Satellite Based Monitoring of Mining Sites Helsinki

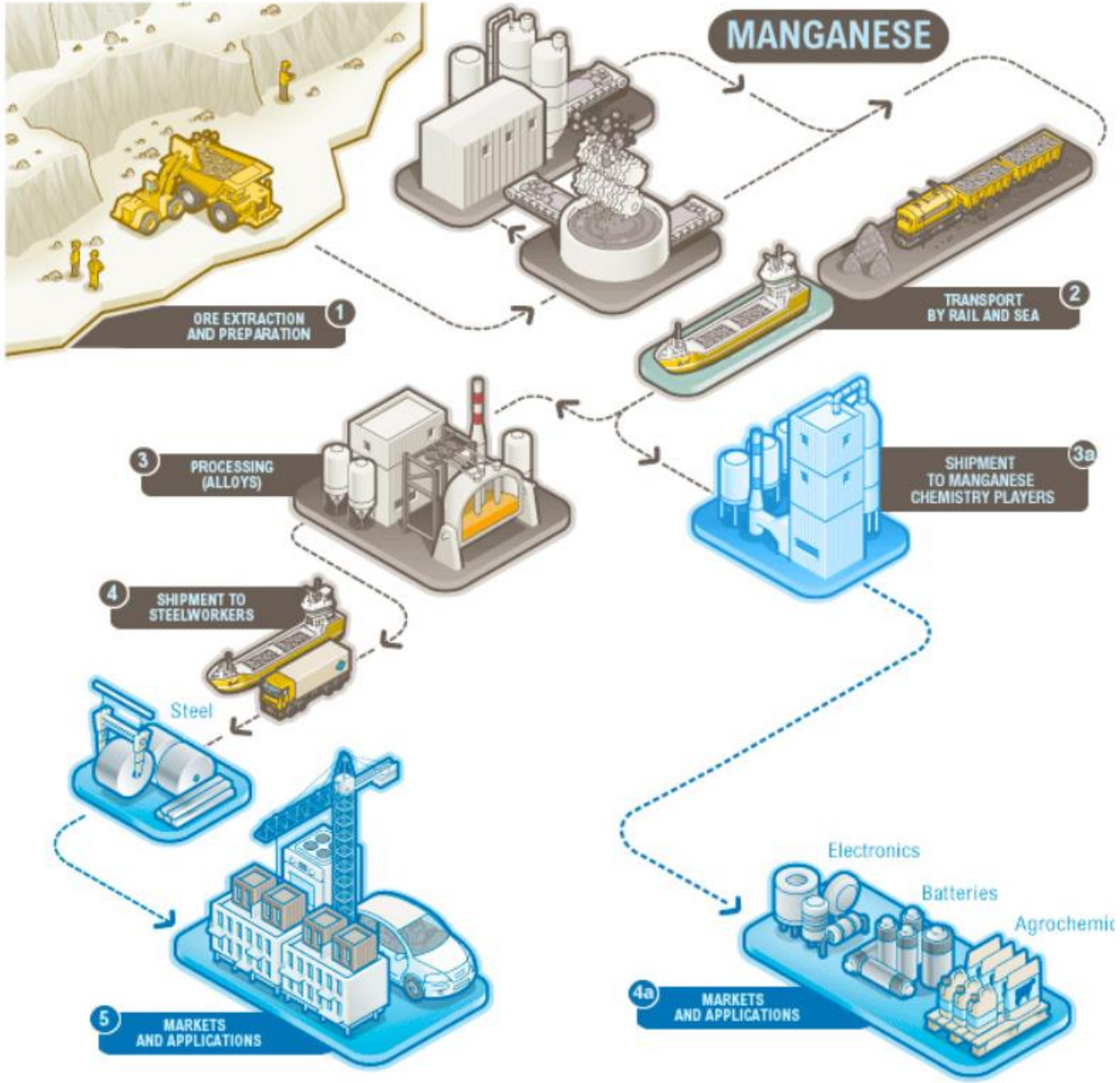
27.05.2019

Asse Hang
VP International Sales
DATEL AS

DATEL

- Estonian company
- Establised in 1990
- Focusing on mapping and GIS applications
- 100+ employees

Mining value chain



- **Mining**
  - Subsiding
  - Landslides
  - Tailing dams
- **Production facilities**
  - Factories
- **Transportation**
  - Ports
  - Railway transport

Topics

- How Monitoring from Space works?
- Examples
  - Landslides
  - Tailing dams
  - Ground subsiding
  - Oil & Gas
  - Production sites
  - Transportation / terminals
- Summary

What is SILLE?

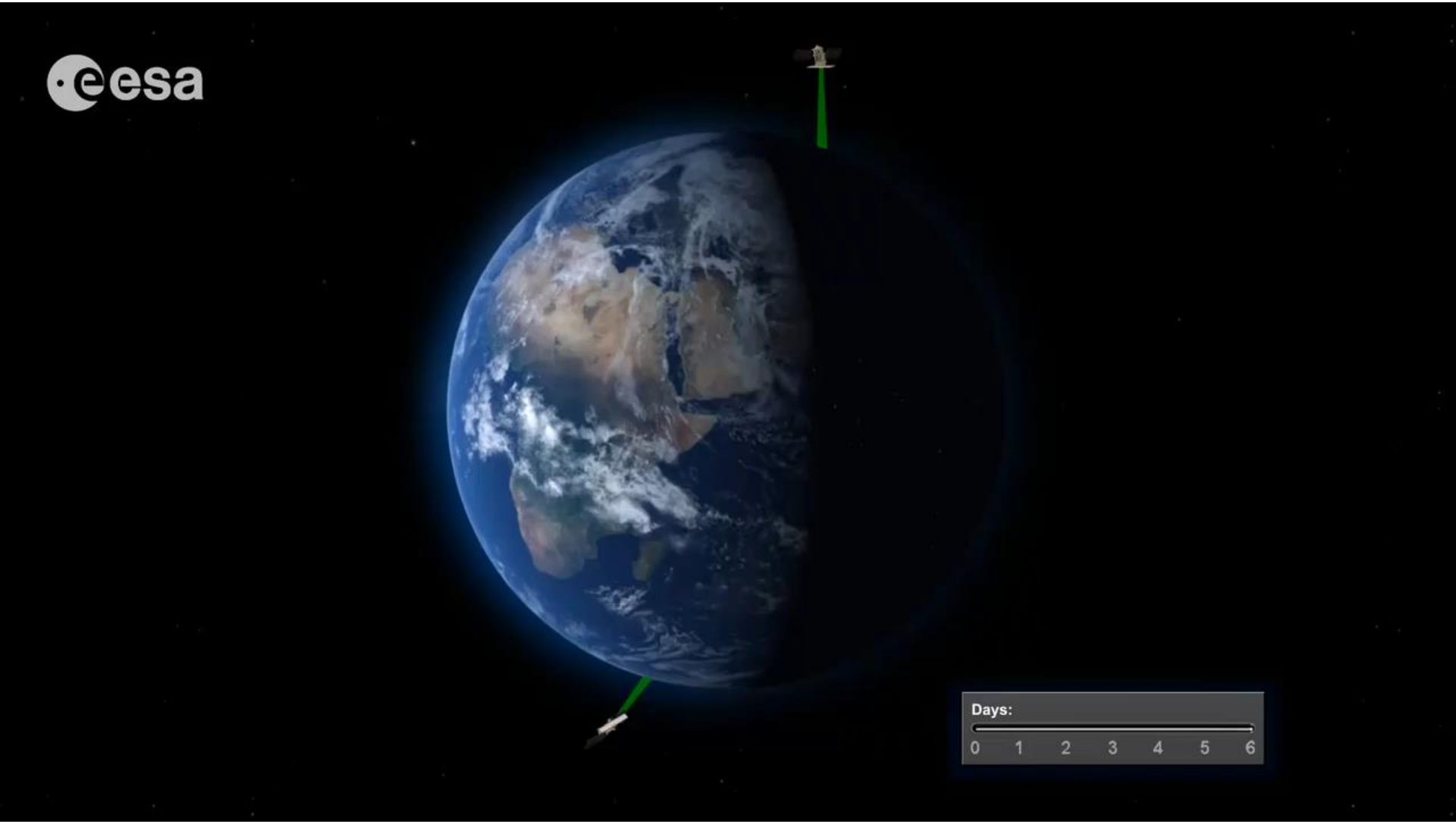
- Satellite based solution for infrastructure monitoring
- Developed by DATEL in cooperation with **esa**, the European Space Agency
- Measures infrastructure shift with high precision
- Service is based on cloud
- Fully remote solution

esa

European Space Agency

Based on esa satellites Sentinel 1a and 1b

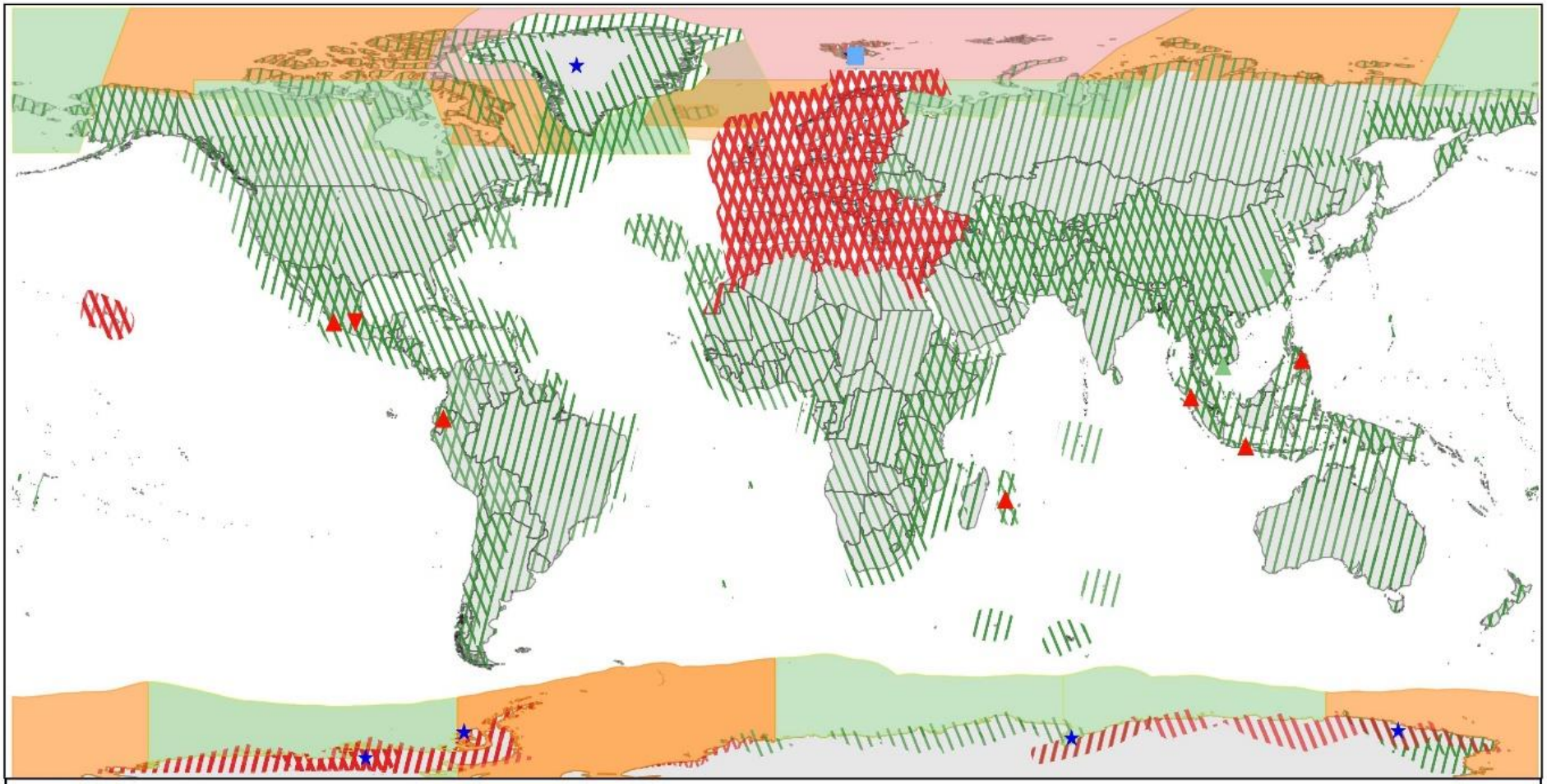
Satellites are circulating around the globe



Sentinel-1 Constellation Observation Scenario: Revisit & Coverage Frequency

sentinel-1

validity start: 02/2018



PASS
- ASCENDING
- DESCENDING

REVISIT
- 6 days

FREQUENCY *
- 12 days

* coverage ensured from same, repetitive relative orbits
** coverage not considering repetitiveness of relative orbits

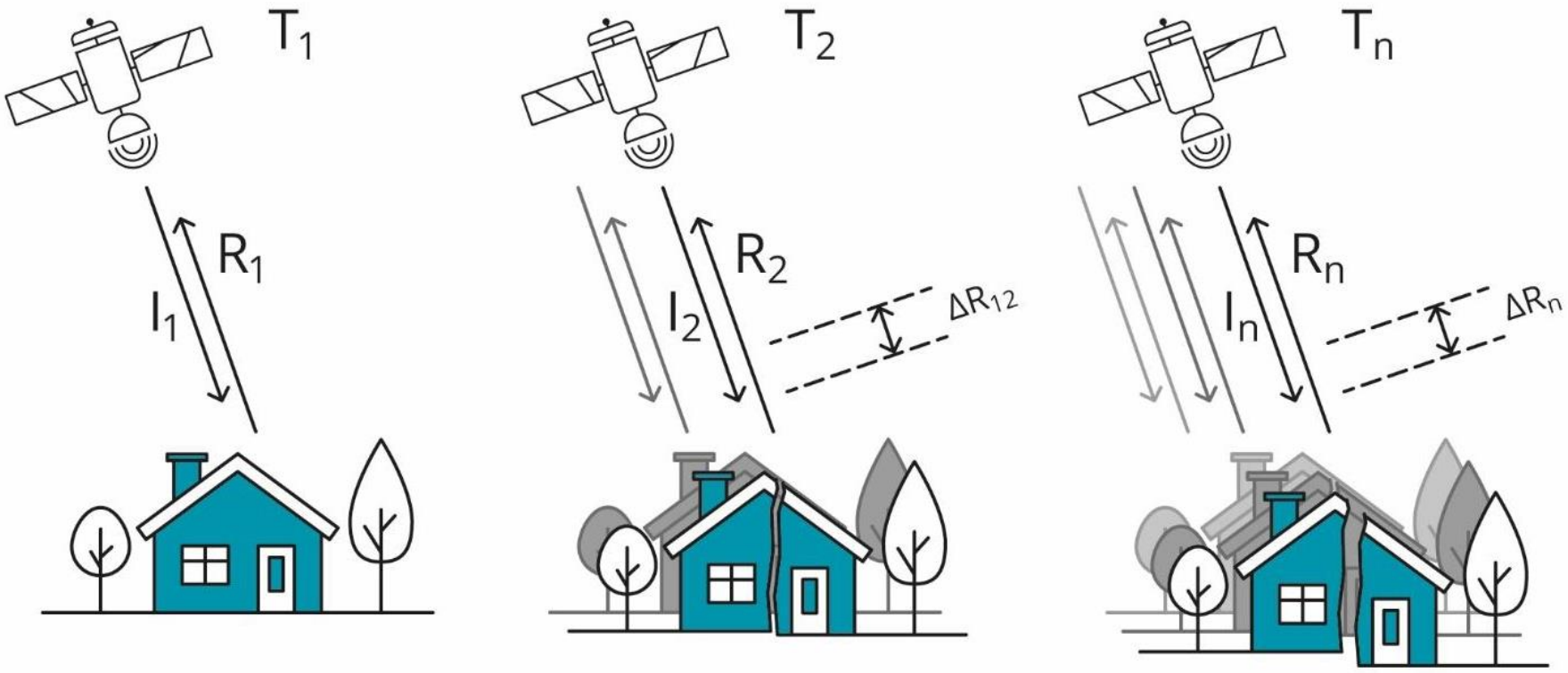
COVERAGE FREQUENCY **
- 1 days
- 1-3 days
- 2-4 days

REFERENCE DATA SITES (6d repeat)
- Highly active volcanism
- Fast subsidence
- Short growth cycle, intensive agriculture
- Fast changing wetlands
- Fast moving outlet glaciers
- Permafrost & glaciers

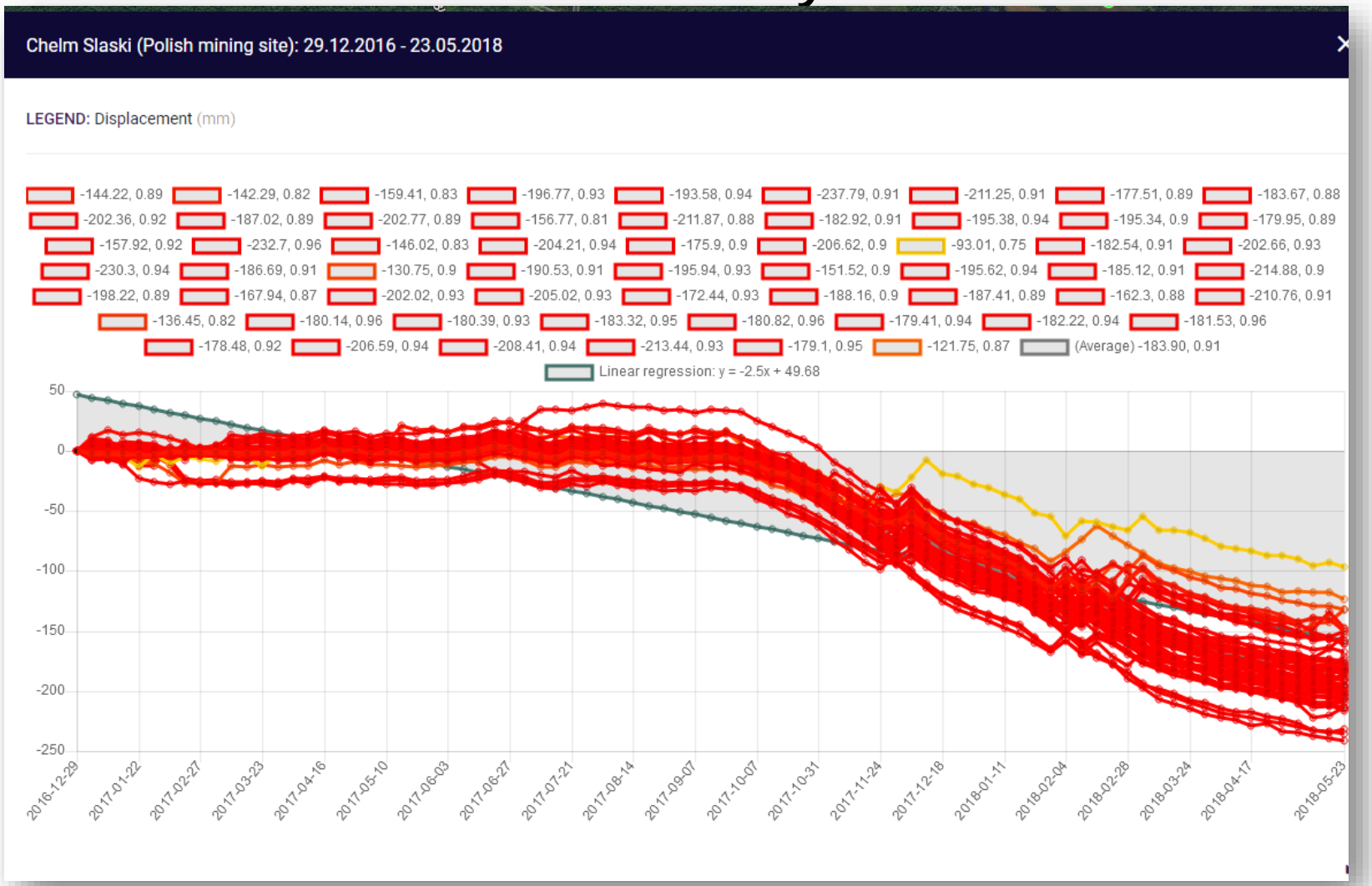
Mining areas

http://www.mining.com/infographic-where-the-minerals-are-82638/

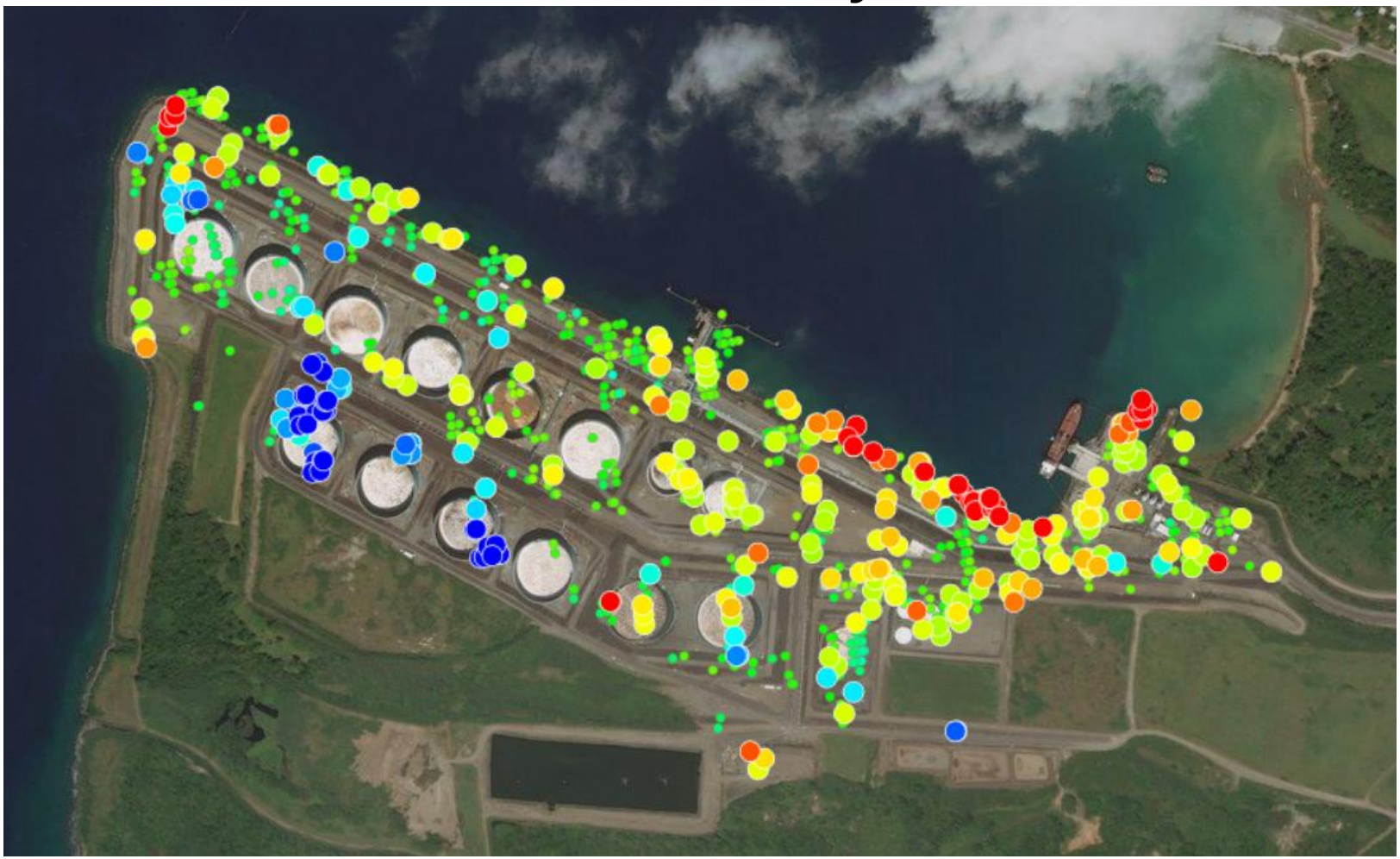
Phase of the reflecting radar signal is measured and converted into distance.



Timeline is built from datapoint series for detailed analysis



Timeline is built from datapoint series for detailed analysis



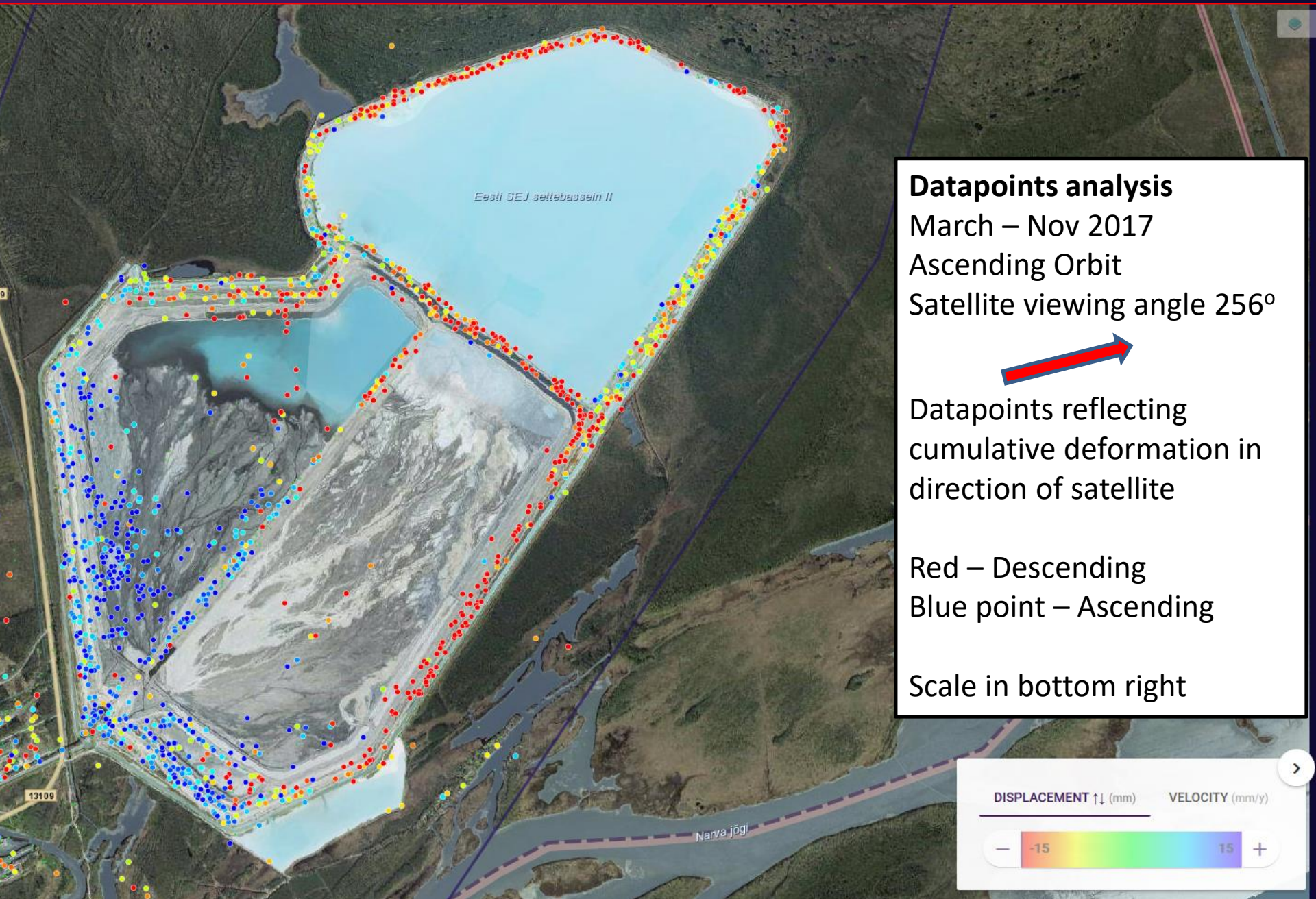
Sille: Applications and Use Cases

- Civil Engineering
- Geo Hazards
- Mining
- Oil & Gas
- Energy
- Emergency
- Real Estate
- Insurance
- Environment

Examples

Oil Shale Power Plant Sedimentation Pools in Estonia

Tailing dams / Blue Lagoon



Datapoints analysis
March – Nov 2017
Ascending Orbit
Satellite viewing angle 256°

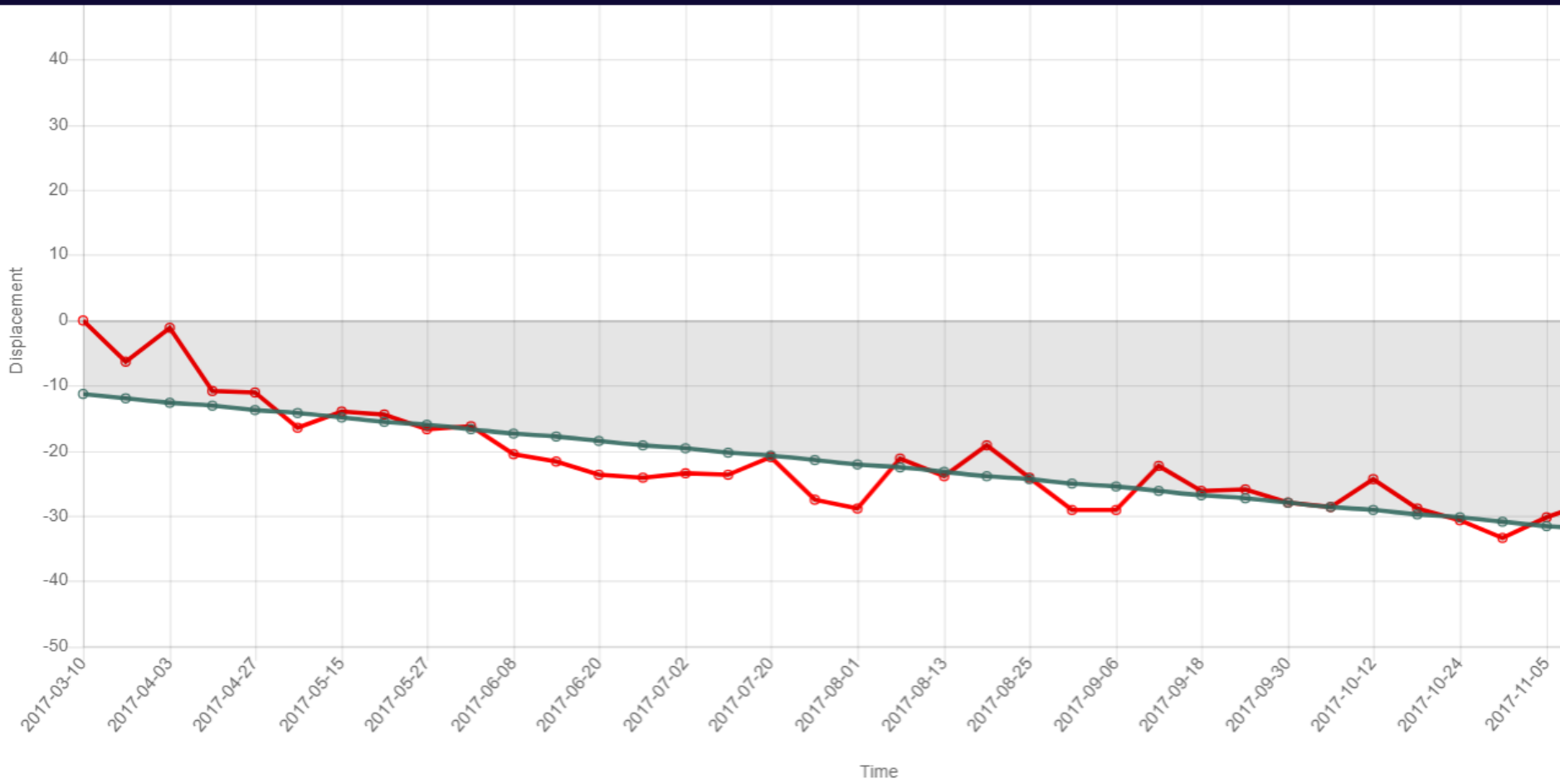
Datapoints reflecting cumulative deformation in direction of satellite

Red – Descending
Blue point – Ascending

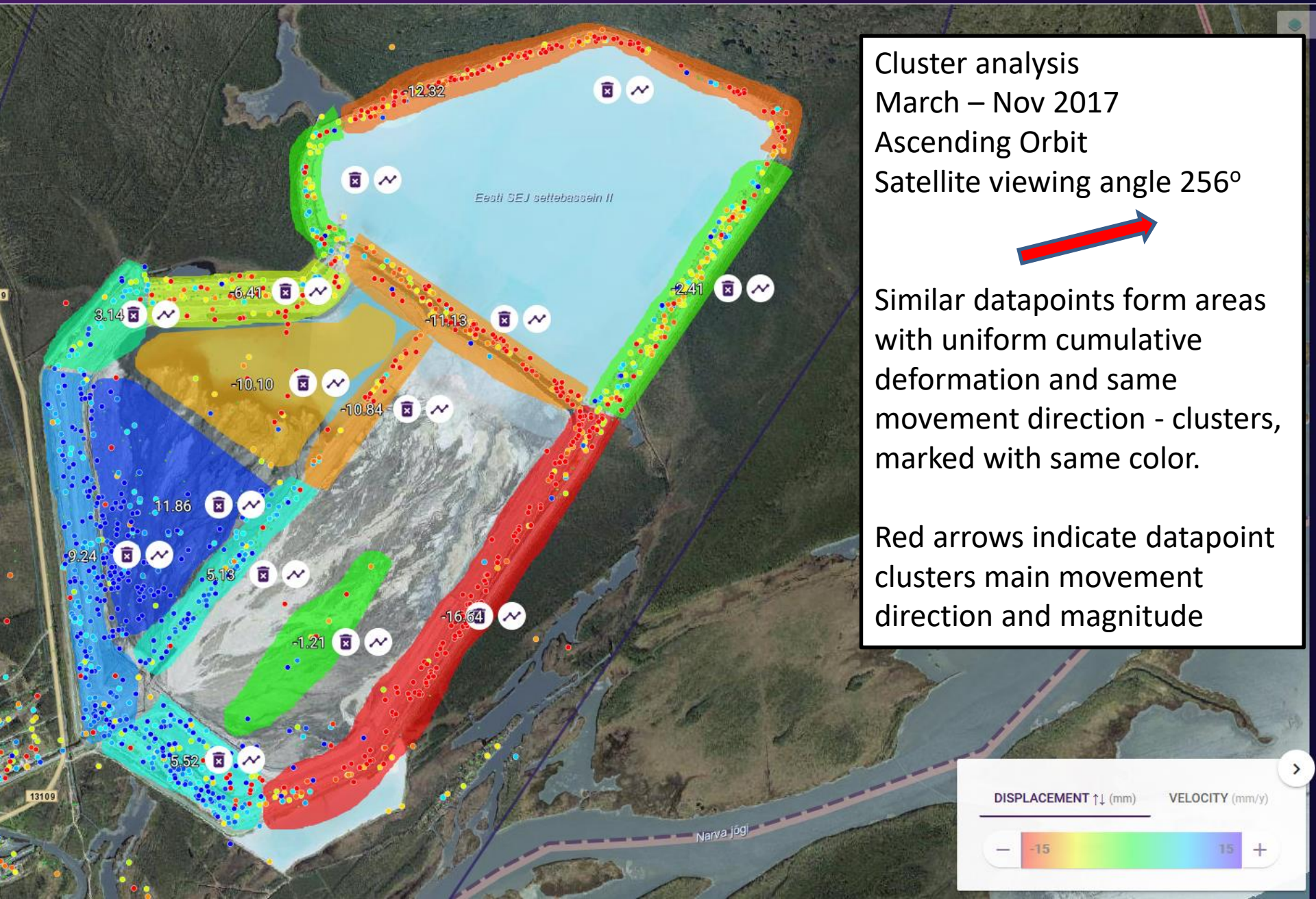
Scale in bottom right

Tailing dams / Blue Lagoon

Eesti elektrijaama tuhamägi: 10.03.2017 - 23.11.2017



Tailing dams / Blue Lagoon



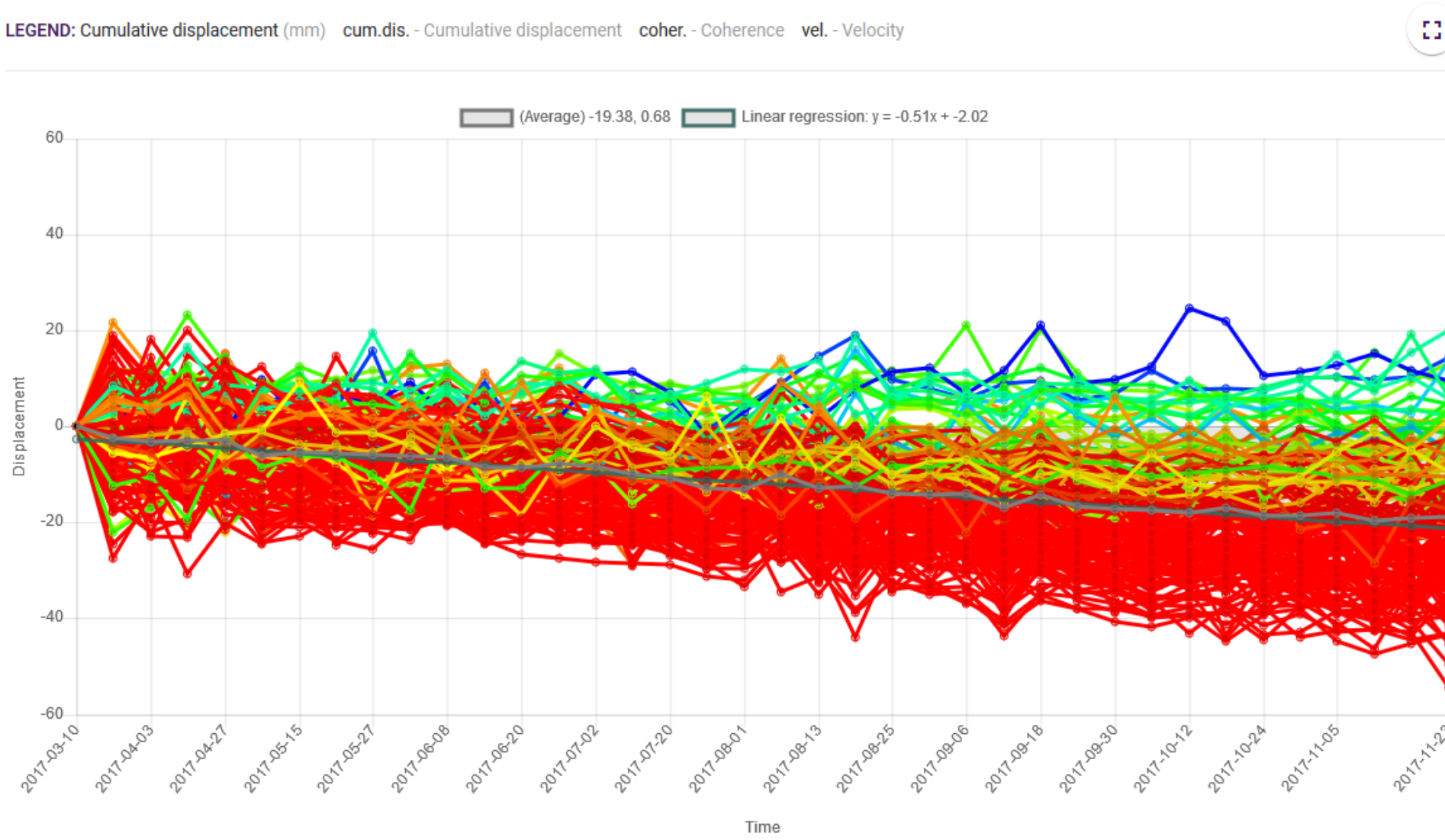
Cluster analysis
March – Nov 2017
Ascending Orbit
Satellite viewing angle 256°

Similar datapoints form areas with uniform cumulative deformation and same movement direction - clusters, marked with same color.

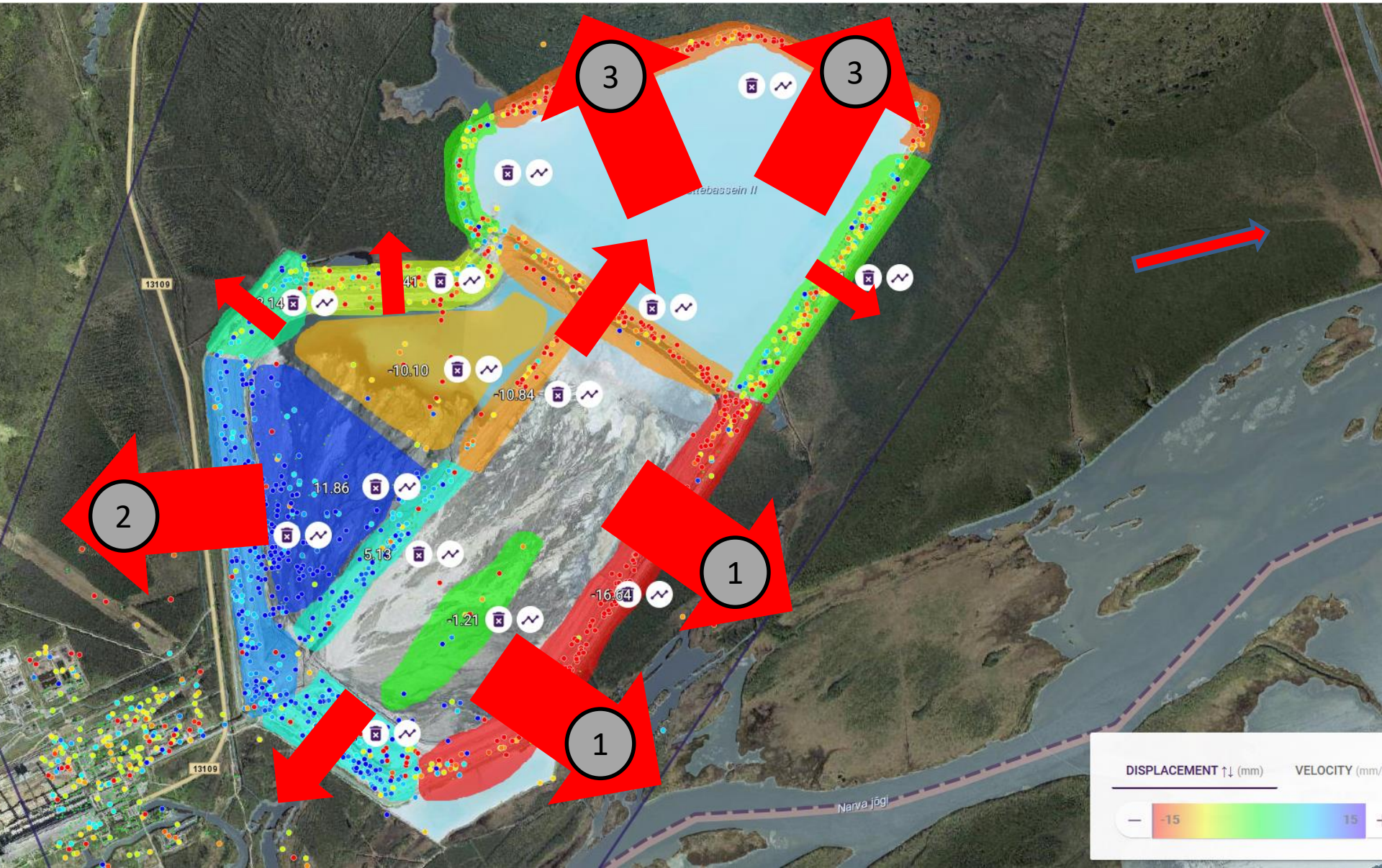
Red arrows indicate datapoint clusters main movement direction and magnitude

Tailing dams / Blue Lagoon

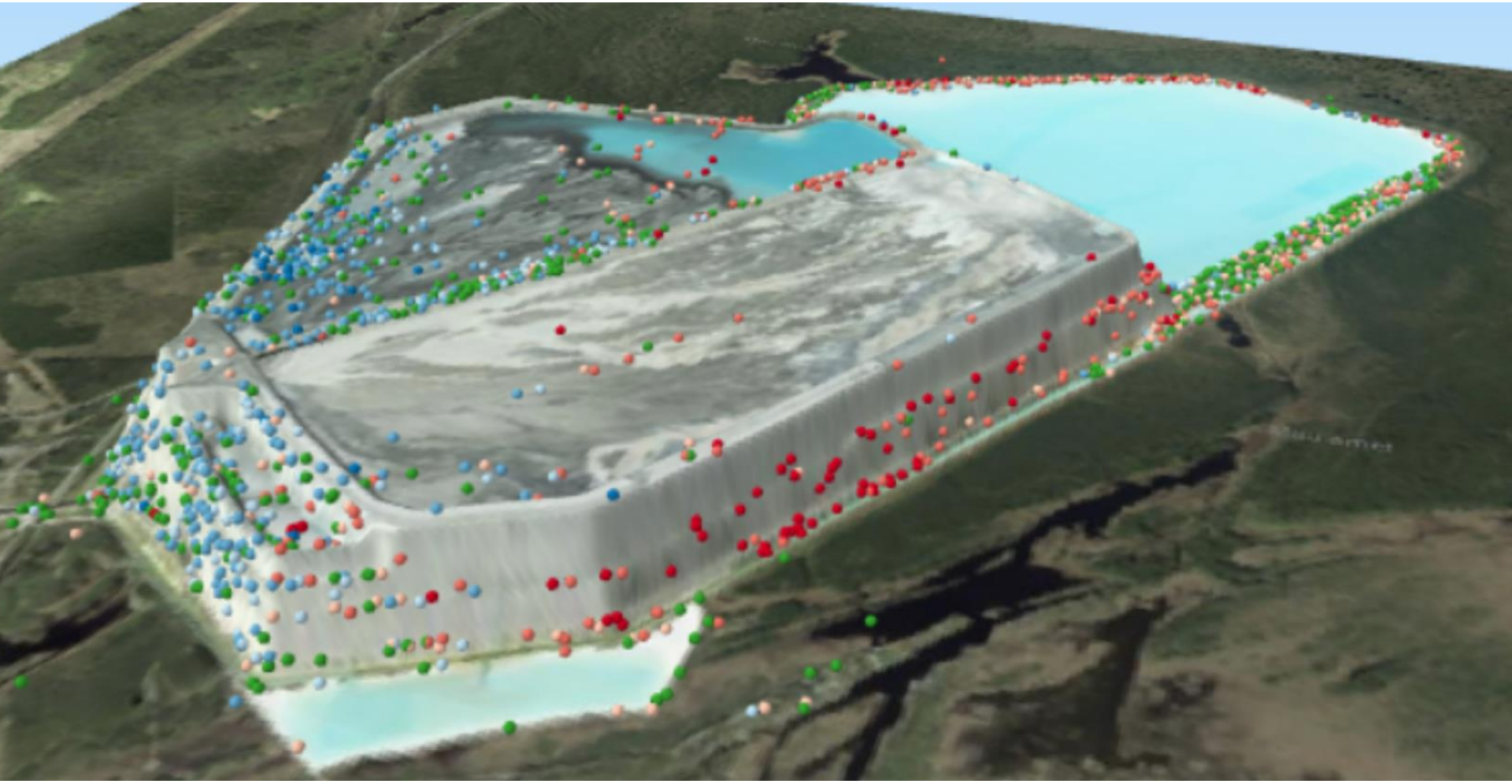
Eesti elektrijaama tuhamägi: 10.03.2017 - 23.11.2017



Tailing dams / Blue Lagoon

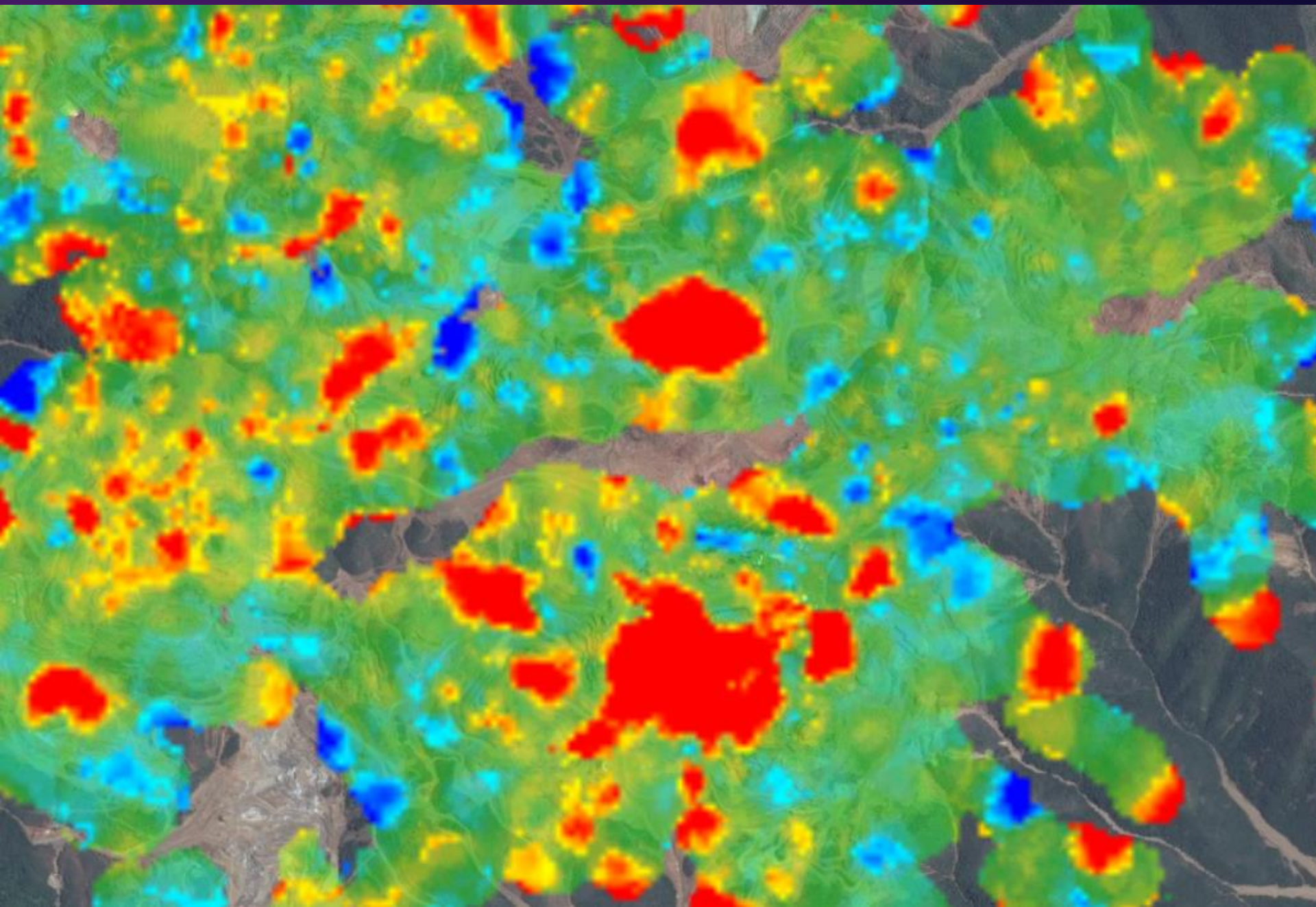


Tailing dams / Blue Lagoon

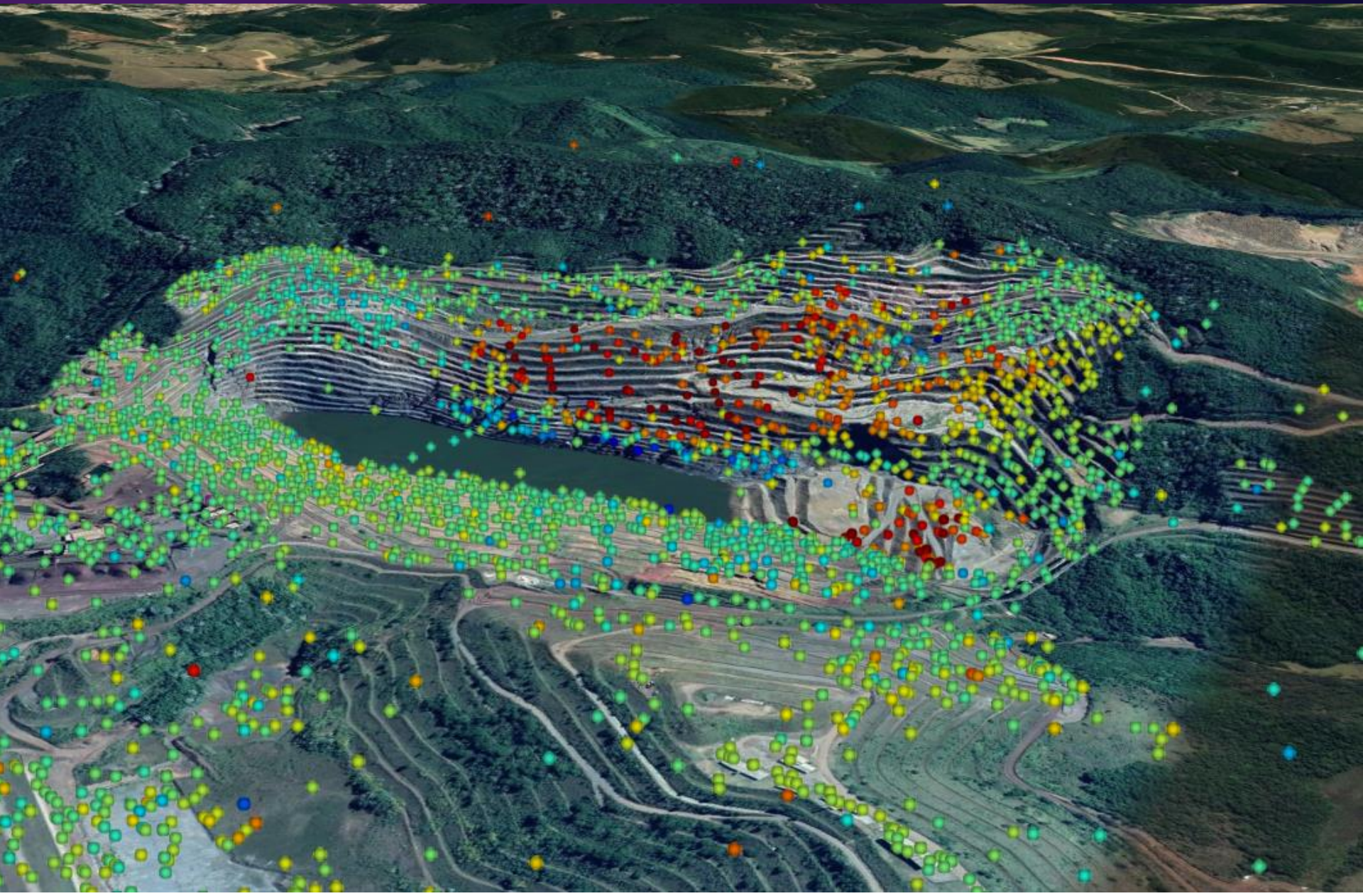


Landslide areas in a mine

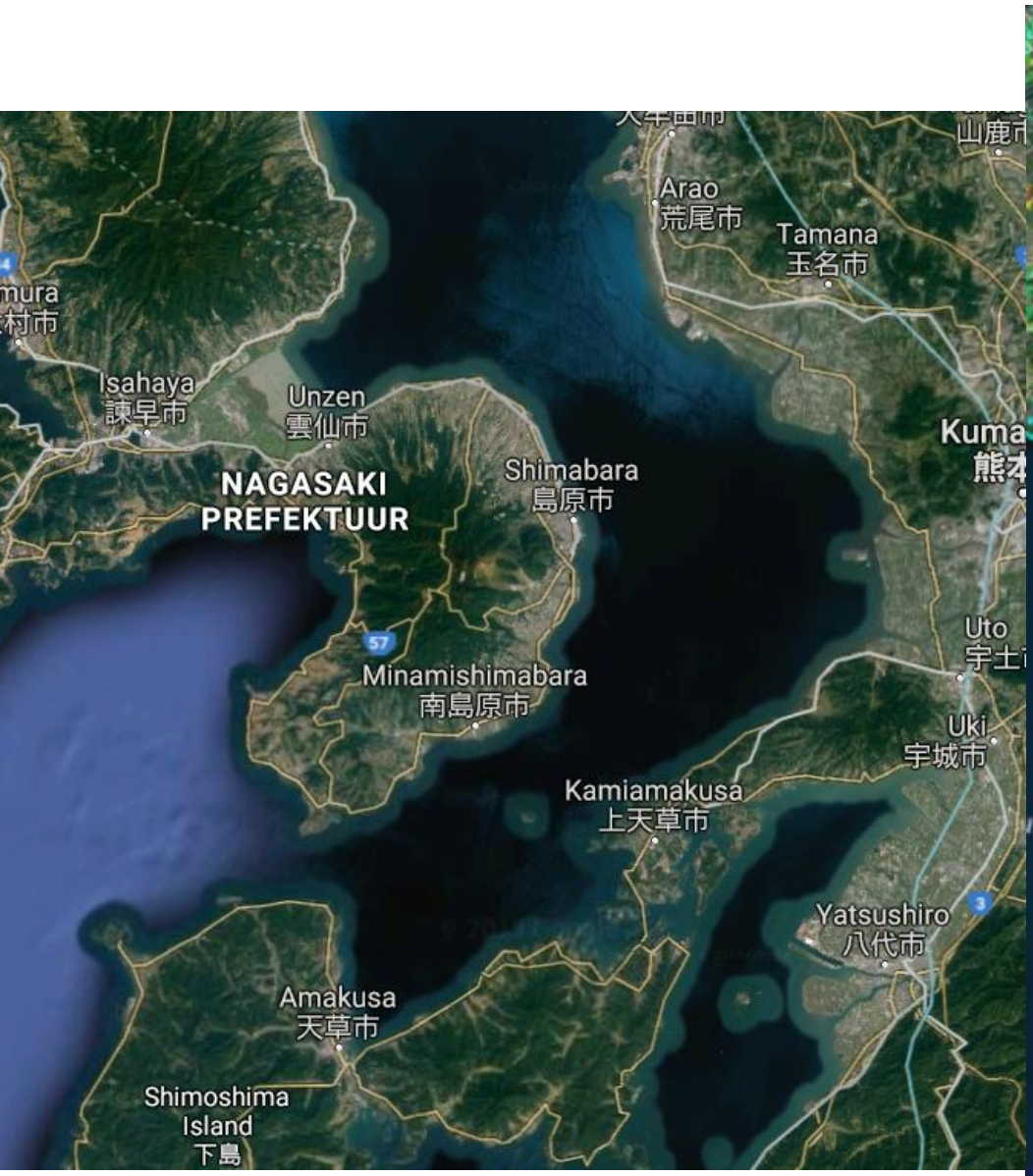
Landslide areas in a mine / APAC



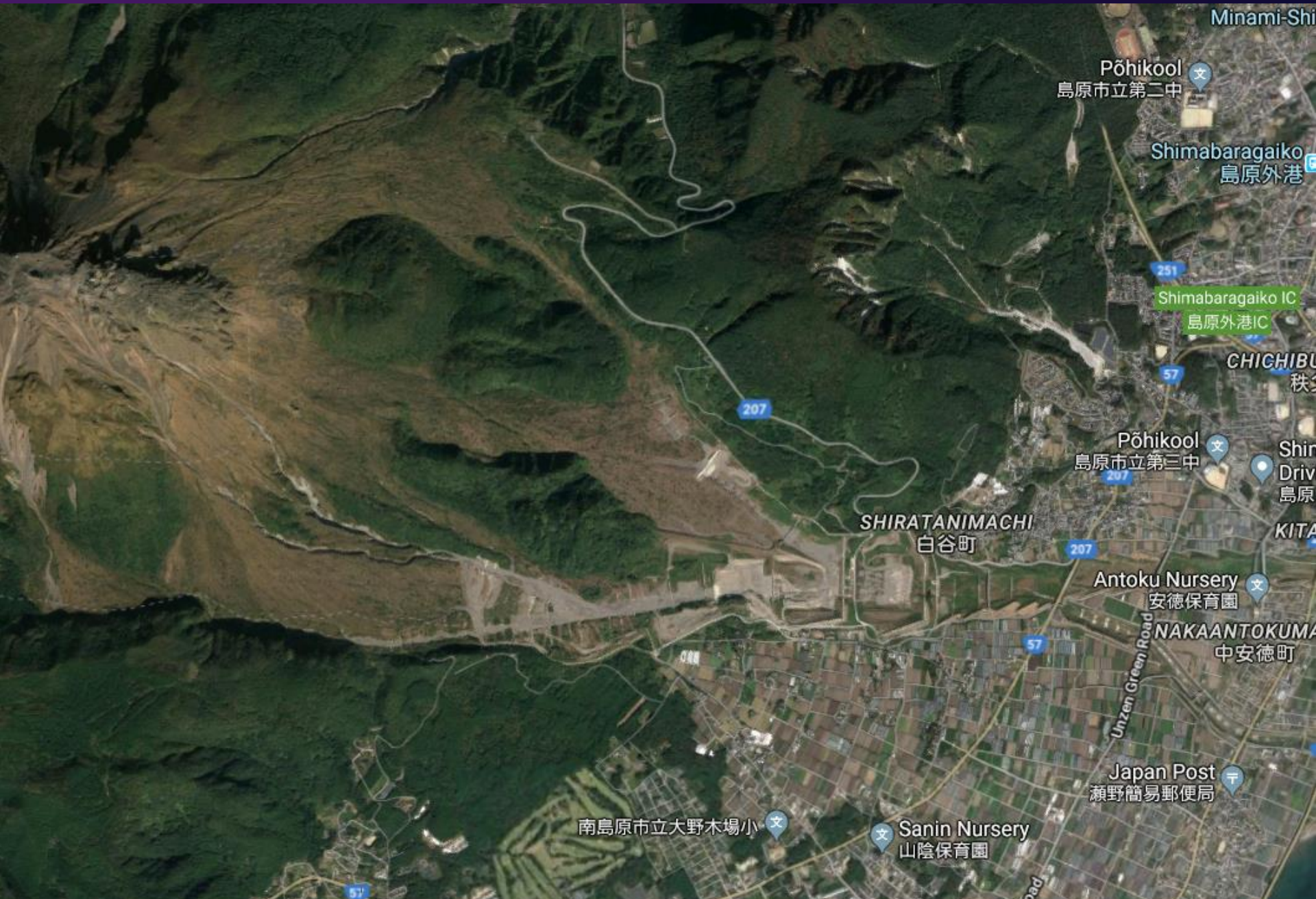
Landslide areas in a mine / South America



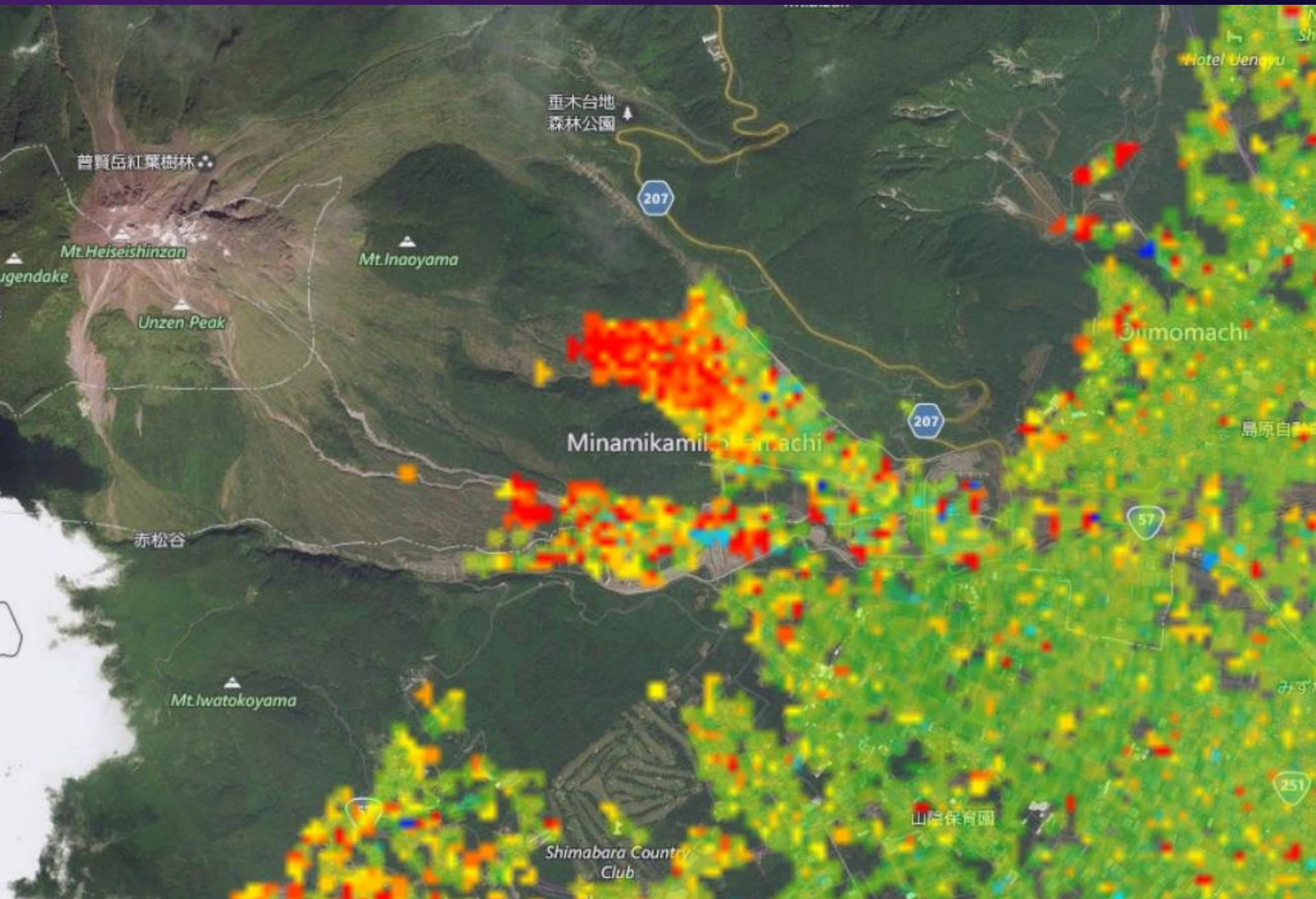
Landslides / Mount Unzen, Minamishimabara



Landslides / Mount Unzen, Minamishimabara



Landslides / Mound Unzen, Minamishimabara

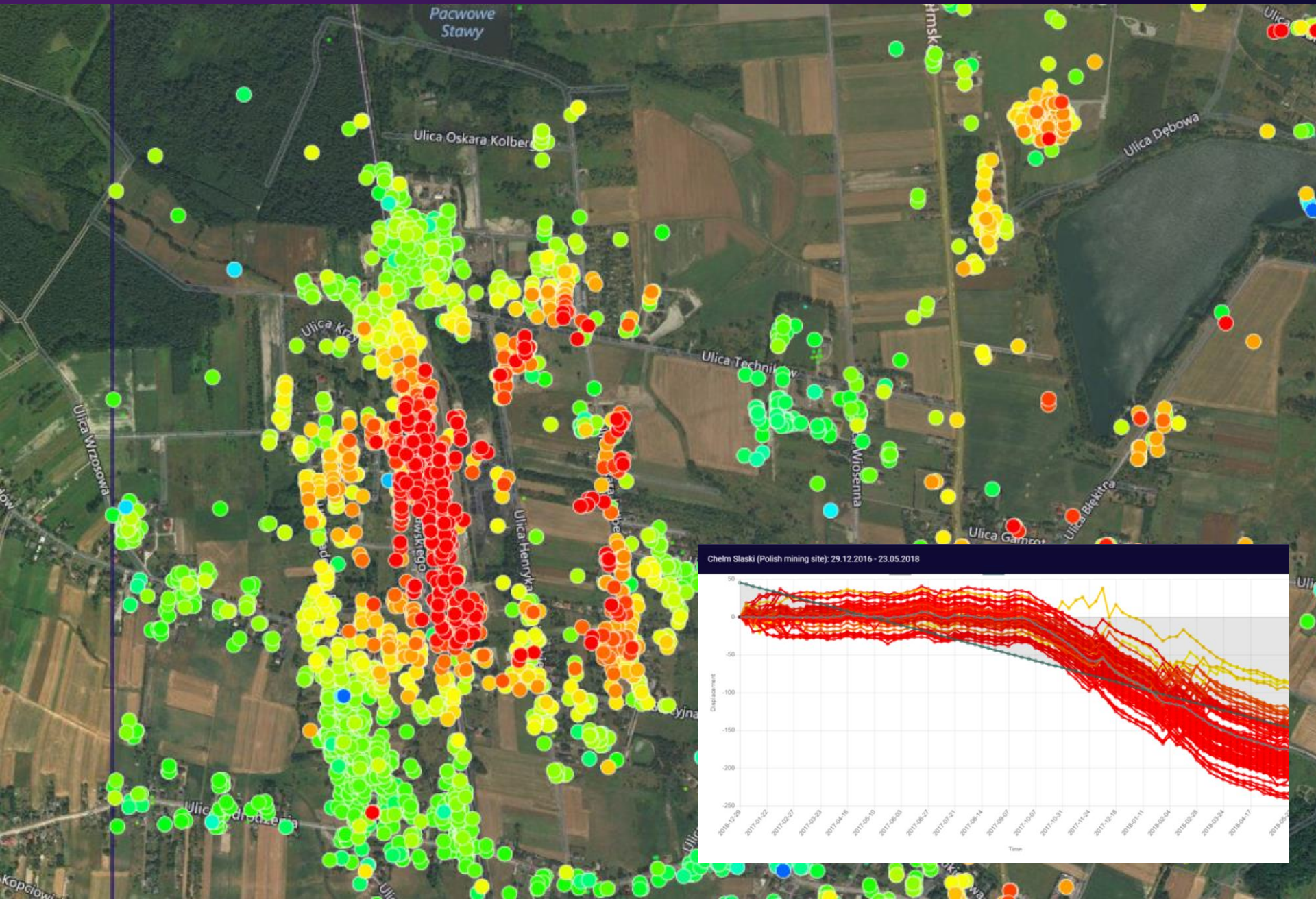


Tailing dam accident

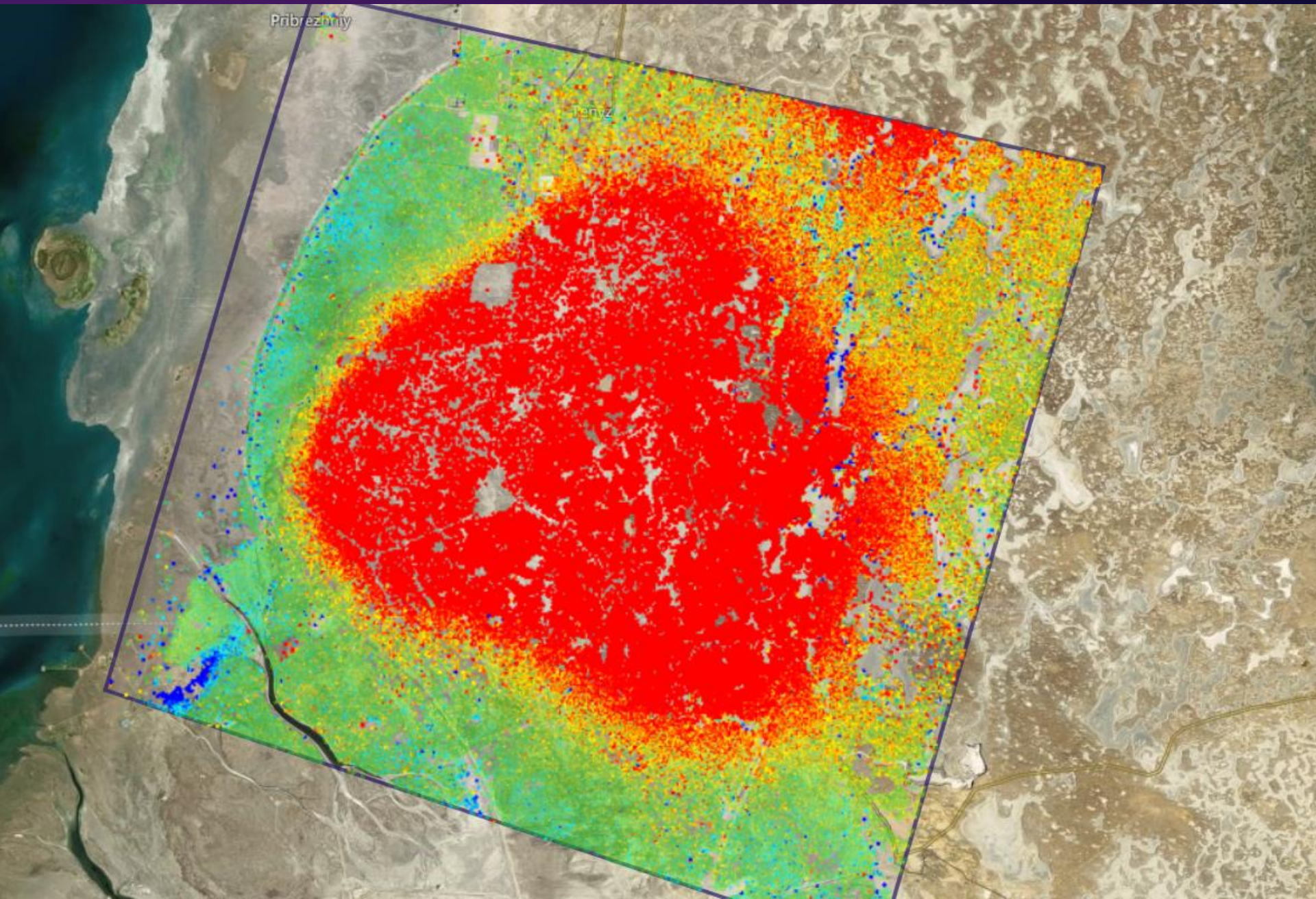
https://www.youtube.com/watch?v=Adk0AwcISHo

Tailing dams

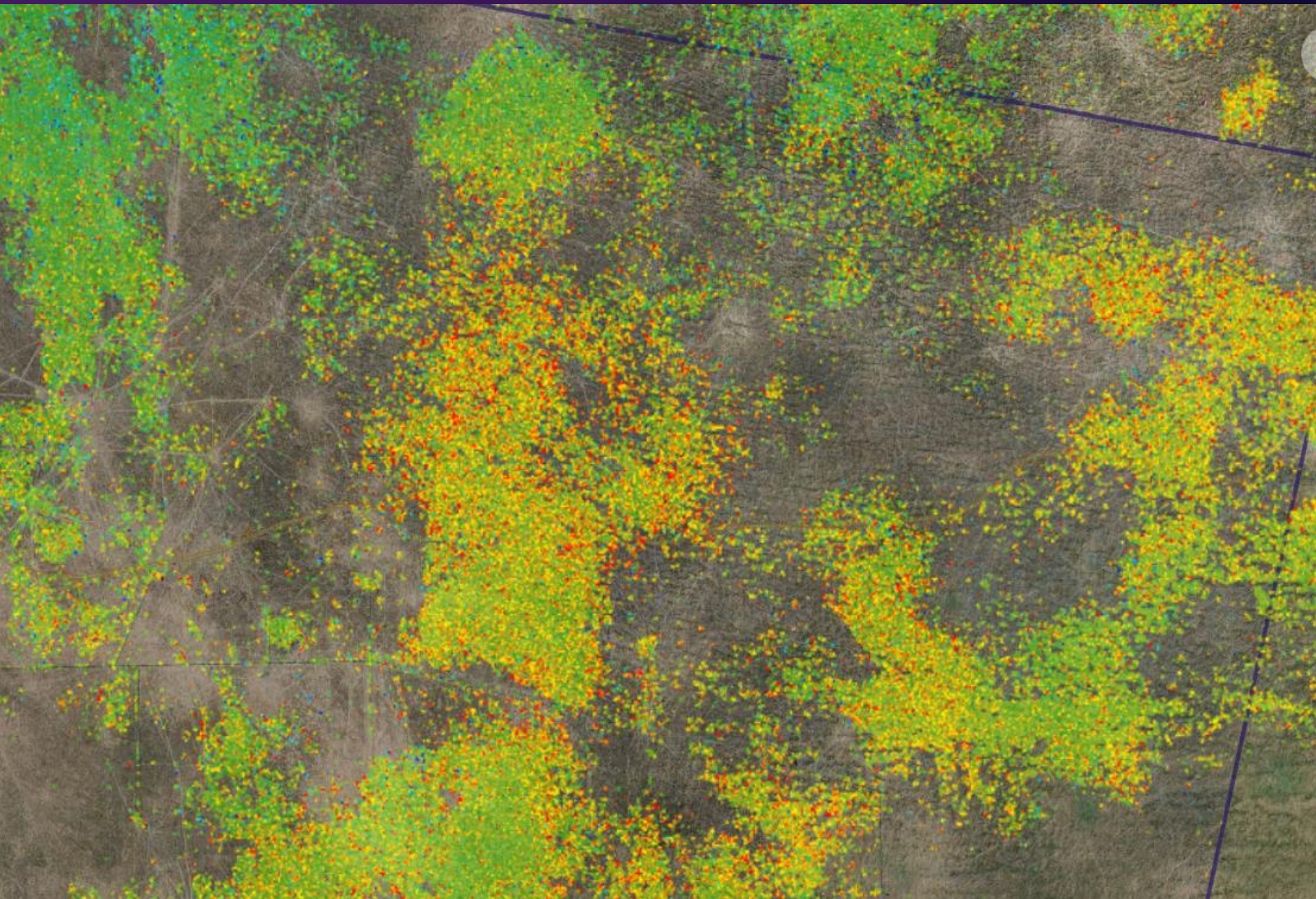
Subsiding areas



Oil & Gas / Oilfield in Kazakhstan



Oil & Gas / Gazfield in Turkmenistan

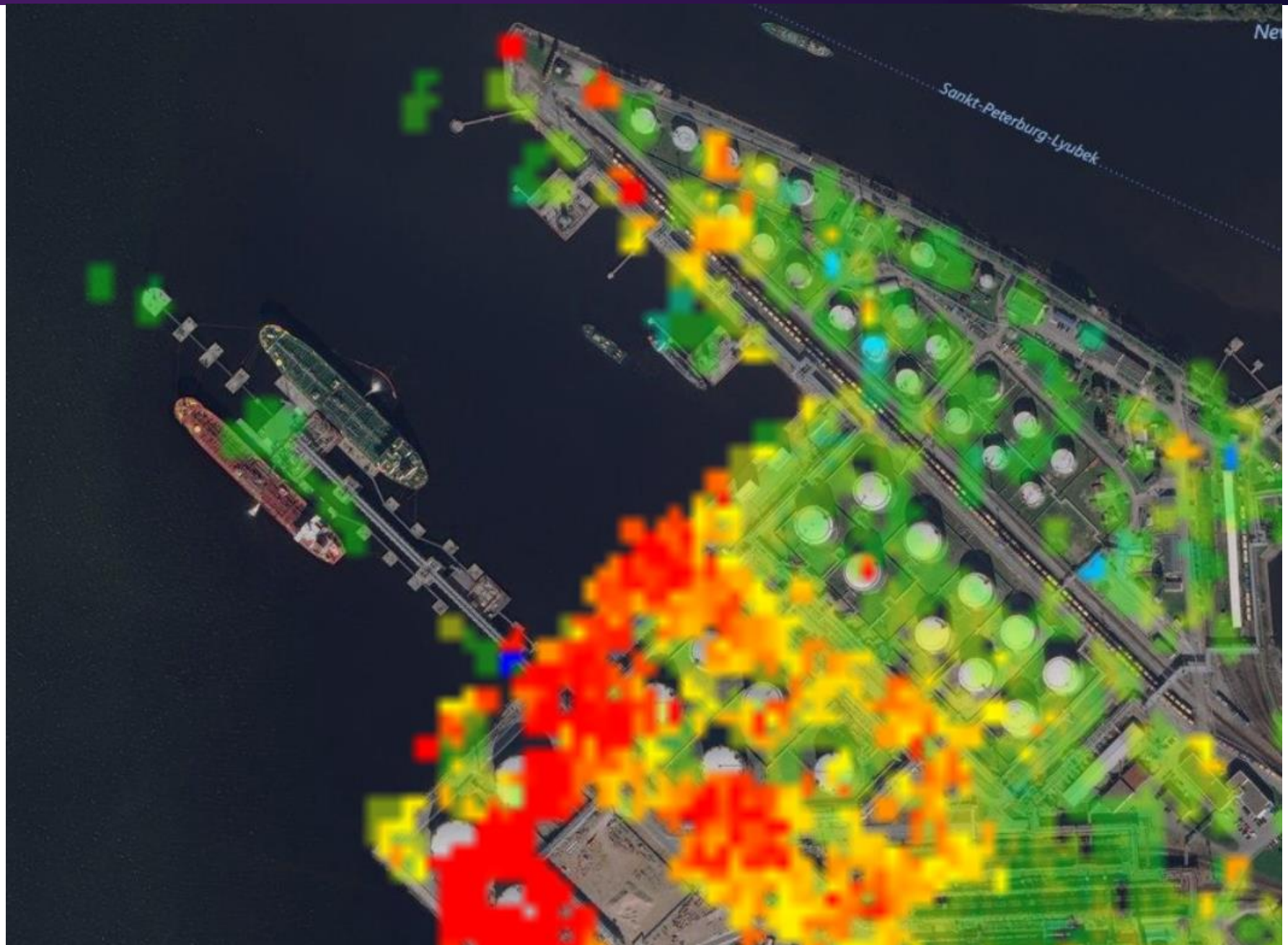


Power plant

Storage areas

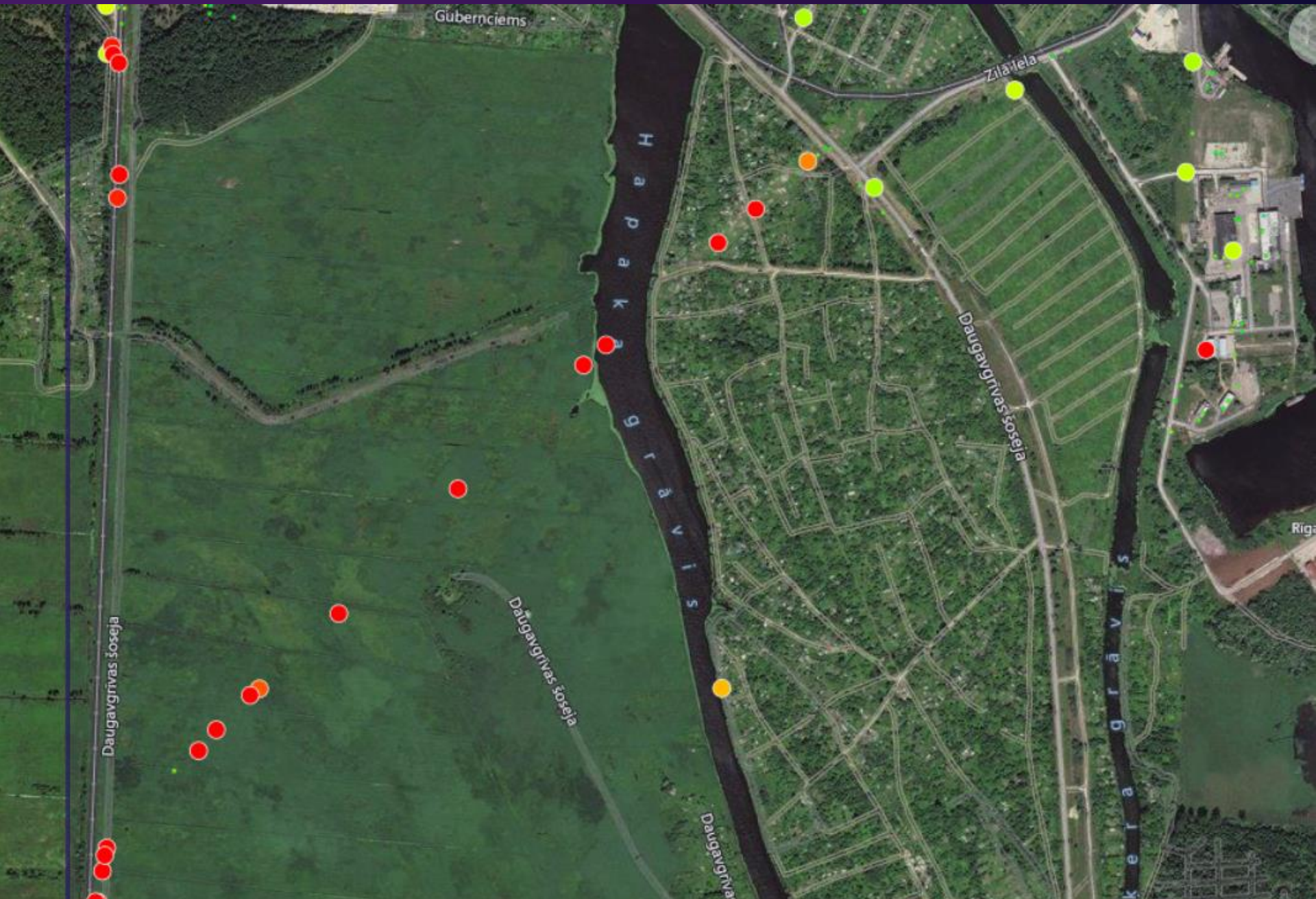
Transportation / Port

Transportation / Port

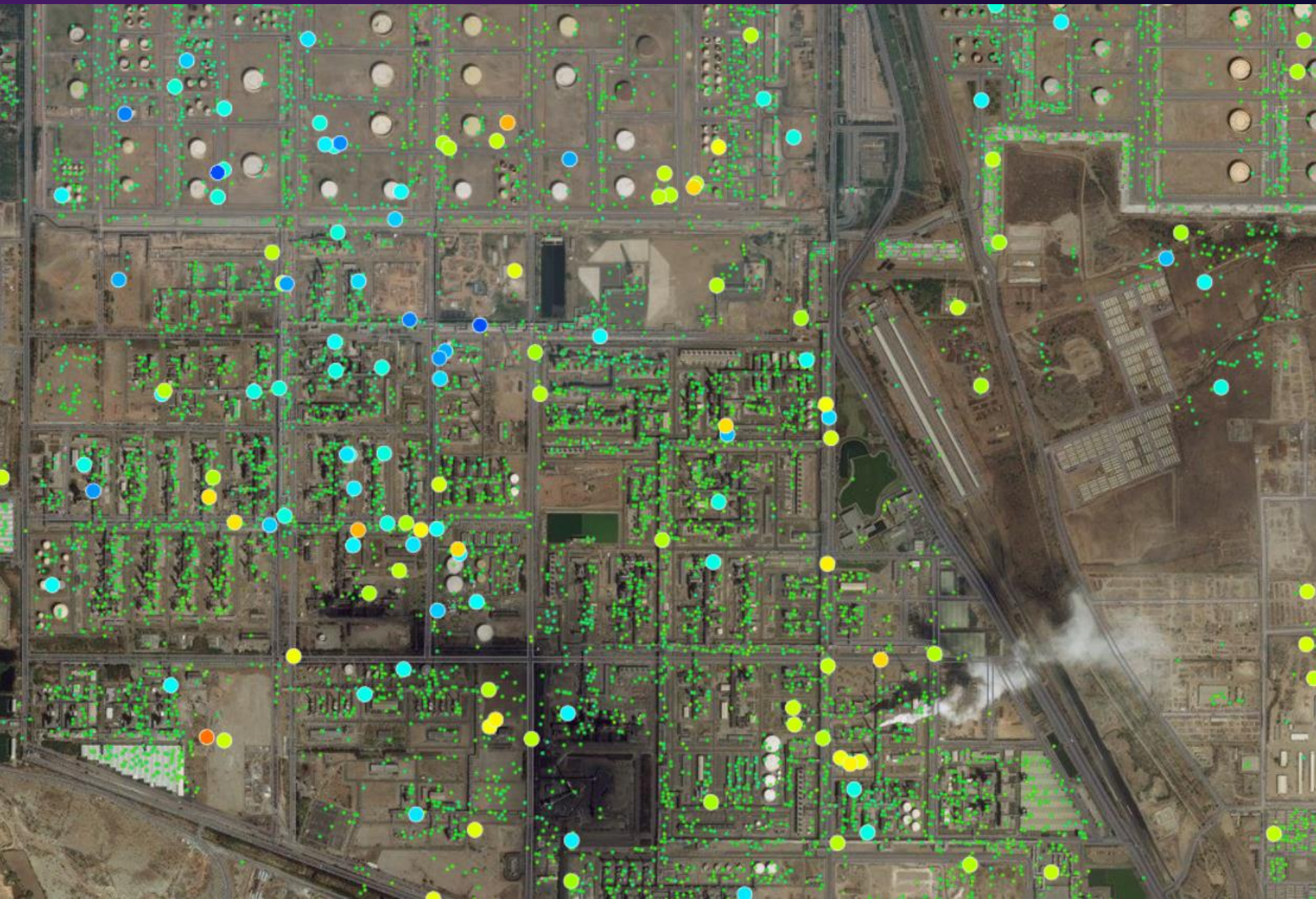


Transportation / Port

Transportation / Railway

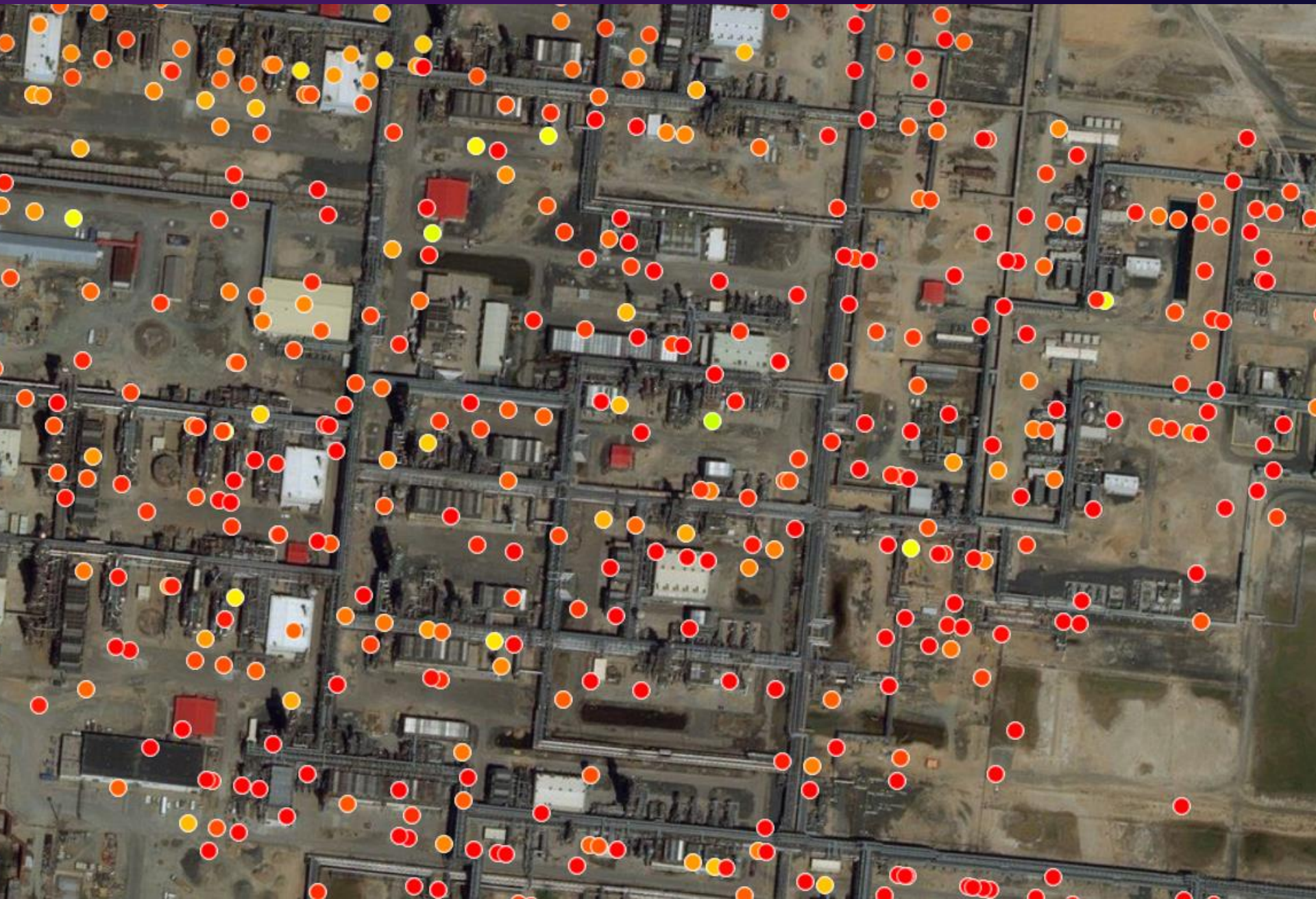


Refinery



Plant

Plant / oilfield



Artificial reflectors

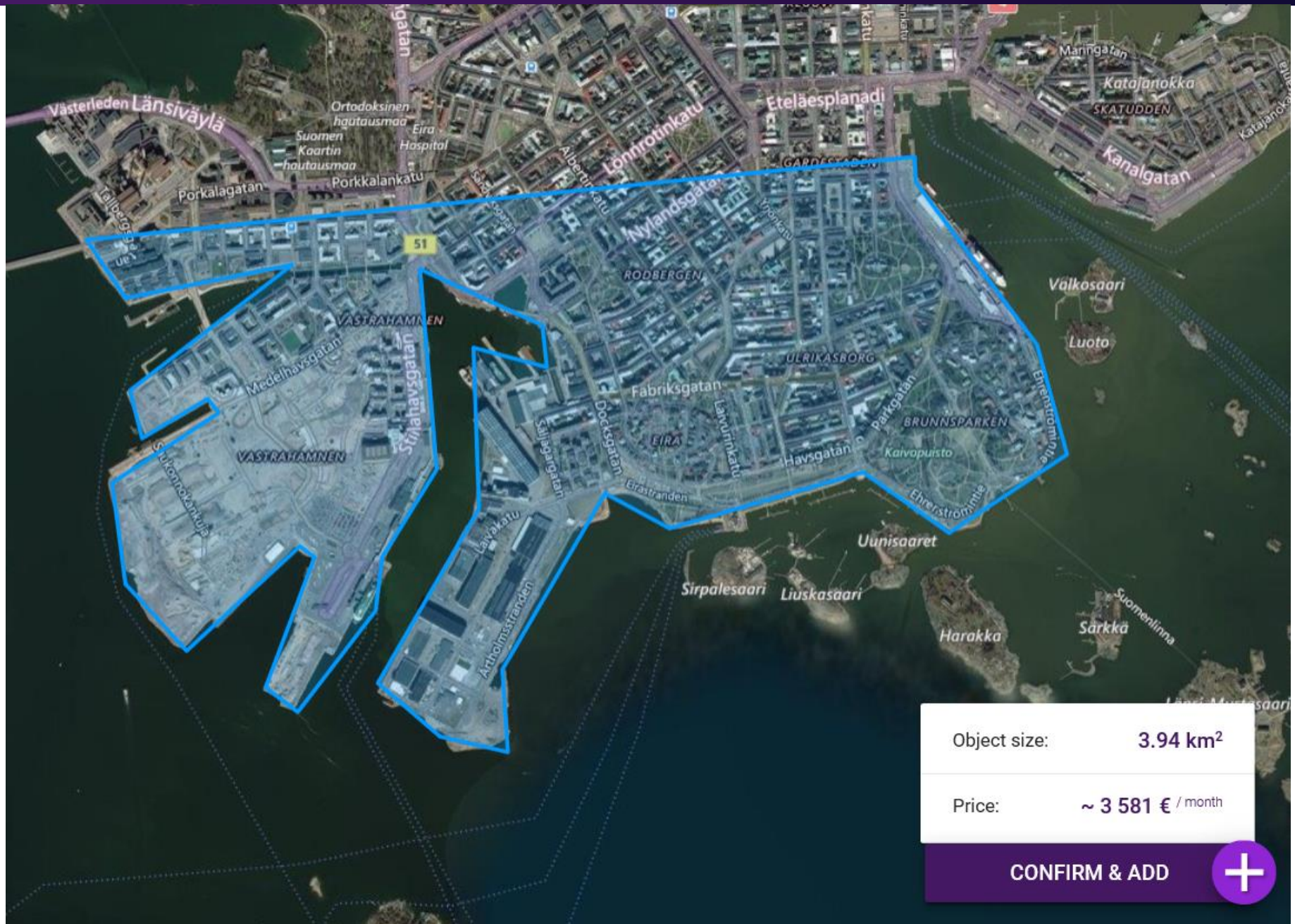
SILLE Advantages

- High precision
- Historic data available since 2014
- Frequent data updates
- Integration possible thanks to API’s
- Providing trendline analysis
- No hardware required
- Fully remote solution
- Gives predictability
- Decreases costs

Our value proposition

- Improved safety
- Continuous monitoring
- Alarming possibility
- Customization and integration possibilities
- Short deployment time
- No in situ equipment needs typically
- Covers big and complex areas easily

For pricing GO: https://www.sille.space/app/#/orders/new



!

Beware of what is
happening in your mine!

Get in Touch!

Asse Hang

VP International Sales

+ 372 5108017

asse.hang@datel.ee

www.sille.space