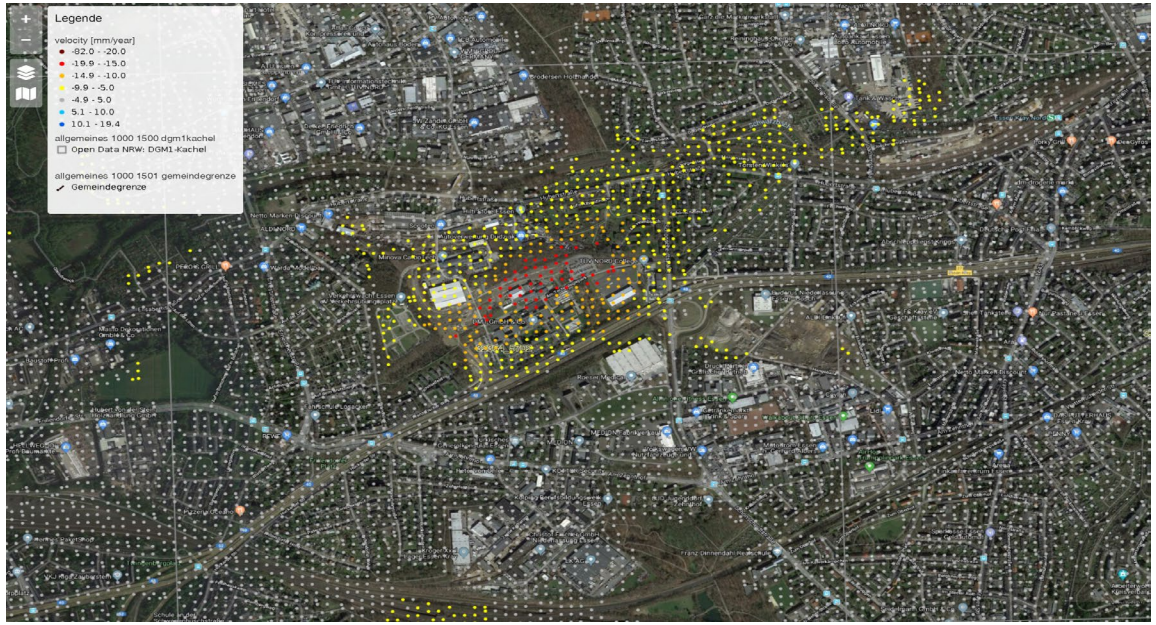


DMT SAFEGUARD SCM Sensor + Mine Shaft Column Monitoring

E.ON

- Monitoring the integrity of shaft filling columns is of great importance worldwide. When monitoring, it must be taken into account that methane gas can escape at the shaft, so explosion protection (Ex-protection) guidelines apply
- In close cooperation with E.ON, DMT has developed a special monitoring system with hydraulic switching that is unique on the market
- Battery-powered data transmission, self-sufficient for several years
- System protection by utility model (DPMA)
- Installation and operation of SCM at 11 shafts with automated data acquisition, data transfer, storage and web visualization with DMT SAFEGUARD, alarm





Infrastructure Platform as a Service

Monitoring Data Infrastructure – Ruhr Area, Germany

Network of the Ruhr cities

- Central management and presentation of monitoring data and relevant geoinformation as a cloud service model
- Surveillance of potential ground movements of the surface at public buildings, structures and construction projects

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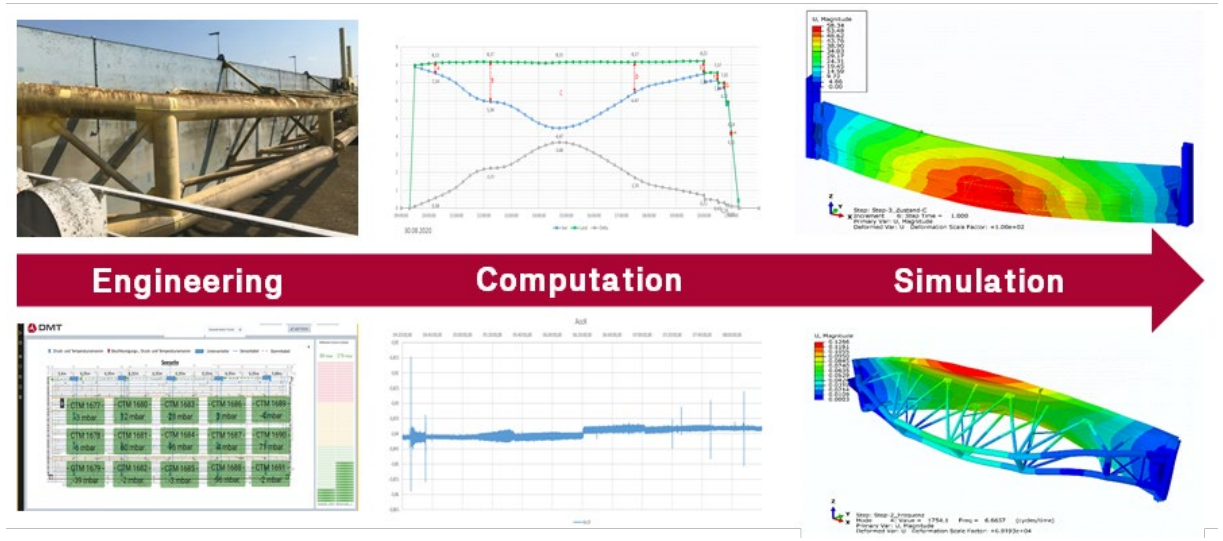
- Provision of DMT SAFEGUARD as a platform
- Continuous monitoring of the surface in given spatial areas by satellite based radar interferometry
- Engineering, installation and operation of ground sensors
- Integration of further geoinformation relevant to post-mining (e.g. risk map of old mining areas) and technical expertise

Critical Infrastructure Civil Engineering



Tailor-made measurement solution for the monitoring of the lift gate of a tidal barrier

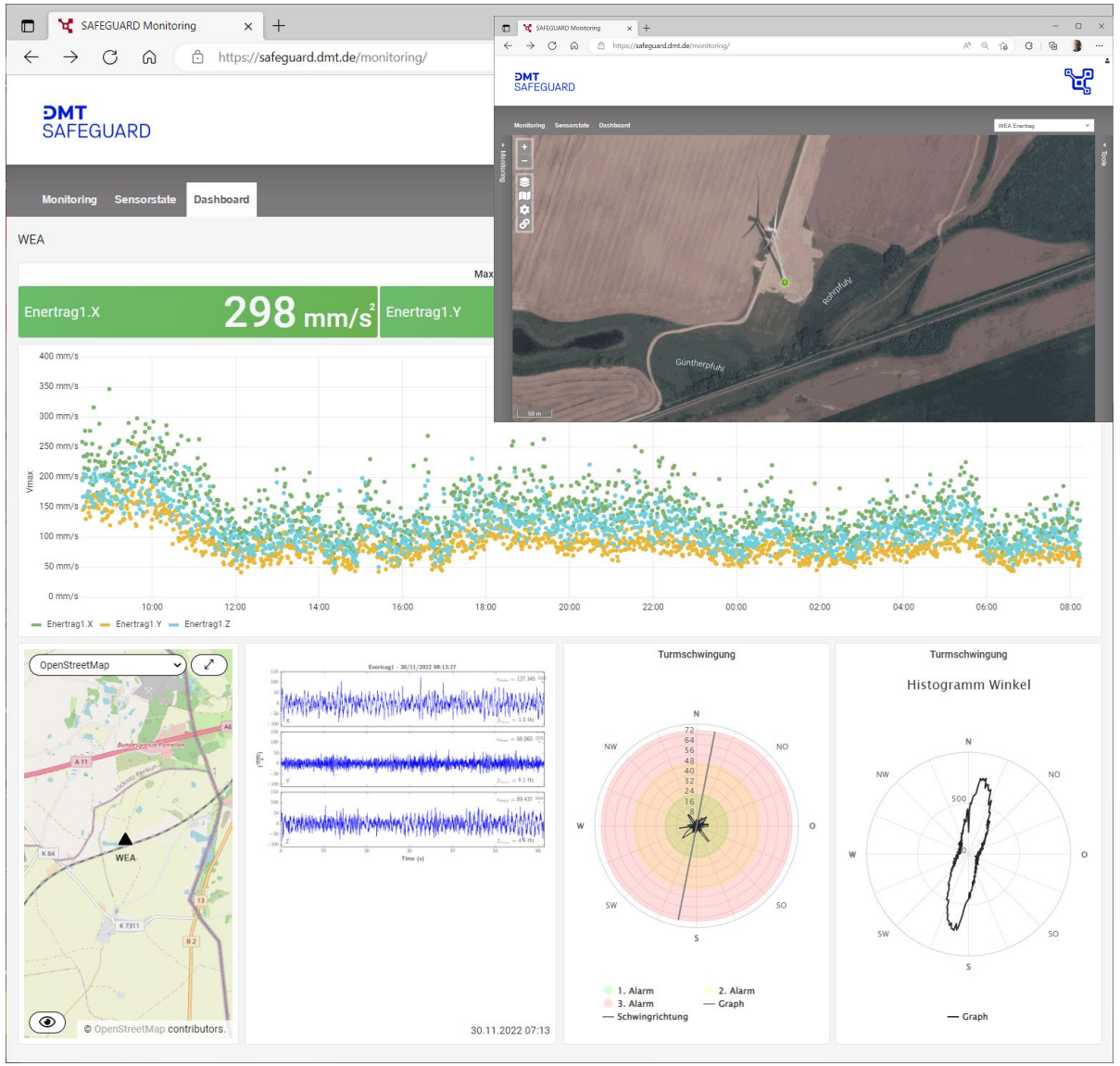
- Emssperrwerk, Gandersum, Lower-Saxony

NLWKN

masterplan ems 2050

- Cooperation of TÜV NORD and DMT at the engineering of a suitable measurement solution
- Engineering and installation of a sensor network for the surveillance of pressure, temperature and vibration
- Online database for the visualization of results
- Simulation and computation of a fatigue verification by TÜV NORD to proof the successful operation of the system

Energy
Wind Turbine Vibration



Wind Turbine Monitoring – Germany

ENERTRAG

- Monitoring of wind turbines regarding vibrations
- Provision of crucial information for turbine operation and safety

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- Engineering of the vibration monitoring system
- Provision of measurement technology, installation
- All sensors are networked and operated online
- Data analytics regarding vibration amplitudes and directions
- Data management and web-based client access via DMT SAFEGUARD Monitoring Platform
- Automated notification (text-message, E-Mail) when threshold values are exceeded

Thank you
for your attention

Dr.-Ing. Karsten Zimmermann MBA

M: karsten.zimmermann@dmt-group.com