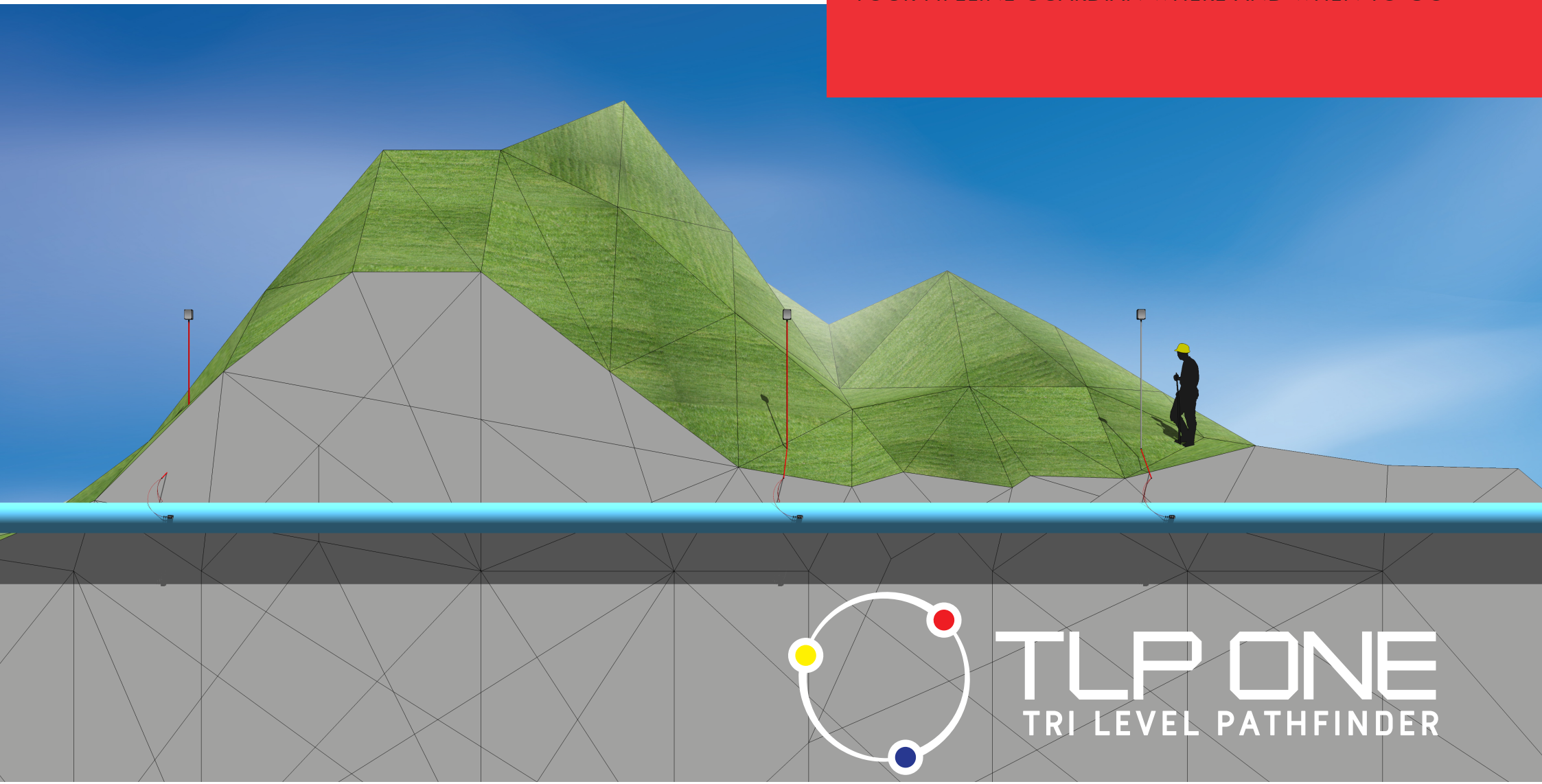
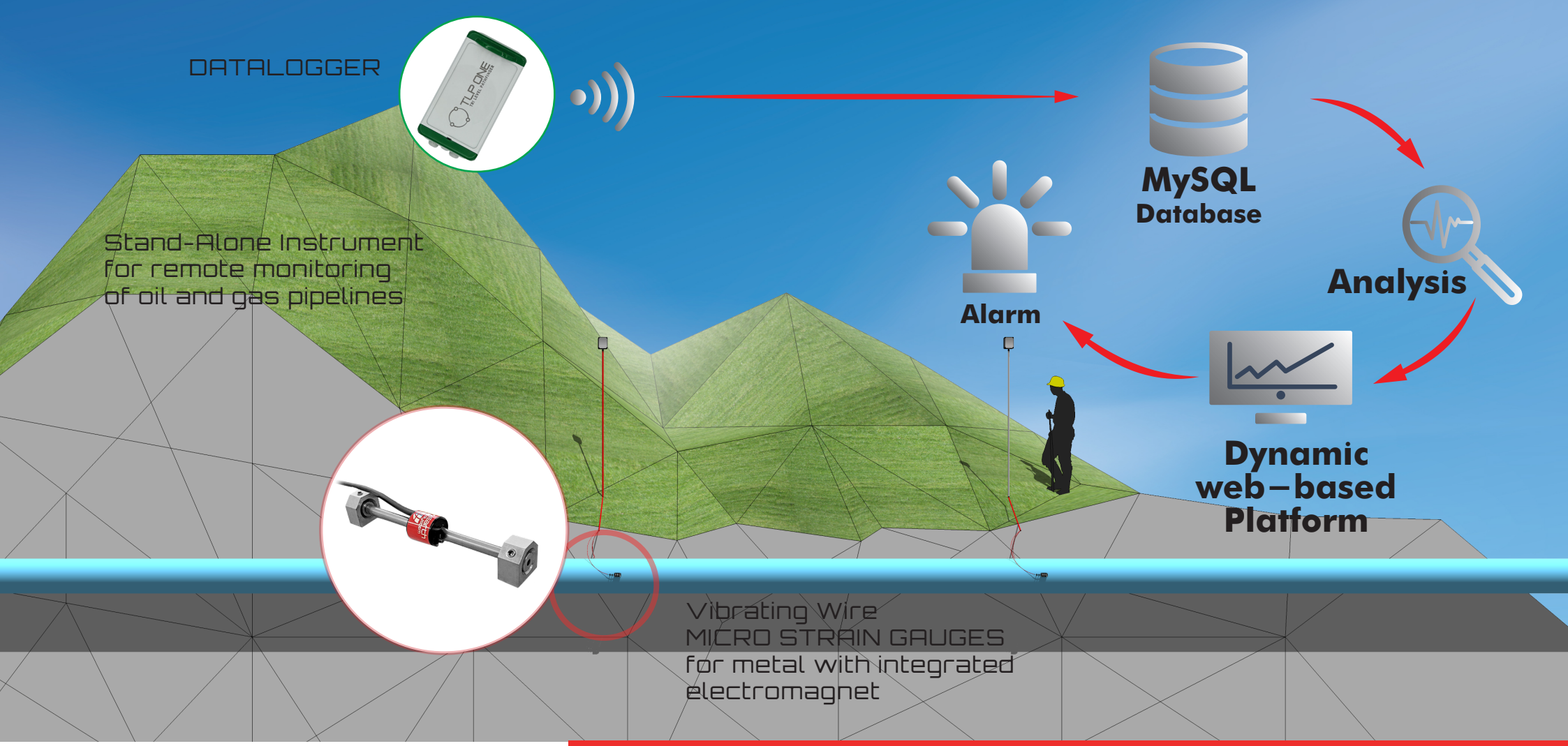
GEI ELETTRONICA | earth system | ase ADVANCED SLOPE ENGINEERING

PIPELINE STRESS MONITORING SYSTEM

YOUR PIPELINE GUARDIAN WHERE AND WHEN TO GO



Stand-Alone Instrument for remote monitoring of oil and gas pipelines

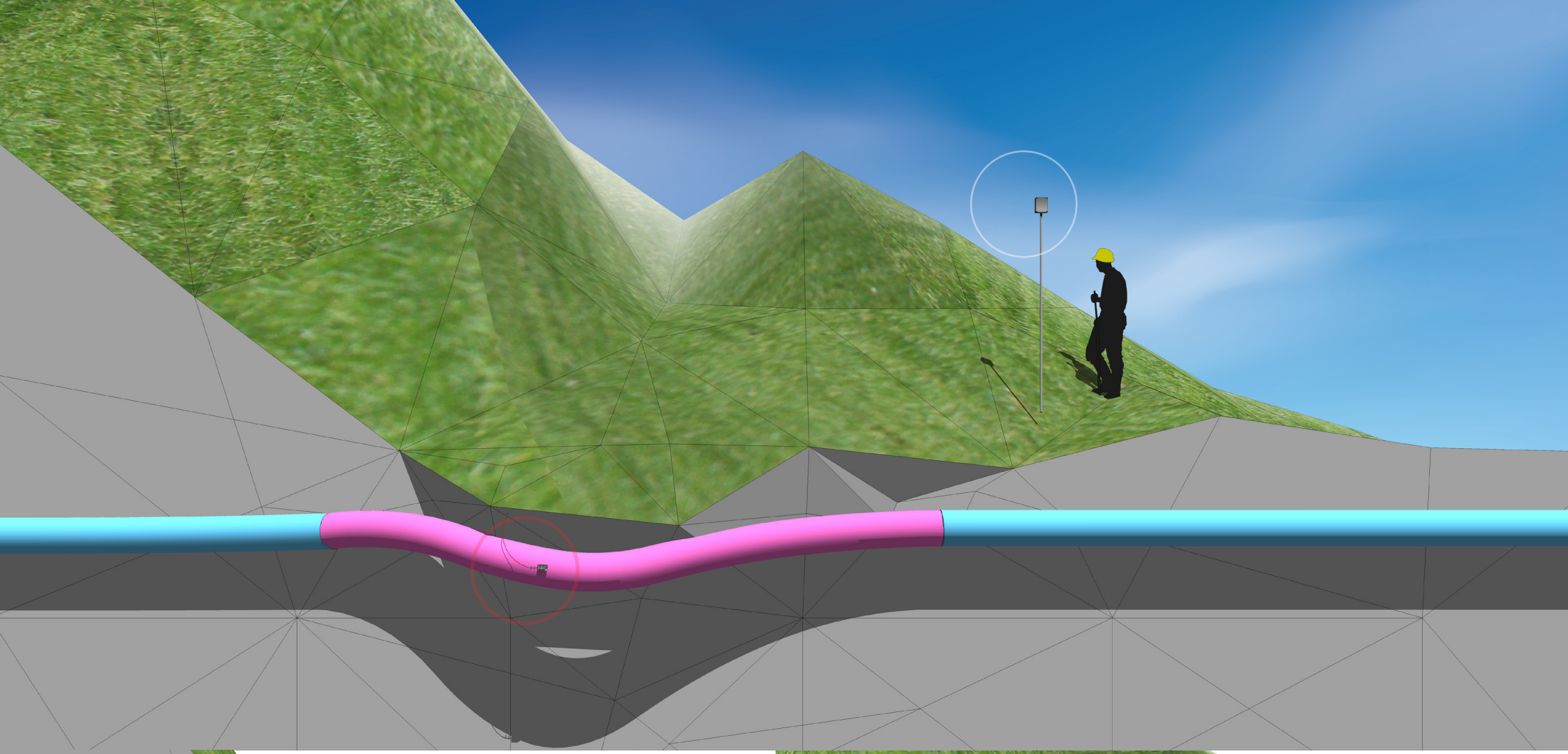


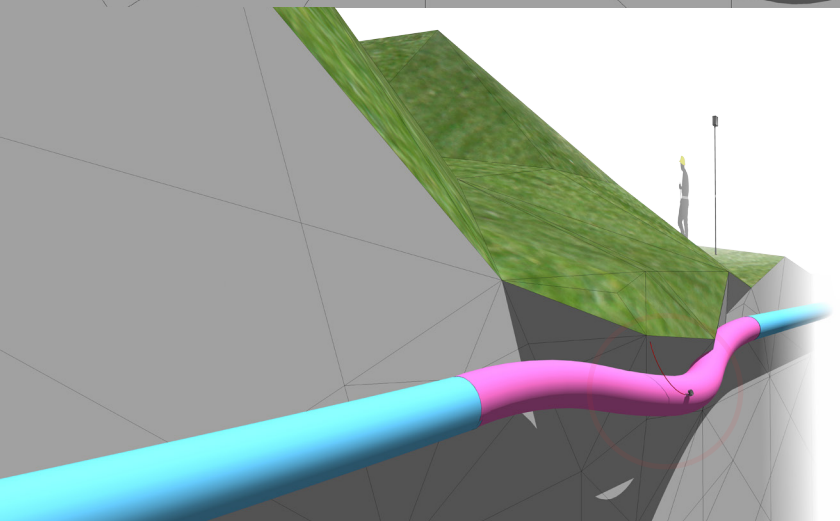
INSTRUMENT RESULTS

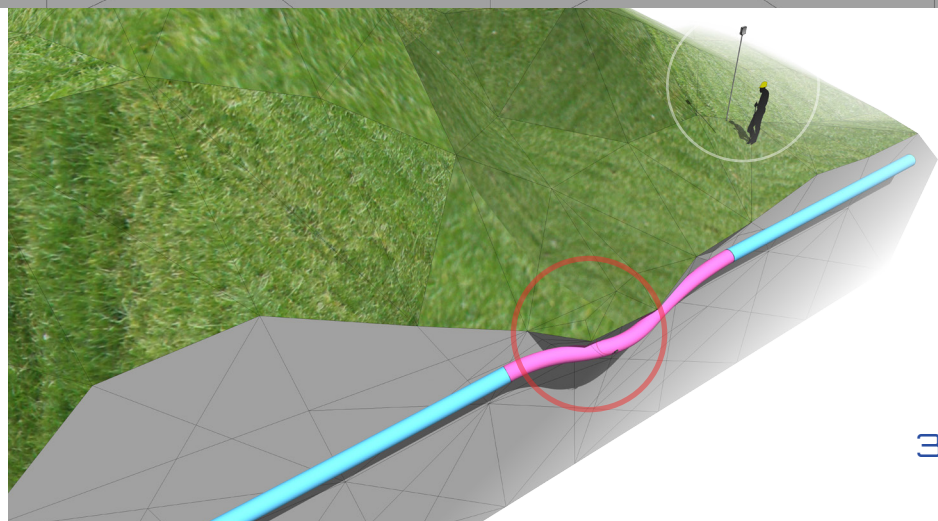
- Accurate strain measurements
- Precise monitoring of the pipeline's tensile state
- Detailed 3D reconstruction of pipe deformation*

*The deformation resolution increases with the number of monitored sections, ensuring more accurate data.

TLP ONE is a "Stand Alone" system designed for the automatic and remote control of deformations in gas and oil pipelines. The measurement is carried out using Strain Gauges, which are arranged in a precise configuration.
The sensors are used to detect micro-deformations of the pipes when they are subjected to tensile or compressive stresses, induced by ground movements, for example due to subsidence phenomena or landslides.
THE SYSTEM is designed to provide useful information for the organization of maintenance activities on the networks and to send Alerts (via e-mail or SMS) to allow timely intervention and counteract any breakage.







VW MICRO STRAIN GAUGE
with integrated electromagnet

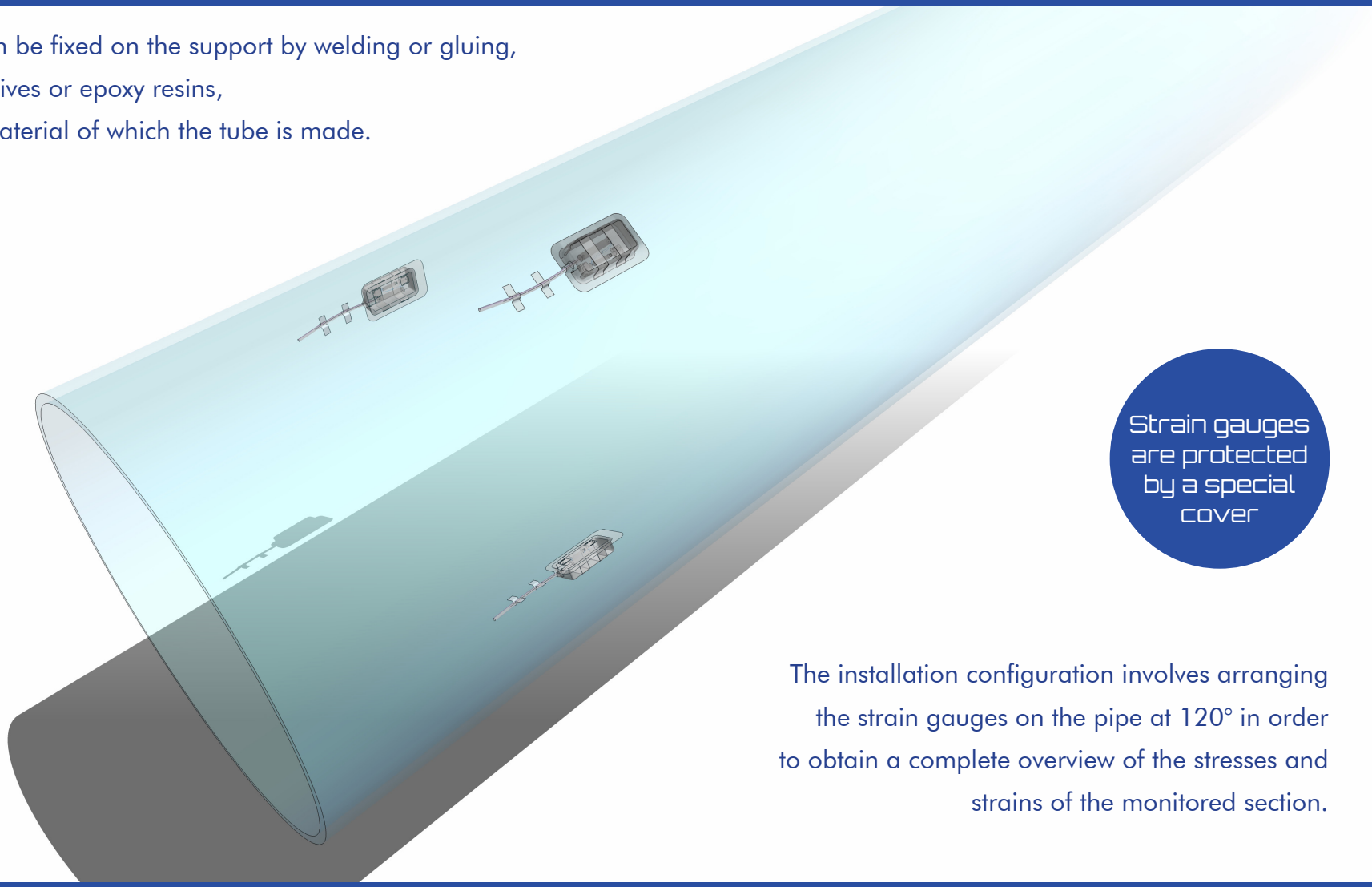
TECHNICAL CHARACTERISTICS

Type of sensor	Vibrating wire
Nominal measuring range	+/1500 με
Sensitivity	1 με
Accuracy	<0.5% F.S.
Non-linearity	better than 0,5% F.S.
Operating temperature	-20° C to +80° C
Integrated temperature sensor	NTC 3 KΩ
Spool resistance	150 Ω
Typical frequency	800 Hz
Operating range	from 500 to 1100 Hz
Thermal dilation coefficient	12.2 με/°C
Output signal	Hz

3 VW Micro STRAIN GAUGES SENSORS are provided for each monitored section.

Strain gauges are arranged on the pipe at 120° one to each other

The strain gauge can be fixed on the support by welding or gluing, using suitable adhesives or epoxy resins, depending on the material of which the tube is made.



Strain gauges are protected by a special cover

The installation configuration involves arranging the strain gauges on the pipe at 120° in order to obtain a complete overview of the stresses and strains of the monitored section.

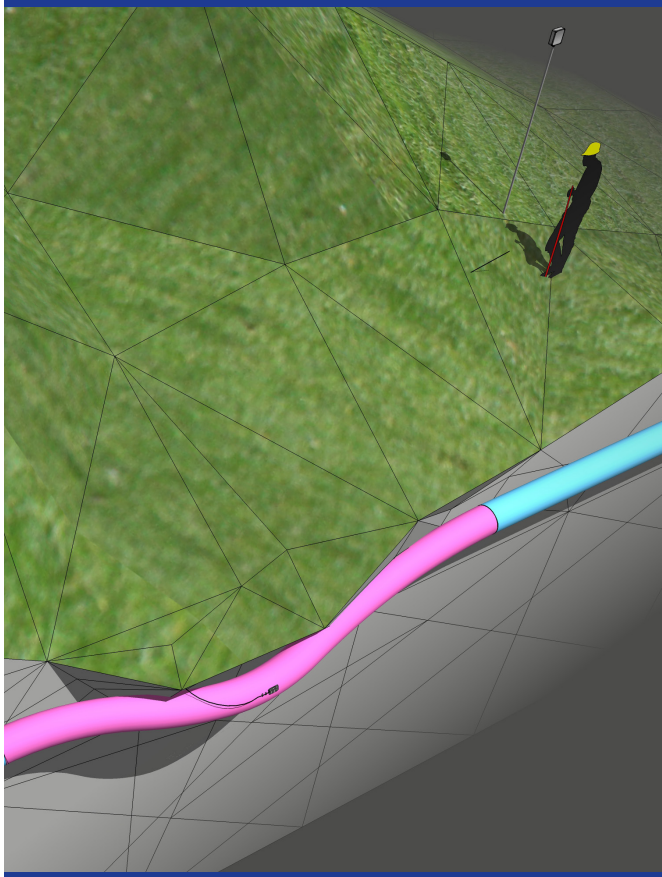
DATALOGGER

A dedicated datalogger manages sensors placed on the pipeline.
The device allows to read the strain gauges, it saves the raw data on a local memory and then it sends them via FTP to Cloud database, using the GPRS/LTE network.

The frequency of sensor reading and data sending is user definable.
The user could connect his PC to the Datalogger via the integrated USB port in order to configure it.

Through the configuration software, supplied with the system and available for Windows 7, 8, 10, 11 operating systems, it is always possible to:
- Configure the sampling frequency of the sensors;
- Set the parameters related to the data transmission (frequency, server address, etc.);
- Check the GPRS/LTE signal coverage;
- Read sensors locally;
- Verify the memory status;
- Update the Firmware.

Moreover, it is possible to change the configuration parameters and update the Firmware remotely through the access to the FTP server.
A low voltage battery system guarantees the datalogger power supply.



TECHNICAL CHARACTERISTICS

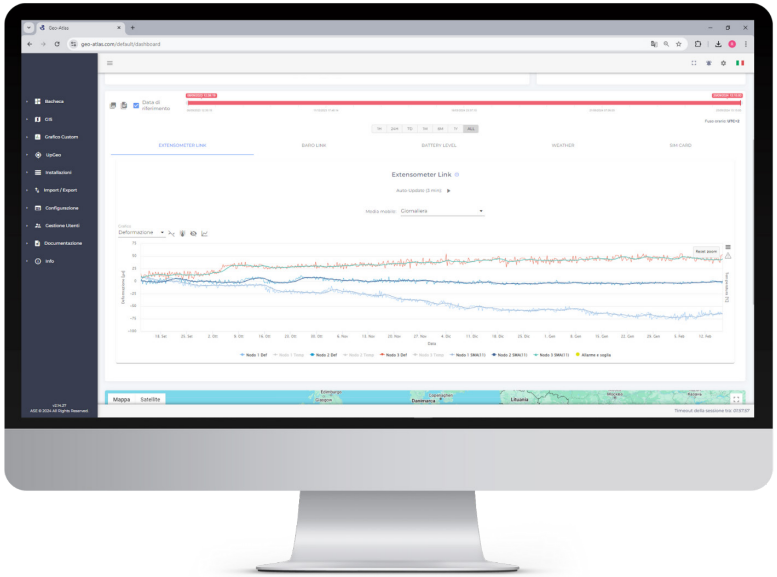
- 3 VW channels - USB C port - Up to 135,000 stored readings
- Degree of protection IP66
- Power supply 3-7 V dc - Battery life > 2.5 years: 3 readings/day, 1 sending/day

DATA processing and representation

The calculation software, developed by means of special algorithms, automatically processes the monitoring data as soon as they reach the Cloud Server. It allows to store, process and display the information coming from the site.

Depending on the set sending frequency, the data recorded by the Datalogger are sent to a MySQL Database. This technology allows the storage and saving of raw data, avoiding any accidental loss of information through several daily security backups. Subsequently, the data are automatically processed by a dedicated software, based on self-learning algorithms able to process the raw information and verify them in real-time, certifying in advance their validity.

The alerting system is automatically activated when the thresholds are exceeded. The software is able to, send email and/or SMS as well as remotely activate light or sound devices.
Thanks to the architecture of the system, both raw and processed data are available and it is always possible to recalculate each result.



- Automatic storage, management and processing of monitoring data;
- Calculation of deformation and stress state of the monitored pipe section;
- Reconstruction of the 3D deformation of the pipe*;
- Automatic sending of email and/or sms alerts and activation of sirens or remote light devices when multi-level thresholds are exceeded.
- Preliminary data validation (automatic identification of spikes and outliers).

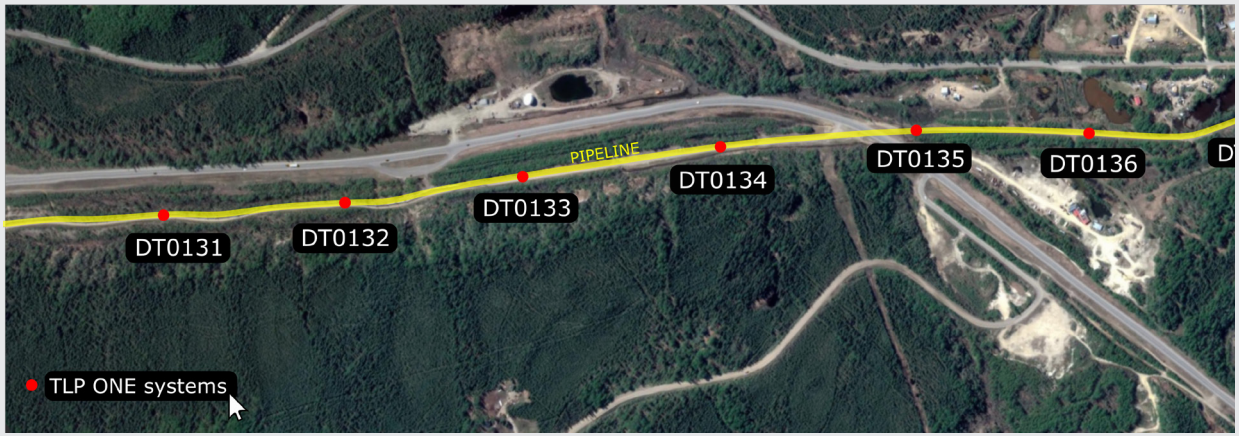
*The resolution of the 3D deformation calculation depends on the number of monitored sections.

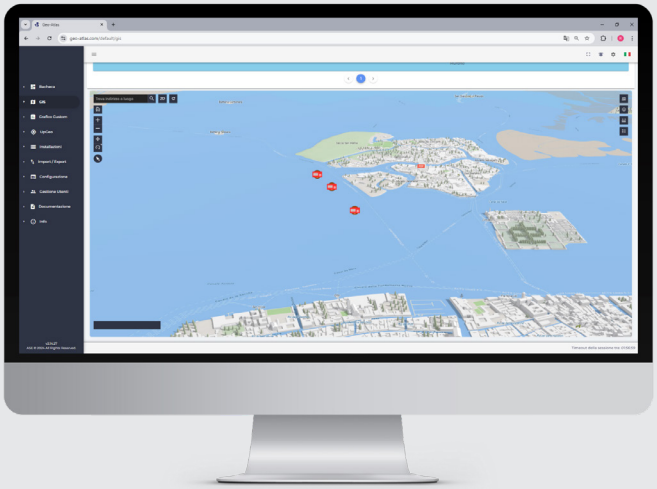
WEB platform

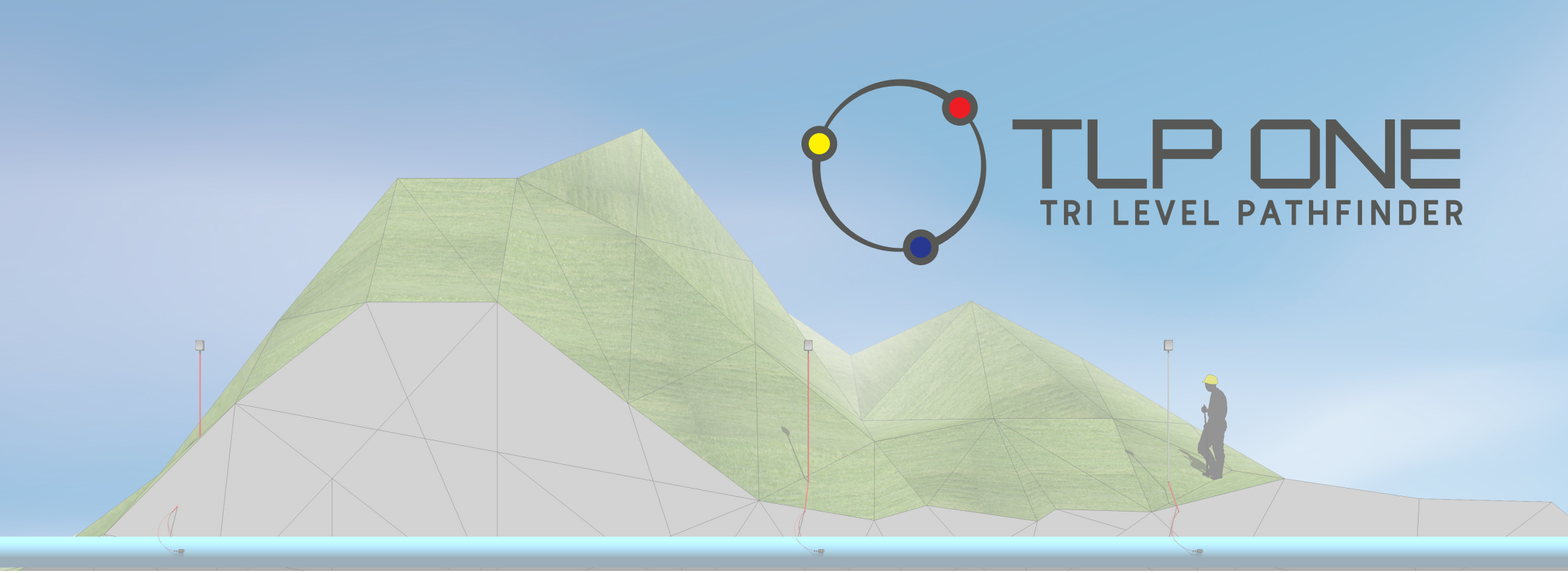
The results are represented on a dynamic web-based platform which, through different tools, allows to obtain an immediate indication of the possible phenomena in action. This platform has controlled access 24 hours a day with different levels of authentication and can be consulted from multiple devices (PC, Smartphone, Tablet, etc.), according to IoT principles.

The advantages of this system are represented by the high dynamism, which allows to choose specific time intervals, see detailed series of data, export results in image or data formats.

- Georeferencing TLP ONE systems;
- Create and manage users and access levels;
- Select sensors from an interactive map;
- Modify the parameters of a given datalogger or sensor, such as zero reading, reference reading, alert email, etc.;
- Visualize the monitoring data related to the desired sampling period through dynamic graphs;
- Export graphs in .csv, .xls, .jpg, .svg, .png, .pdf formats;
- Display monitoring data in tabular form;
- Upload documentation;
- Correlate monitoring data from different sensors.







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