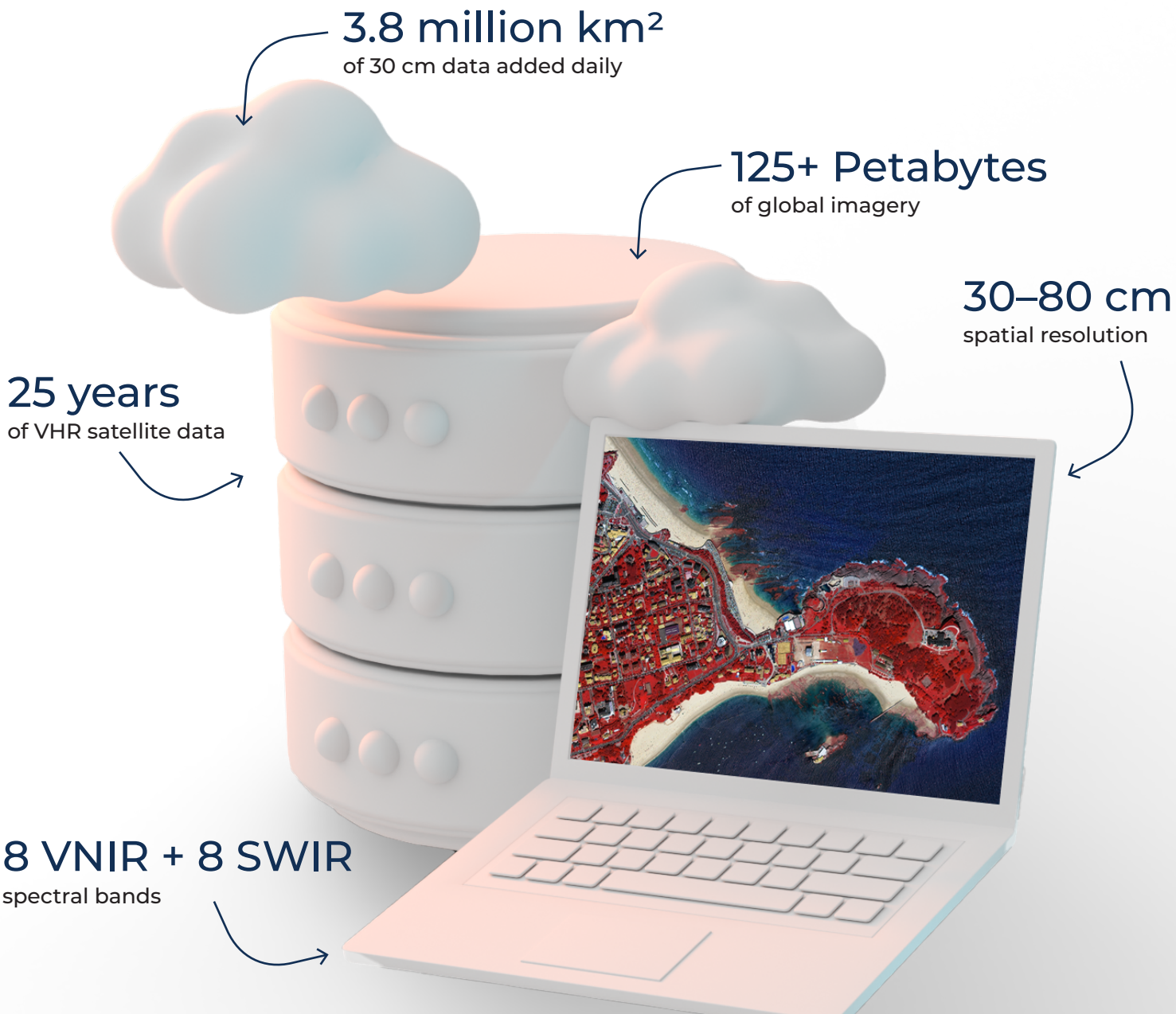
VHR SATELLITE ARCHIVE DATA FOR EUROPE'S GREEN AND DIGITAL TRANSITIONS

EUROPEAN SPACE IMAGING

CAN EUROPE'S FUTURE BE ACHIEVED WITHOUT LOOKING BACKWARD?

As the European Union doubles down on its sustainability agenda through flagship frameworks such as the European Green Deal, Horizon Europe, and the EU Biodiversity Strategy for 2030, the demand for detailed, long-term, and scalable Earth observation datasets is rapidly growing. While advanced tasking capabilities are necessary for ongoing mapping and research, a robust historical archive of Very High Resolution (VHR) satellite imagery is critical to accomplishing these objectives.

European Space Imaging (EUSI) offers access to a 25 year archive covering the globe several times with 30–80 cm multispectral data. This archive presents a unique asset for policymakers and researchers working to meet the EU's sustainability goals – supporting urban development, biodiversity protection, climate adaptation, and food security.



SUSTAINABLE URBAN DEVELOPMENT & DIGITAL TWINS

Cities lie at the heart of Europe's green transformation. By 2030, urban areas are projected to cover 7% of EU territory, up from 4.3% in 2006.[1] Digital twins and other virtual representations of cities are increasingly utilised in Horizon Europe-funded projects to simulate infrastructure changes, monitor environmental impacts, and plan resilient public services. To support such high-precision modelling, a digital twin dataset must meet **three critical criteria**:

1 READINESS

Timely access to up-to-date imagery is essential. Projects requiring fresh data collections often face delays due to tendering processes. A pre-curated dataset with recent acquisitions eliminates these bottlenecks and accelerates implementation.

2 ACQUISITION FREQUENCY

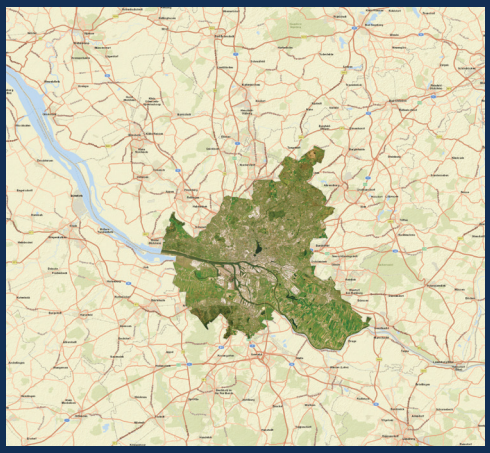
Urban landscapes are evolving rapidly. Updates every 2–3 years are insufficient to capture meaningful changes. For effective planning and monitoring, datasets must provide updates at least once or twice per year.

3 GEOSPATIAL FIDELITY

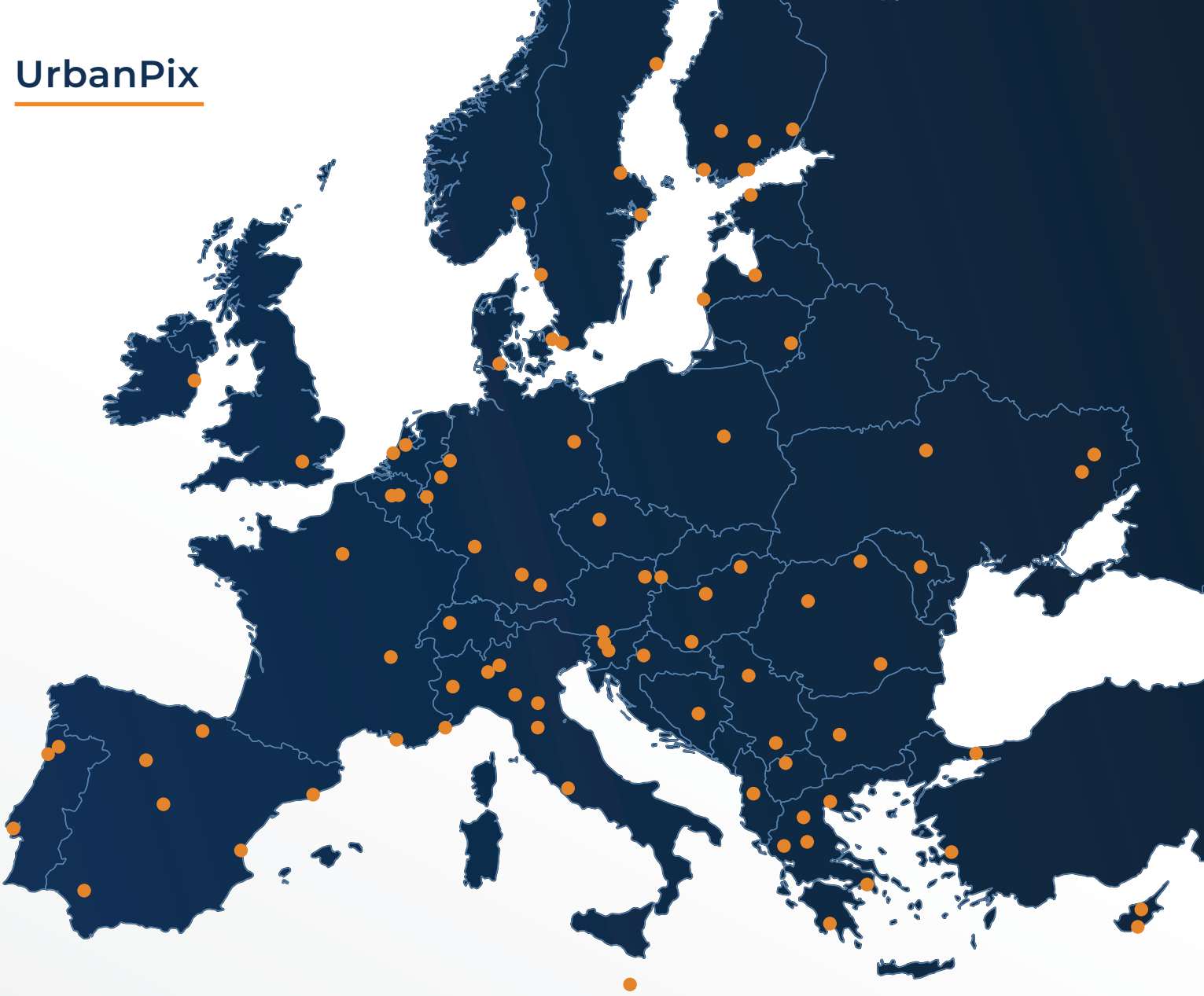
The utility of a digital twin hinges on the detail it can deliver. High-frequency data that lacks the resolution to distinguish road markings, pedestrian pathways, or minor infrastructure features limits operational relevance.

UrbanPix

UrbanPix is a curated dataset of key European metro areas collected at least once per year in triple stereo, facilitating off-the-shelf 30 cm 3D models and 15 cm HD mosaics. EUSI regularly collects over 100 key cities identified by the EU Commission and the German Aerospace Center (DLR) with the strictest parameters for high-quality digital twins. Combined with EUSI's general-purpose VHR archive covering nearly all European urban areas continually for over two decades, UrbanPix provides an unparalleled foundation for the development of virtual urban representations.



UrbanPix



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Leuven

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Sofia

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Cyprus
Limassol
Nicosia

Czech Republic
Prague

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Bucharest
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United Kingdom
London

CLASSIFYING AND IMPROVING URBAN POOR AREAS

CASE STUDY

Challenge: Mapping and Addressing Urban Poverty

Urban poor areas, known as “Arrival Cities,” often lack the infrastructure and services needed to support their rapid growth. These informal settlements, typically overlooked by traditional mapping, face a major challenge in receiving adequate policy attention due to the absence of reliable data. Understanding and addressing the needs of these areas requires a scalable, accurate way to identify and assess them.

Method: WorldView Satellite Imagery for Precise Classification

Researchers at the German Aerospace Center (DLR) used Very High Resolution (VHR) imagery provided by EUSI to analyse 44 global Arrival Cities – many located in Europe. The methodology involved:

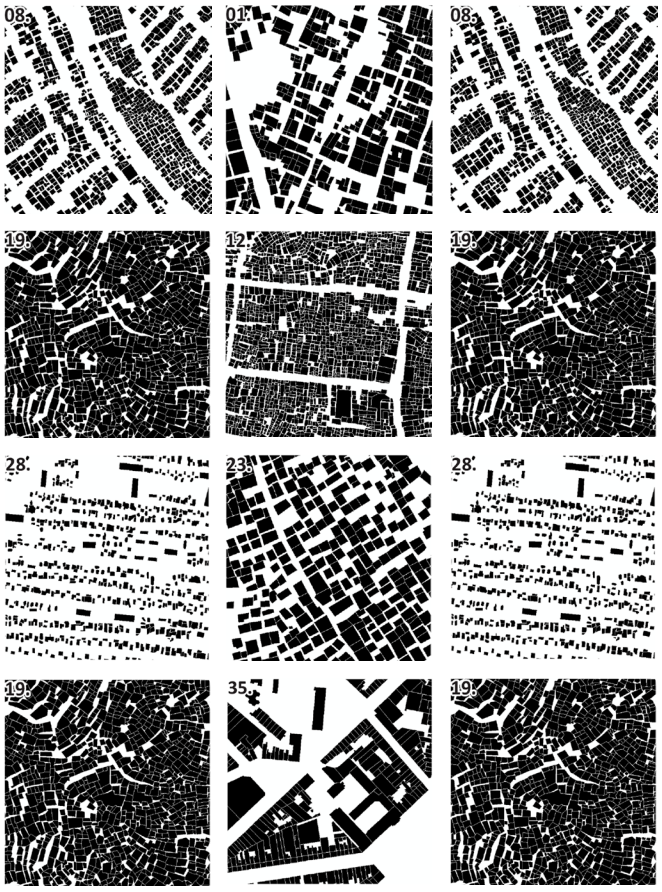
1. Data Collection: Using WorldView imagery to capture detailed 3D building models and settlement patterns.
2. Classification: Creating a Morphologic Settlement Type Index based on building density, size, height, and layout to identify and classify different types of informal urban areas.

Results: Informing Targeted Infrastructure and Services

By analysing the WorldView data, the study achieved:

- **Accurate Mapping:** Produced precise maps of urban poor areas, including those not officially recognised.
- **Tailored Interventions:** Highlighted variations in settlement types, enabling more effective, context-specific infrastructure and service planning.
- **Improved Resource Allocation:** Provided actionable insights to target resources and services to the most underserved areas.

This study demonstrates how VHR satellite imagery can transform the planning and delivery of infrastructure in urban poor neighbourhoods, ensuring interventions are data-driven and aligned with local needs.



Ground figure plans of the Arrival Cities

BIODIVERSITY MONITORING AND LAND USE CHANGE

Europe's biodiversity is under significant threat, with 19% of species at risk of extinction.[2] The European Commission has committed to the ambitious goal of legally protecting 30% of EU land and sea by 2030.[3] Achieving this goal demands frequent and detailed insights into land cover dynamics.

Sentinel-2 offers a foundational input, but integrating it with VHR imagery significantly enhances spatial resolution which is key to identifying landscape features.

The EUSI archive includes Red Edge and NIR bands compatible with Sentinel data, making it ideal for vegetation analysis and biodiversity assessments. Time-series analysis at sub-meter resolution allows for the validation of national habitat maps and supports initiatives led by DG RTD and ESA to monitor ecosystem health under the IPBES framework.

VHR imagery environmental monitoring applications include:

- Detection of illegal logging and land encroachment
- Mapping invasive species or habitat fragmentation
- Fine-scale vegetation index analysis in protected zones

ARCTIC AND BOREAL REGION MONITORING

The Arctic is warming nearly four times faster than the global average, driving profound environmental changes with global consequences[4] – from accelerating sea-level rise to disrupted weather patterns across Europe. The EPRS briefing on Arctic policy underscores the region's strategic importance for Europe, not only as a frontline of climate change but also as a key area of geopolitical interest.

Core to these efforts is the EU's investment in Earth Observation systems. While Copernicus provides a valuable foundation for polar monitoring, there is growing recognition of the need for high-resolution, historical data to track long-term changes with finer spatial and temporal granularity. This is particularly critical in fragile coastal areas, ice margins, and zones of infrastructure development.

EUSI's deep archive of Very High-Resolution (VHR) satellite imagery – dating back over two decades – offers unique value in this context. Through consistent monitoring of key polar locations, this archive supports detailed retrospective analyses of ice retreat, permafrost degradation, coastal erosion, habitat disruption, and human activity expansion. This dataset complements Sentinel and other data sources by filling critical resolution and temporal gaps.

In support of EU research and sustainability goals under frameworks like the Green Deal, Horizon Europe, and the EU Arctic Policy, this historical imagery enables:

- Multi-year baselines for detecting change in glaciers, sea ice edges, and built environments.
- Validation of predictive models tied to climate resilience and environmental impact assessments.
- Evidence gathering for EU diplomacy and compliance monitoring under Arctic environmental treaties.
- Monitoring of maritime activity along emerging shipping corridors, aligning with EU concerns over safety, pollution, and ecosystem impacts.

FOOD SECURITY APPLICATIONS IN AFRICA

VHR data is also vital to the EU's external sustainability commitments, including food security interventions in Africa. According to the FAO, approximately 282 million people in Africa experienced undernourishment in 2022. Early warning systems are critical for anticipating droughts, crop failures, and biological threats like desert locust swarms, which can consume up to 191 million kilograms of crops daily.

FIGHTING DESERT LOCUST SWARMS IN WEST AFRICA

CASE STUDY

Challenge

In early 2020, East Africa faced one of its largest desert locust invasions in recorded history, exacerbating pre-existing food insecurity across the region. Factors such as abnormal weather patterns, violent conflict, and inadequate resources for pest control created significant challenges for mitigation efforts. Locust swarms destroyed over 175,000 acres of farmland in Ethiopia and Somalia by late 2019, threatening food supplies for millions. The COVID-19 pandemic further complicated response efforts by causing supply chain disruptions and mobility restrictions.

Methods

Researchers used WorldView archive satellite imagery along with geospatial analytics to model locust vulnerability and optimise response strategies. Key datasets included:

- Soil condition and moisture data: Analysed historical soil moisture levels to pinpoint regions with ideal breeding conditions.
- VHR imagery derived Land Use / Land Cover (LULC) maps: Mapped agricultural zones at risk of locust damage.

These datasets were integrated into a socio-environmental vulnerability model, which accounted for environmental factors and socioeconomic conditions and enabled precise targeting of breeding hotspots for optimised pesticide application.

Results

The vulnerability model helped stakeholders prioritise interventions in high-risk areas, mitigating the impact on critical agricultural lands. By leveraging WorldView historical satellite data accessible through EUSI, researchers provided actionable intelligence that supported regional food security and minimised further damage during the crisis.[5]

TRAINING AI FOR SUSTAINABLE MONITORING

Advanced analytics and AI models depend on high-quality datasets for training and validation. The EUSI archive is accessed by startups and researchers alike, working on projects to support Horizon Europe's sustainability goals.

Why EUSI Archive Access is a Prime Resource for AI Model Training

Developing reliable and scalable geospatial AI models requires more than just large volumes of imagery – it demands quality, consistency and accessibility.

Exceptional resolution and clarity

With 15–50 cm resolution, the archive provides the level of detail needed for precise object detection, segmentation, and classification tasks – from urban feature extraction to individual plant analysis and coastal litter identification.

Cohesive and diverse dataset

Over 125 petabytes of global satellite imagery, harmonised with consistent metadata and spectral bands is ideal for machine learning models requiring uniform inputs across different regions and time periods.

Streamlined big data ingestion

API-based access supports efficient querying, filtering, and bulk downloads, enabling seamless integration into AI development pipelines without manual overhead or data fragmentation.

ARBOAIR ADVANCING FOREST MANAGEMENT WITH SYNTHETIC DATA AND UNREAL ENGINE

CASE STUDY

In a pioneering collaboration, European Space Imaging (EUSI) and Swedish forestry tech firm Arboair have transformed forest analysis by integrating Very High-Resolution (VHR) satellite imagery to addresses the limitations of traditional data collection methods, enabling scalable, cost-effective, and precise forest management and urban biodiversity solutions.

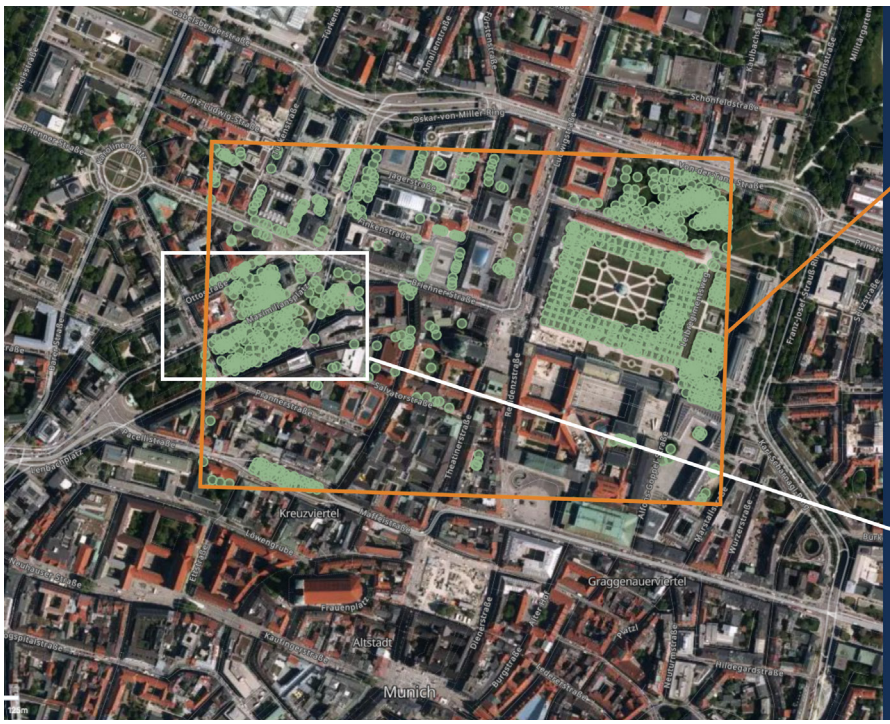
Challenge

Traditional forest monitoring methods, such as drone surveys, are often constrained by limited coverage areas, seasonal accessibility, and high operational costs. This led Arboair to choose VHR satellite imagery as the best dataset to scale their forest and urban tree analysis. However, as many researchers and startups have experienced, training their AI models would require large amounts of satellite imagery.

Solution

Arboair developed an innovative approach to this problem that relies on a smaller sample of EUSI archive data to create their own synthetic training data. Instead of using a massive amount of satellite data for training, they used the Unreal game engine to create training data for the AI algorithm. This workflow has unlocked a wide range of possibilities in image detection, including:

- **Unlimited Variation** – allows the generation of large, diverse datasets to train robust and resilient models
- **Detection Training on Rare Classes** – enabling identification of uncommon features that would be impractical without synthetic data
- **Cost-Effective Scaling** – reducing expenses by avoiding costly fieldwork and repeated data acquisition
- **Flexibility and Customisation** – providing the ability to tailor environments, conditions, and parameters to match evolving project needs



Number of trees	990
Trees per hectar	21
Crown cover	1367.43
Median height	17
Median crown diameter	8.4
Deciduous (percentage)	100

KPI (3-30-300)	
3 trees visual per building	No
30% crown coverage	Almost (29.1%)
300 m to green area	Yes

SPECIFICATIONS AND DATA ACCESSIBILITY

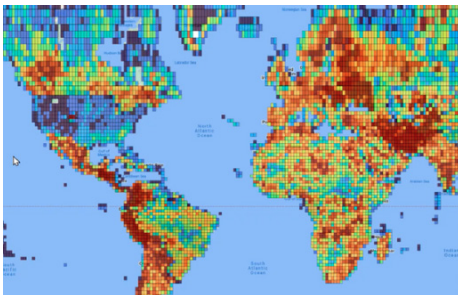
EUSI provides European institutions and commercial users with access to the world's most robust VHR satellite imagery archive, ranging from the IKONOS satellite, launched in 1999, to the newest WorldView Legion satellites.

THE DATA

- 30–80 cm native GSD with up to 15 cm HD processing
- 8 spectral bands, including Red Edge compatibility with Sentinel-2
- 8 SWIR bands
- < 5 m CE90 accuracy

THE ARCHIVE

- Over 125 Petabytes of VHR imagery
- Dating back to 1999
- 74 million km^2 collected over Europe in 2024
- 3.8 million km^2 of 30 cm imagery collected daily with World-View and WorldView Legion



THE ACCESS

- Single source to data access for European institutional users
- Easy search and ordering through ATOM platform
- Robust API for seamless integration into existing systems and workflows
- Custom ordering and delivery pipelines

Sources

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EUSI

EUROPEAN SPACE IMAGING

DYNAMIC TASKING. RAPID RESPONSE. MISSION READY.

YOUR MISSION, OUR SOLUTION

European Space Imaging (EUSI) delivers unparalleled Very High Resolution (VHR) satellite tasking solutions, tailored to the critical needs of European authorities, member states, and crisis response agencies. Leveraging direct tasking capabilities and a locally integrated ground station, EUSI ensures rapid response and real-time mission support. With access to the world's most advanced optical, SAR, and hyperspectral satellite constellations, we provide decision-makers with actionable intelligence with the highest precision, speed and reliability.

Scan the QR code to access our website and additional materials

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