Citymesh Drone Solutions

Enhancing Infrastructure Monitoring with Non-Destructive Aerial Techniques

EUPAVE
EUROPEAN CONCRETE PAVING ASSOCIATION

Drone Solutions

An aerial view can help you make better decisions

Citymesh Safety Drones BV is a company emerged in 2023 out of Citymesh BV, Cegeka, and Drone Division.

- We offer end-to-end solutions for various sectors.
- Industrial solutions in hard-to-reach areas or emergency situations
- Ensuring the safety of individuals, environment and structures
- Minimizing down time for critical infrastructure
- Building the world's first safety drone shield in Belgium consisting of 70 state-of-the-art drones

Goal: faster, better, more accurate and less expensive decisions

Drone Solutions

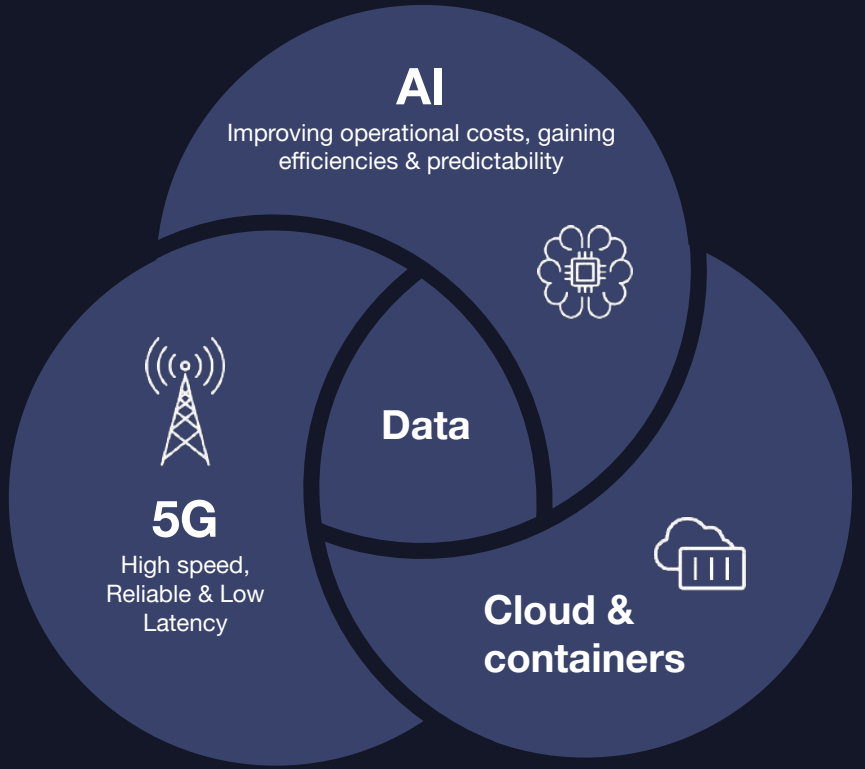
Citymesh

We specialize in offering both permanent and temporary connectivity solutions, utilizing cutting-edge Wi-Fi, 0G, 4G, and 5G technologies **turning connectivity into operational value.**

IT Integrator Solutions	Private 4G-5G / LAN / WLAN / WiFi / Indoor Coverage / Firewall (Security) / SD-WAN
Drone Solutions	Emergency Services / Inspection / Telco Mapping
Critical Solutions	Reliable Connectivity for critical operations. Uninterrupted voice and data transmission.
Operator Solutions	Mobile Subscriptions / Fixed Connectivity / Fixed Mobile Unification (FMU)
Temporary Solutions	Temporary Camera Solutions / Connectivity / Event kit / Mobile kit / Porto-Radio-PTX / WiLi / TowerEye
IoT Solutions	Track & Trace / Smart Metering / 0G Connectivity (Sigfox) / Sensoring

The Trinity of Innovation

for the next decade



CITYMESH

Citymesh Drone Solutions

Drone Operator

VLOS - Visual Line of Sight

DiaB - Drone in a Box

BVLOS - Beyond Visual Line of Sight

Drone Solutions

End to end solutions + inspection/analyse platform

INSPECT

MEASURE & ANALYSE

REPORT

3 industries

- ➔ Energy (HV - Solar)
- ➔ Telecom
- ➔ Infra & Construction

+ Innovation projects

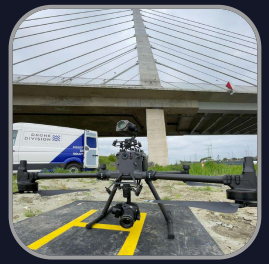
Drone Solutions

How do we work?

INSPECT | **MEASURE & ANALYSE** | **REPORT**

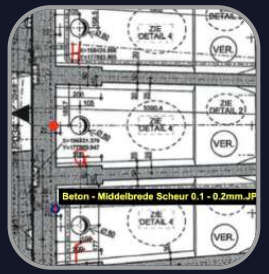
PREPARATION

What technology is needed to deliver data?



What data is needed to get correct insights?

What is your goal? What do you need to make a decision?



Drone Solutions

How do we work?

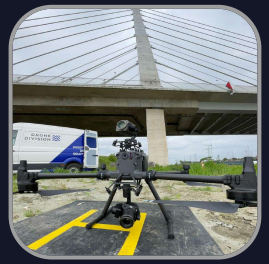
INSPECT | **MEASURE & ANALYSE** | **REPORT**

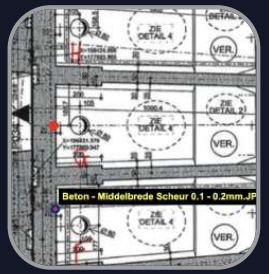
PREPARATION

What technology is needed to deliver data?

What data is needed to get correct insights?

What is your goal? What do you need to make a decision?



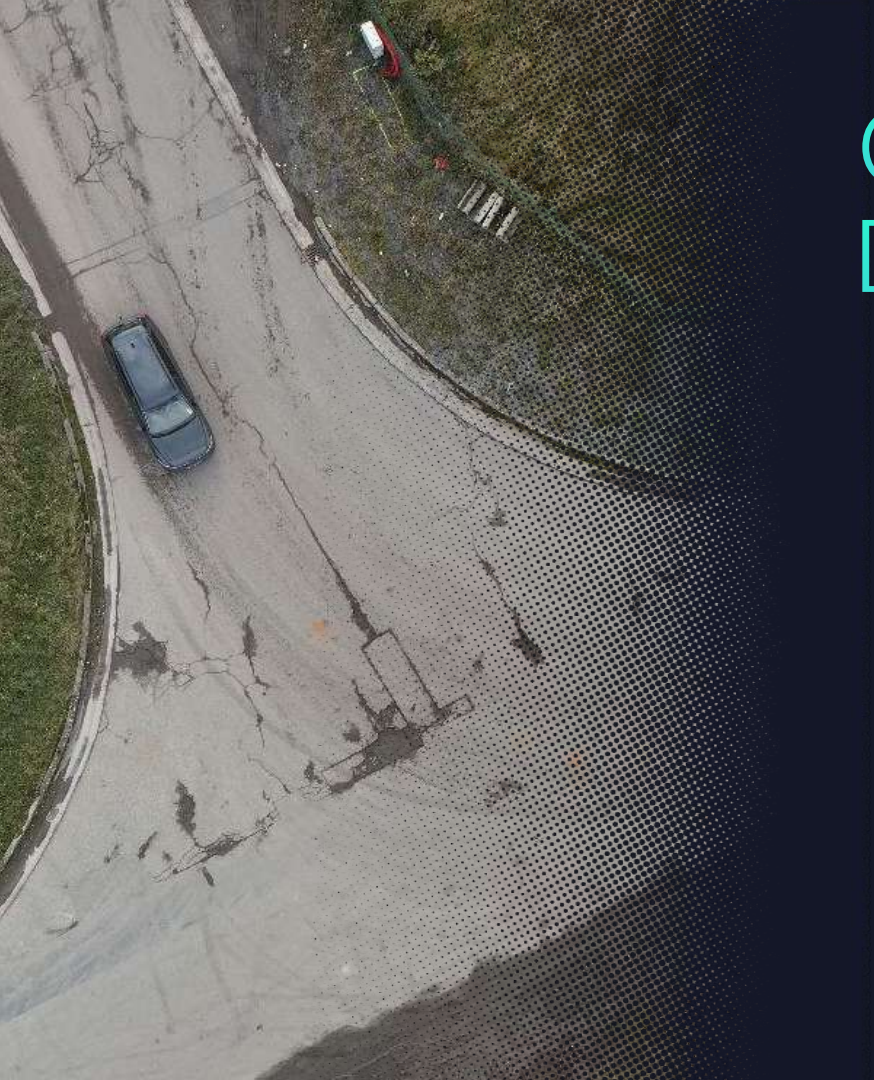


EXECUTION

Data collection
Choice of technology
Execution of assignment

Data processing
Analysis (manual or automated)
Measure
Toolset

Data reporting
Custom client report
Toolset
Raw data



Citymesh Drone Solutions

Infrastructure monitoring

1. Visual expert inspection on site
2. Automated flight with imaging
3. Using LiDAR
   Light Detection and Ranging

Drone Solutions

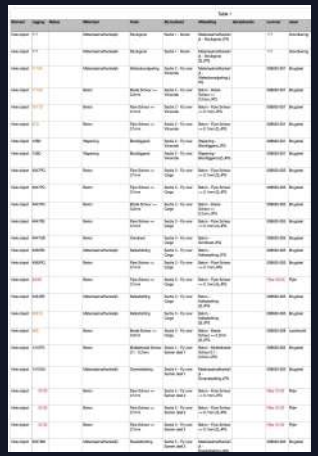
Using drones for non-destructive inspections

1. Visual inspection with experts on site

We deliver high end technology, easy-to-use tools, automated custom client reporting.

The client delivers high quality insights and expertise on site.

Together we deliver fast and accurate decisions (on the spot) with detailed reporting.



Drone Solutions

Visual inspection

- ✅ Fast result (on site)
- ✅ Very High precision
- ✅ Fast decision making
- ✅ No Processing time
- ✅ Complex structures or difficult access

⚠️ Larger area > time

Drone Solutions

Using drones & imaging for monitoring & measurement

2. Automated flight with imaging resulting in Orthophoto and DSM.
Centimeter precision for larger areas. Post-Analysis by expert client.

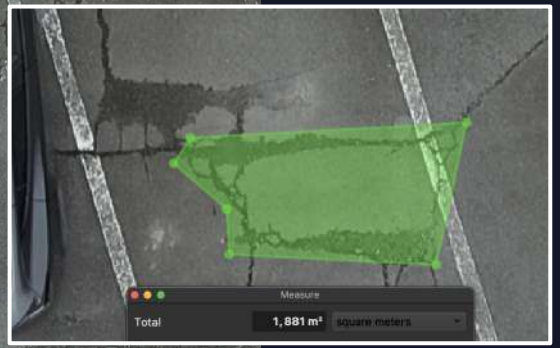
- Flight at 75-120m height
- Accuracy:
  8 - 15mm / pixel
- Post analysis by client
  - Site preparation
  - Volume measurement
  - Surface measurement
  - Site monitoring
  - Earth moving
- DatuMate/Autodesk/…

Drone Solutions

Using drones & imaging for monitoring & measurement

Drone Solutions

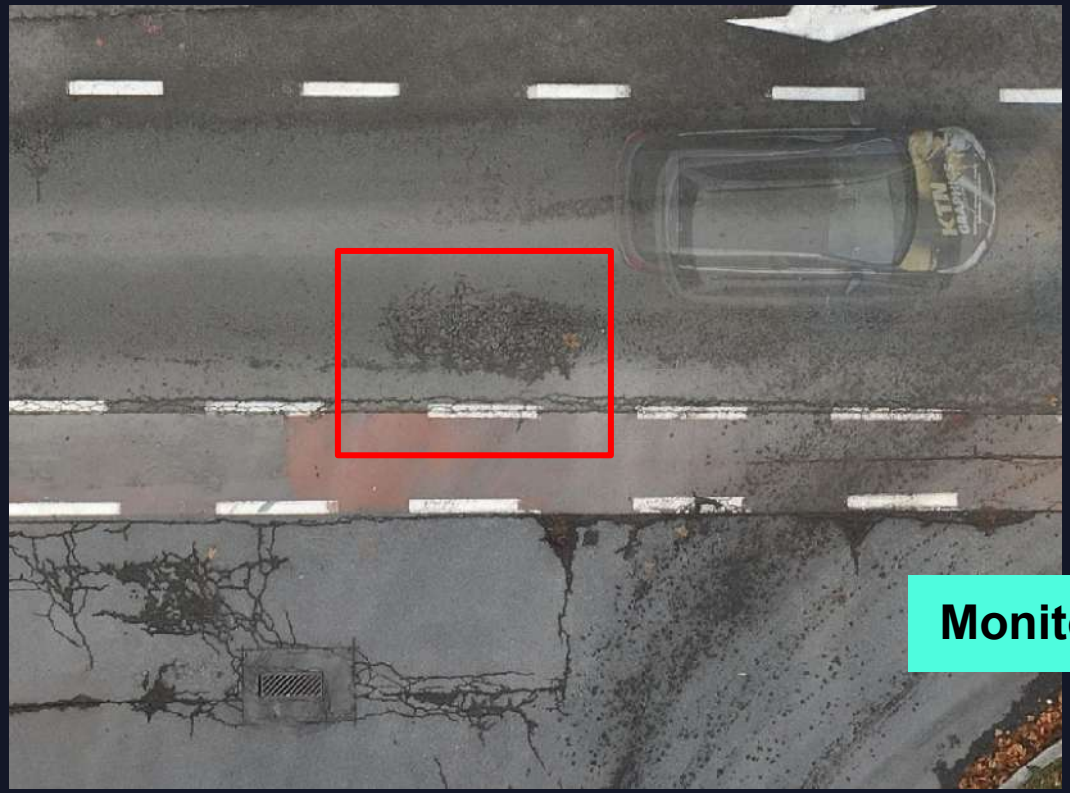
Using drones & imaging for monitoring & measurement



Site Preparation

Drone Solutions

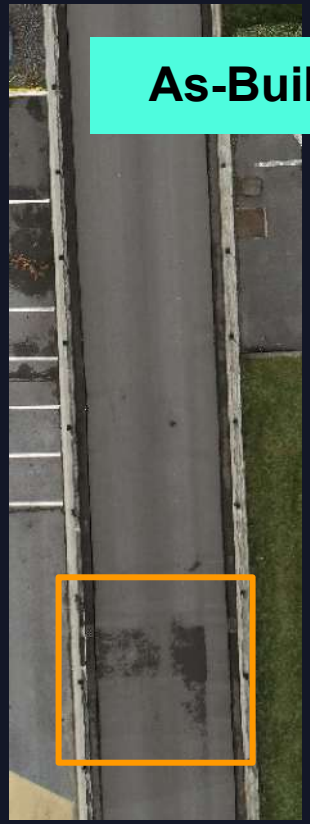
Using drones & imaging for monitoring & measurement



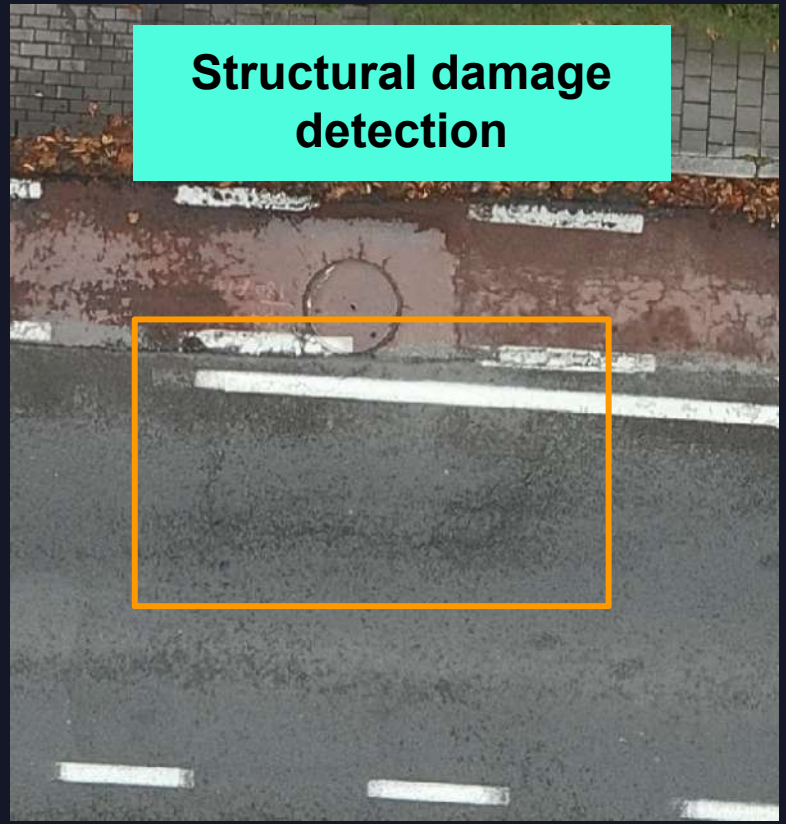
Monitoring over time

Drone Solutions

Using drones & imaging for monitoring & measurement



As-Build reporting



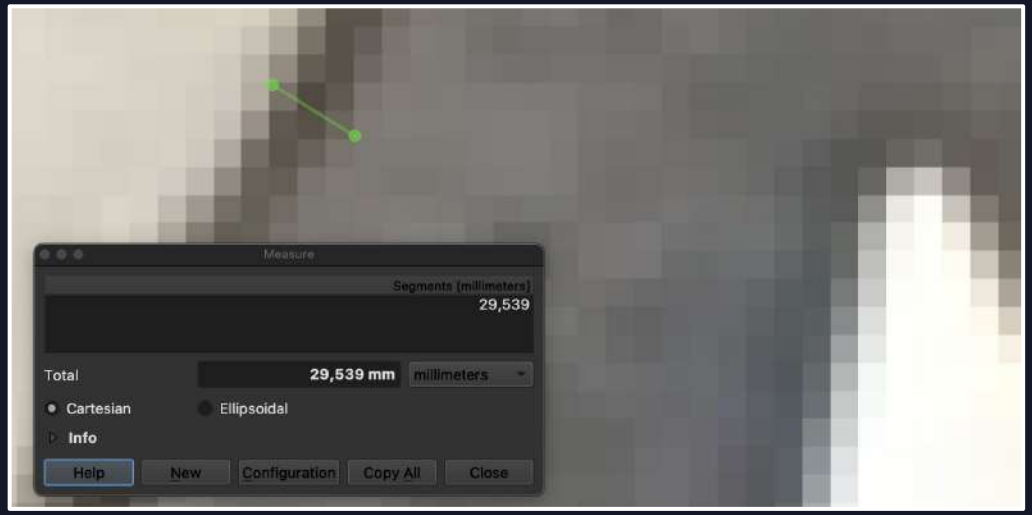
Structural damage detection

Drone Solutions

Use of orthogonal images

Orthogonal images:

✅ Good visualisation
✅ High precision
✅ Large areas
✅ Easy to use



Example: 8mm per pixel (flight at 75m)

⚠️ Long flights at low height
⚠️ Processing time

🔥 More accurate if executed at lower flight with 55mm lens!

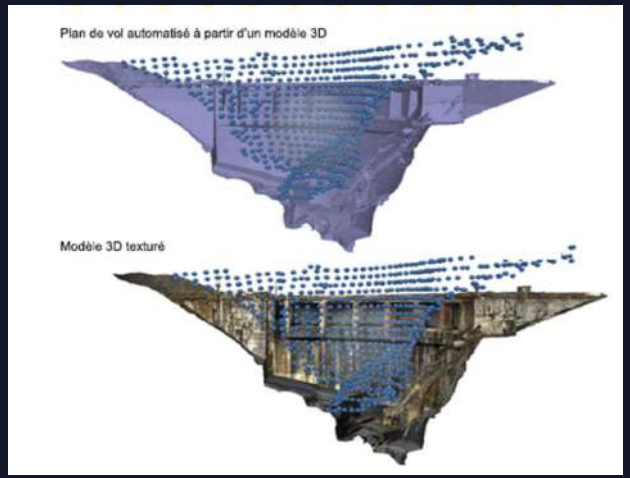
Drone Solutions

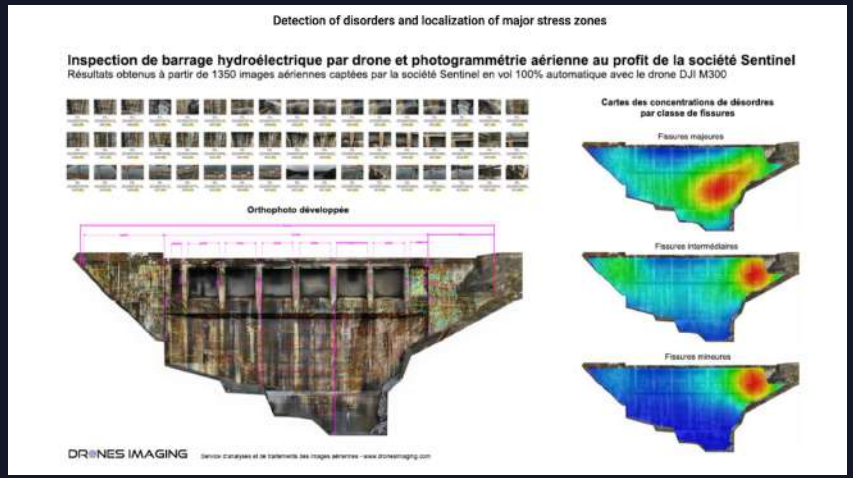
What if...

A flight at 20m height would result in a precision of **2.5mm / pixel?**

What are your needs? Let us know!

Example of a Dam: 0.8mm/pixel





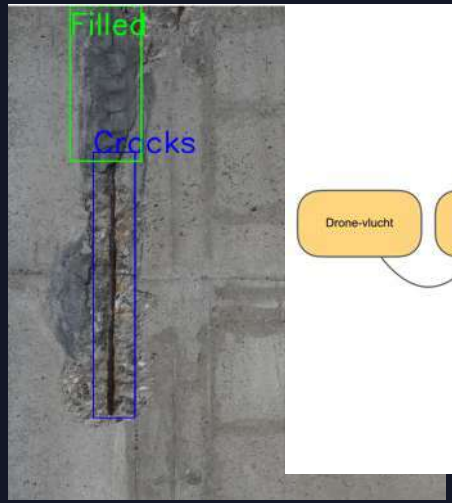
Source: https://www.dronesimaging.com/en/dam-inspection/

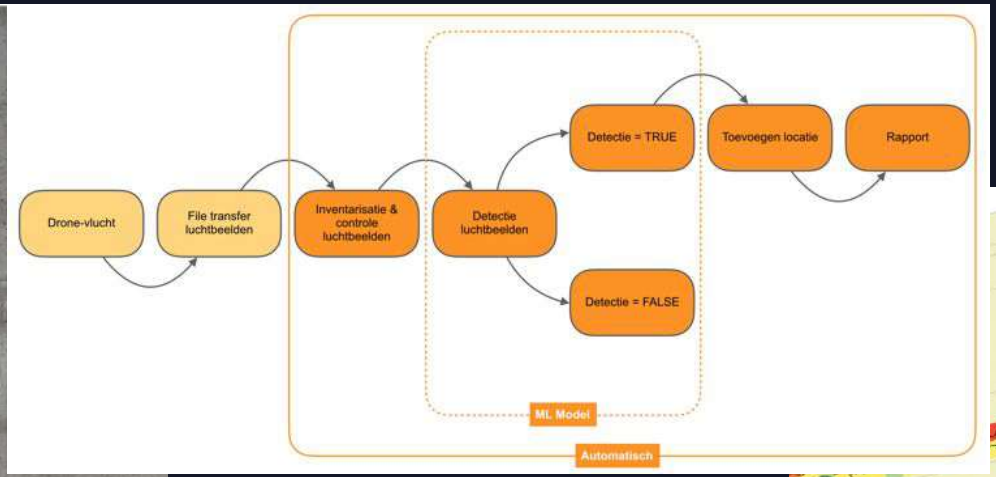
Drone Solutions

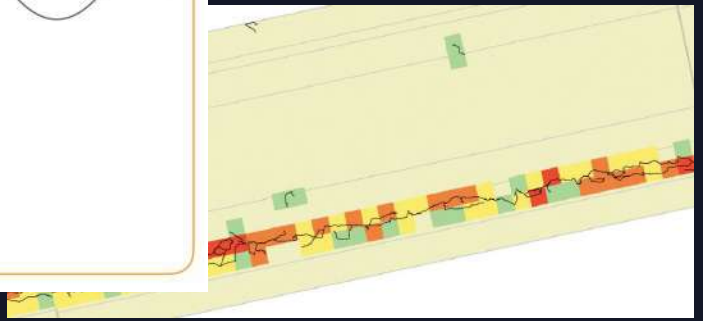
Artificial Intelligence for fast analysis

Images allow to identify patterns (cracks, colorization, gaps, filled areas,...)
Artificial Intelligence can detect patterns up to 30x faster at large surfaces.

The speed and accuracy of AI models on portable devices is on a roll this year.
Specific attention on smaller and local A.I. models.
This offers automated detection on site on a laptop or portable devices.







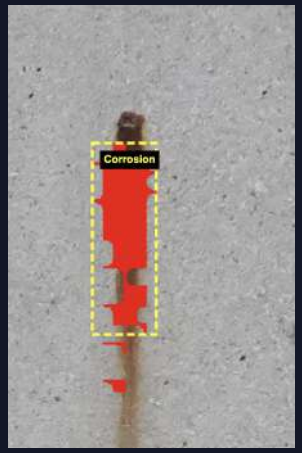
Drone Solutions

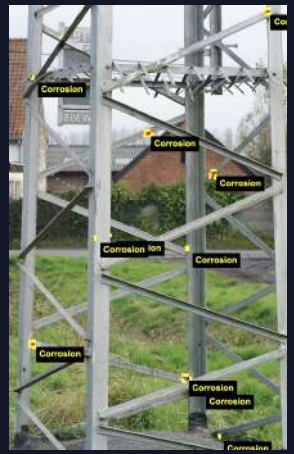
Artificial Intelligence

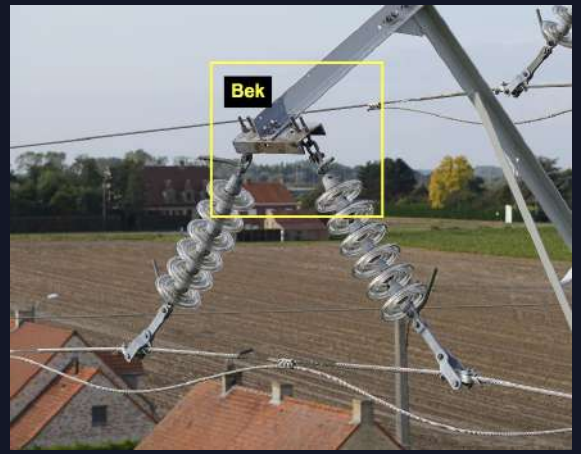
Citymesh Safety Drones has A.I. detection models for:

- Concrete cracks, corrosion, filled, decolorization
- Rust detection (on HV Pylons)
- HV Equipment (insulators, clamps, ...)

Our expert developers and data engineers can create a custom model with training data.







Drone Solutions

Using Drones for 3D modelling
3D Point cloud from images

An accurate 3D Point Cloud can be created while processing orthogonal images.

- ✅ Precision up to 20 mm
- ✅ Common use in BIM tools
- ✅ Excellent volume measurement
- ✅ Easy site & progress monitoring

- ⚠️ Processing time
- ⚠️ Visualisation <> weather conditions
- ⚠️ Artefacts near water surface
- ⚠️ Difficult detecting cracks

Drone Solutions

Using Drones for 3D modelling LiDAR technology

3. Use of LiDAR

Instead of creating 3D model from images, the use of laser equipment (LiDAR) on drones starts to become mature.

✅ Using a LiDAR has some advantages.

- Very fast “processing”
- BIM ready
- Reducing flight time
- “Through” vegetation

⚠️ Missing some vital visual information that imagery delivers.

Drone Solutions

Lidar technology for drones Evolution 2022 - 2024

2022: DJI M300 + L1

⚠️ Unstable 10-120mm accuracy with 300mm errors
⚠️ Missing spots (dark parts)
⚠️ Hard setting up GCP's *(Ground Control Points)*
⚠️ Difficulty on vertical surfaces (calibration)

✅ Fast flight & processing
✅ No artefacts near water surfaces

Orthophoto on same area was accurate up to 8mm.

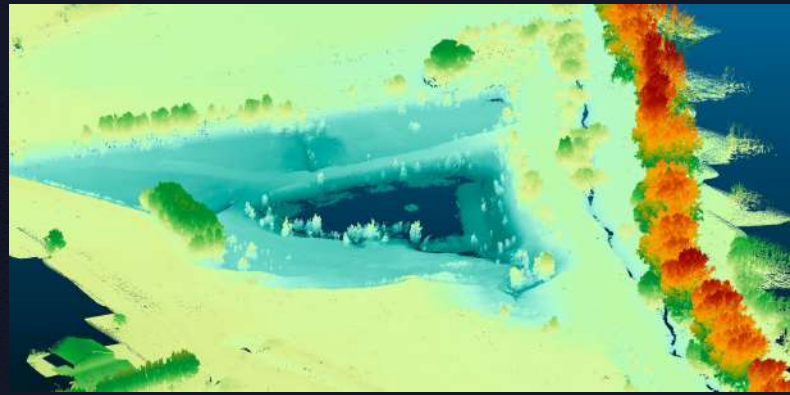
👎 3D point cloud from images was accurate up to 40mm *over full model*

Drone Solutions

Lidar technologie for drones Evolution 2022 - 2024

2024: DJI M300 + Yellowscan LiDAR

- ✅ 25mm fixed accuracy (horizontal/vertical)
- ✅ Fast flight & processing
- ✅ Easy crop vegetation
- ✅ Fast processing time
- ✅ No artefacts near water surfaces



- ⚠️ Still poor visualisation but…
- 👉 LiDAR can be equipped with high-end (double) camera

Drone Solutions

Lidar technologie for drones
Looking for a use case

Drone Solutions

What if...

We use a combination of low flight LiDAR + images.

✅ Decreasing processing time
✅ Increasing details in 3D point cloud
✅ Tag images to the 3D model for quality reporting

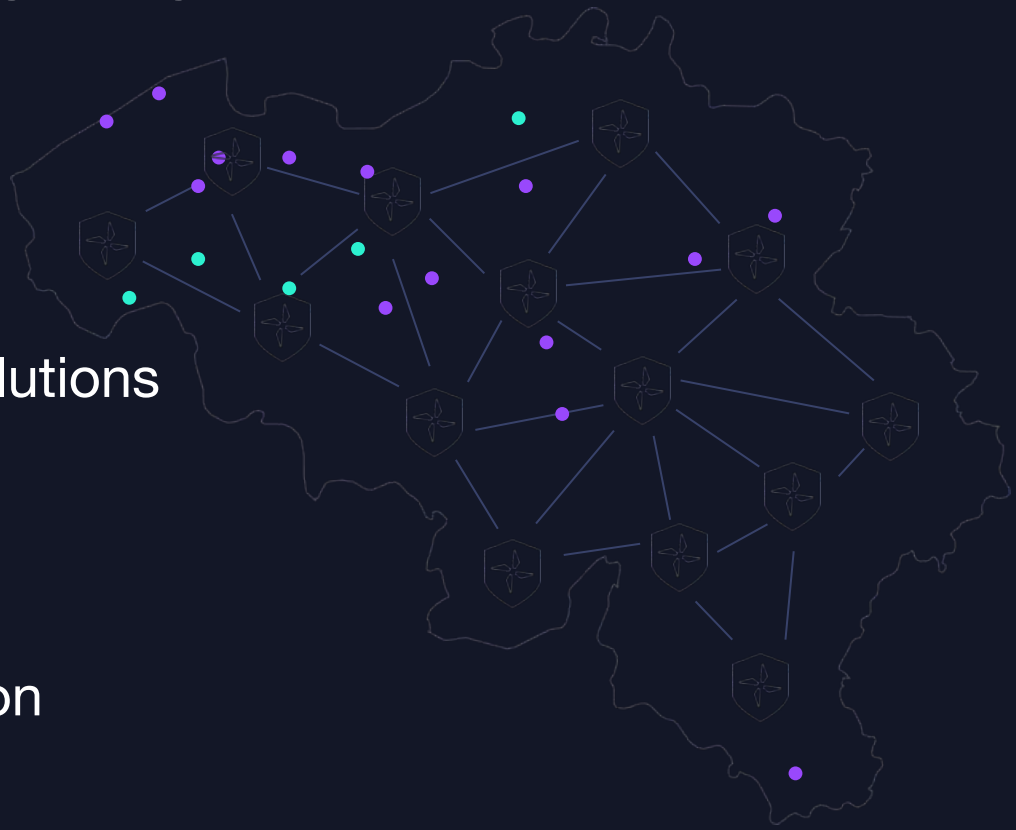
🔥 Can we discover cracks in 3D data? *Combination of laser + images*

We would like to test a lower flight with LiDAR and high definition camera.
Looking for a partner in the audience.

Future monitoring techniques

Safety Drone Network

The Shield Network



- **70** Drone in a box solutions
- **24/7**
- **40** Pilots
- In **5** Remote Operation Centers

Safety Drone

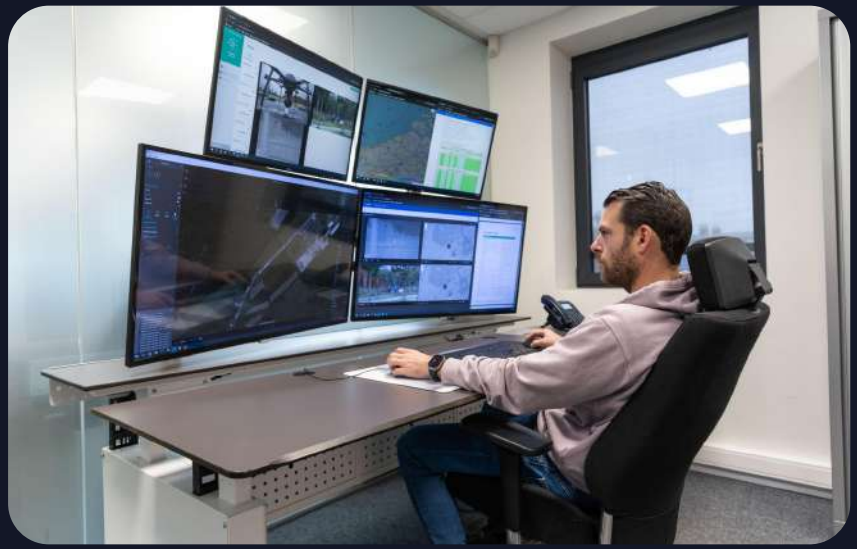
NOKIA Safety Drone Box

- Autonomous
- Equipped with HVAC - and charging system
- **CE-certified**
- Launch camera

Safety Drone

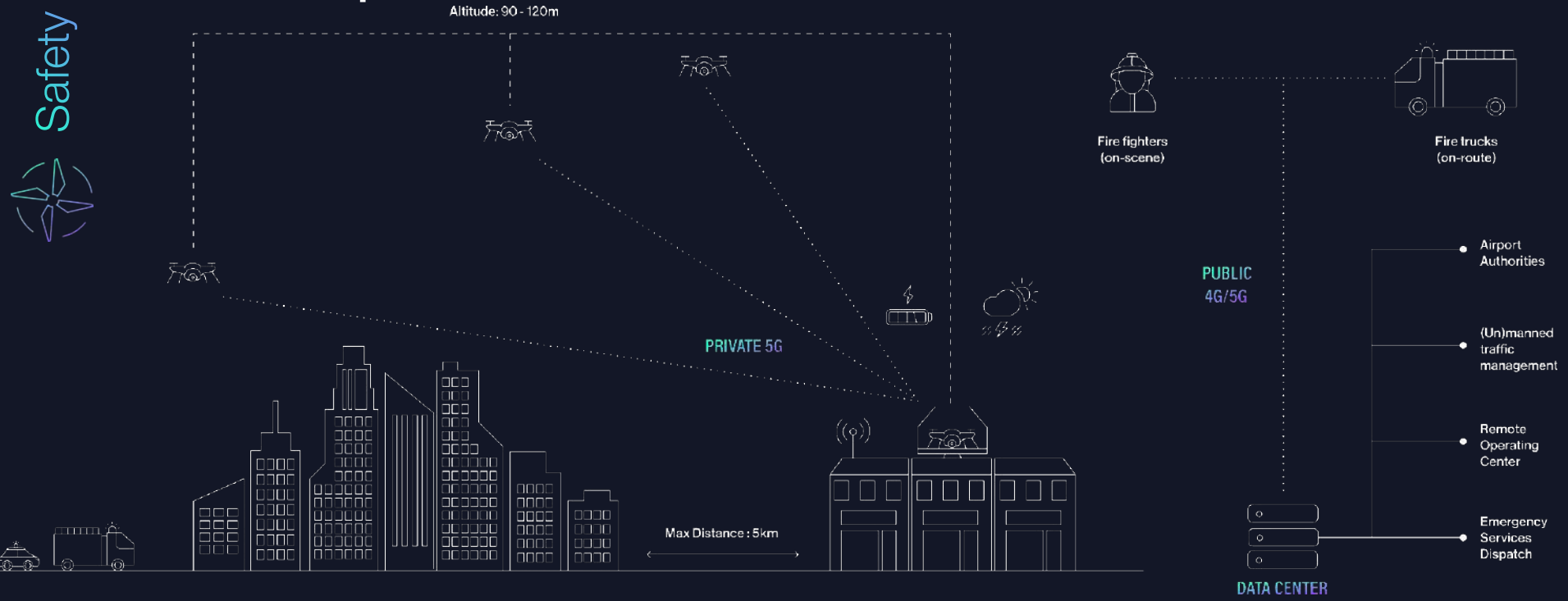
Remote Operation Center

- Remote pilot
- High security
- Full control & backup systems



Safety Drone

The Concept



Safety Drone

Solution for infrastructure monitoring

Drone in A Box can be equipped with high end LiDAR.

🤖 Daily automated flights, saving people and time

🚧 Continuous working - reduce down time on site

🔥 Fast 5G data delivery & processing

👍 Available for everyone 24/7

✅ Reducing costs per flight/inspection

Drone Solutions

Next steps

Call for use case

Technology is ready for a serious use case on different surfaces.

➔ **Test with orthophoto for**
- Site monitoring
- As-Build Reporting
- Crack detection

➔ **Test with images - A.I. for detection of cracks, patterns, …**

➔ **Test with LiDAR for**
- Site monitoring
- As-Build Reporting
- Crack detection

Thank You

CITYMESH

Kurt Pappaert
Operational Manager Drone Inspections

Mail me
kurt.pappaert@citymesh.com

Call me
+32 476 80 60 96

Stefaan Degryse
Sales Director Citymesh Drone Solutions

Mail me
stefaan.degryse@citymesh.com

Call me
+32 497 45 47 27