Nara Space Satellite Imagery Analytics Solution

Natural Disaster Management Solution

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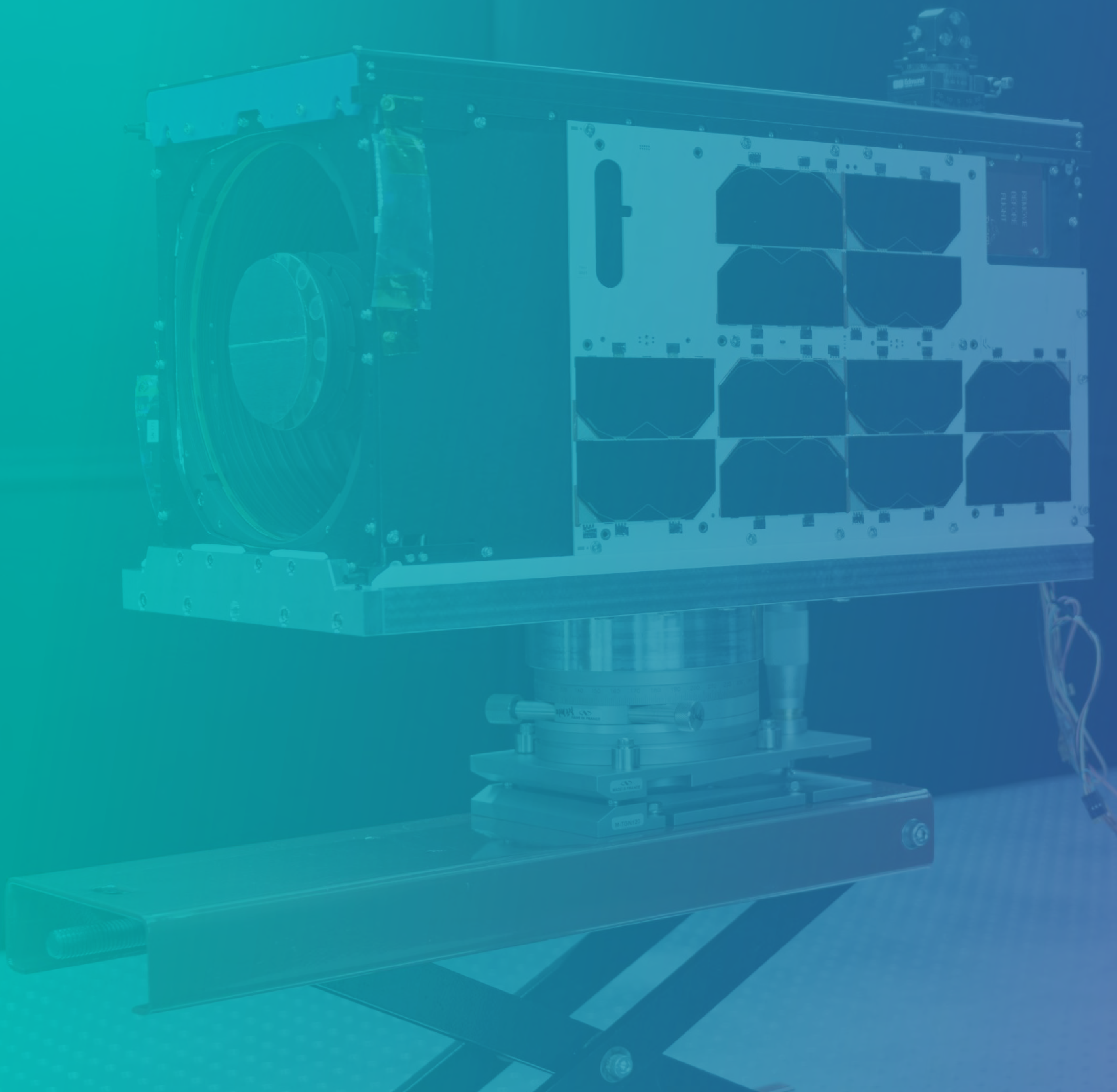


01

Satellite Imagery Analytics Solution

Satellite Imagery Analytics Introduction

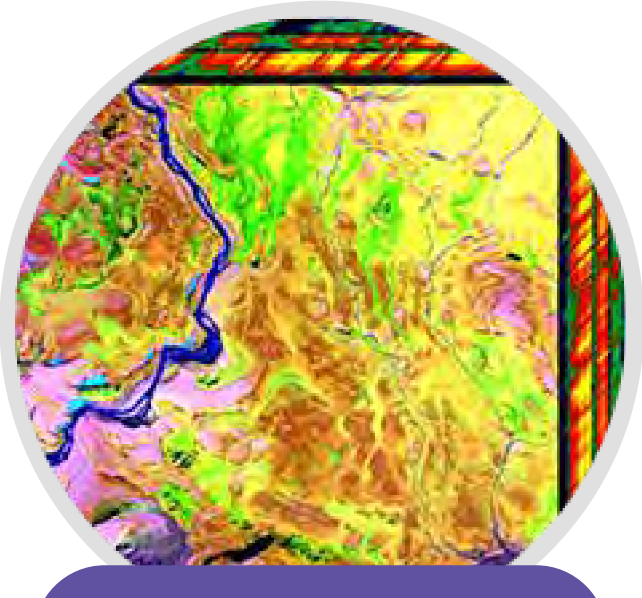
Key Industry Applications

Service Delivery Options

Nara Space Satellite Imagery Analytics Solution

Nara Space collaborates with global data partners and leverages multi-sensor data fusion technologies to deliver highly accurate analytics results

Multispectral



Hyperspectral

SAR

MULTI-SENSOR DATA FUSION

Key Industry Applications

Natural Disaster

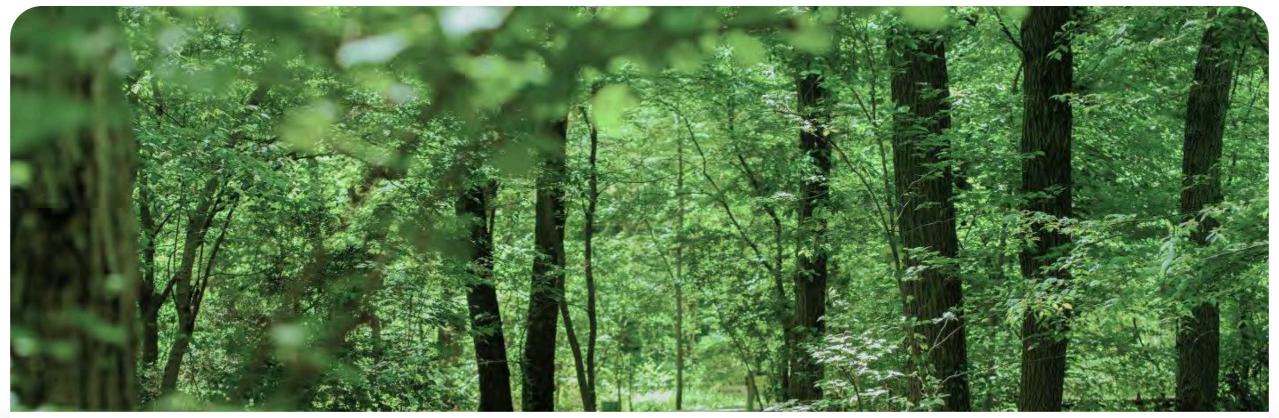
Wild Fire Detection
Flood Detection
Landslide / Earthquake / Ground Subsidence

Finance

Construction Monitoring
Economic Intelligence

Agriculture

Yield Prediction
Corn
Soybean
Wheat

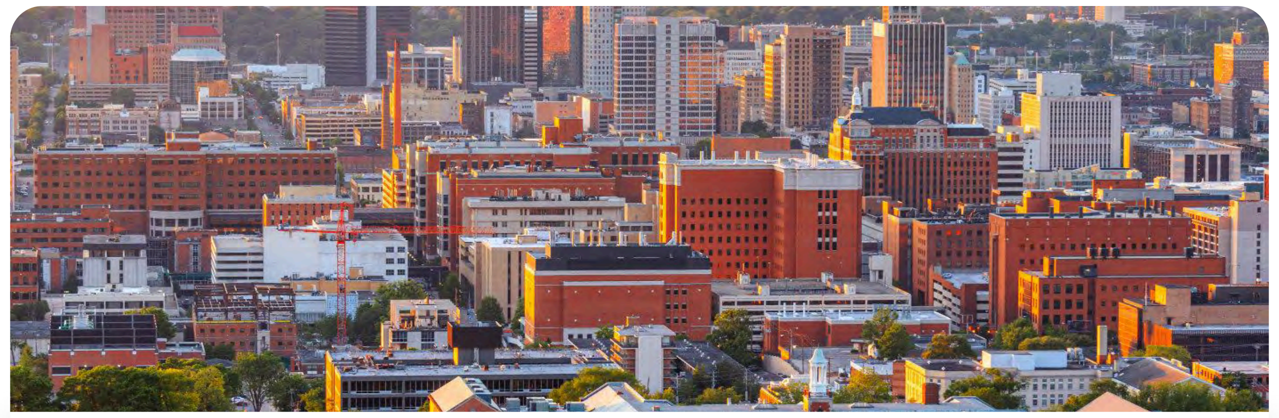


Environment

Tree Detection
Land Classification
Water Quality Assessment

Defense

Super-Resolution Imaging
Object Detection
Object Segmentation
Change Detection



Urban

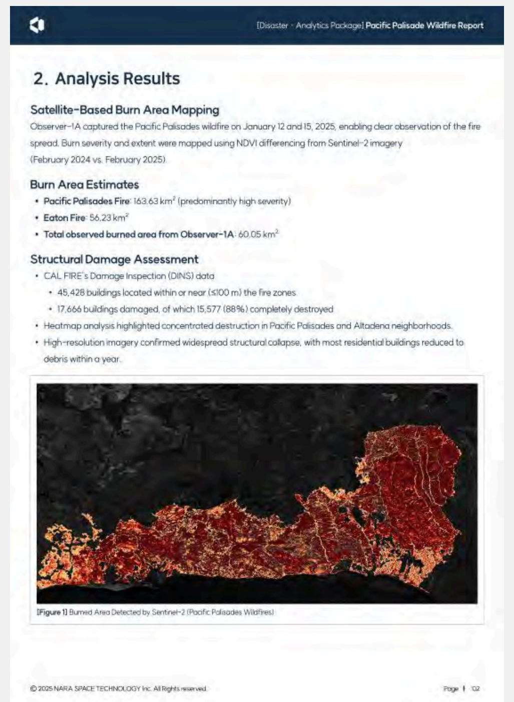
Urban Management
Smart City Strategy Development
Land Use & Construction Monitoring

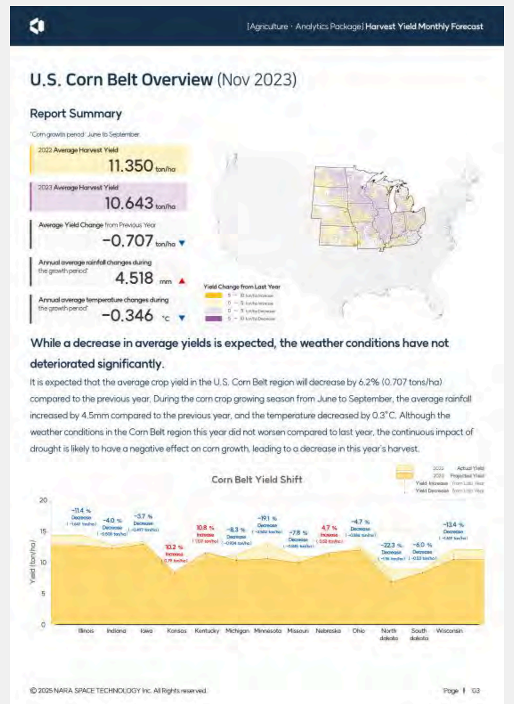
Service Delivery Options

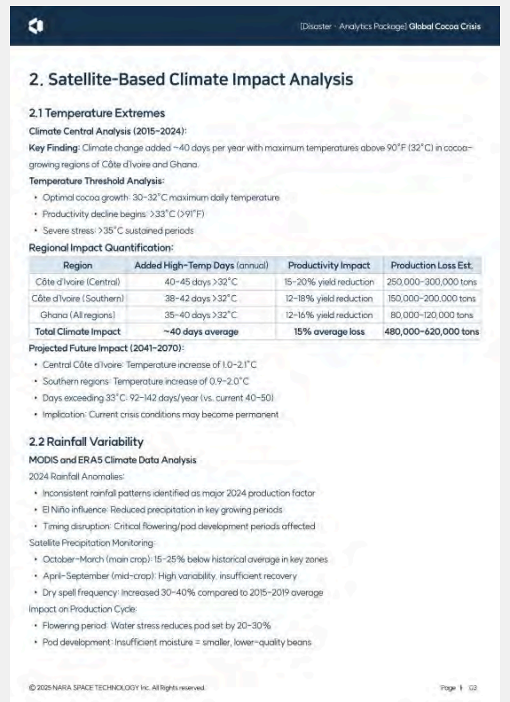
On-Demand Insight Reports

Get concise, decision-ready summaries without handling satellite data

Examples

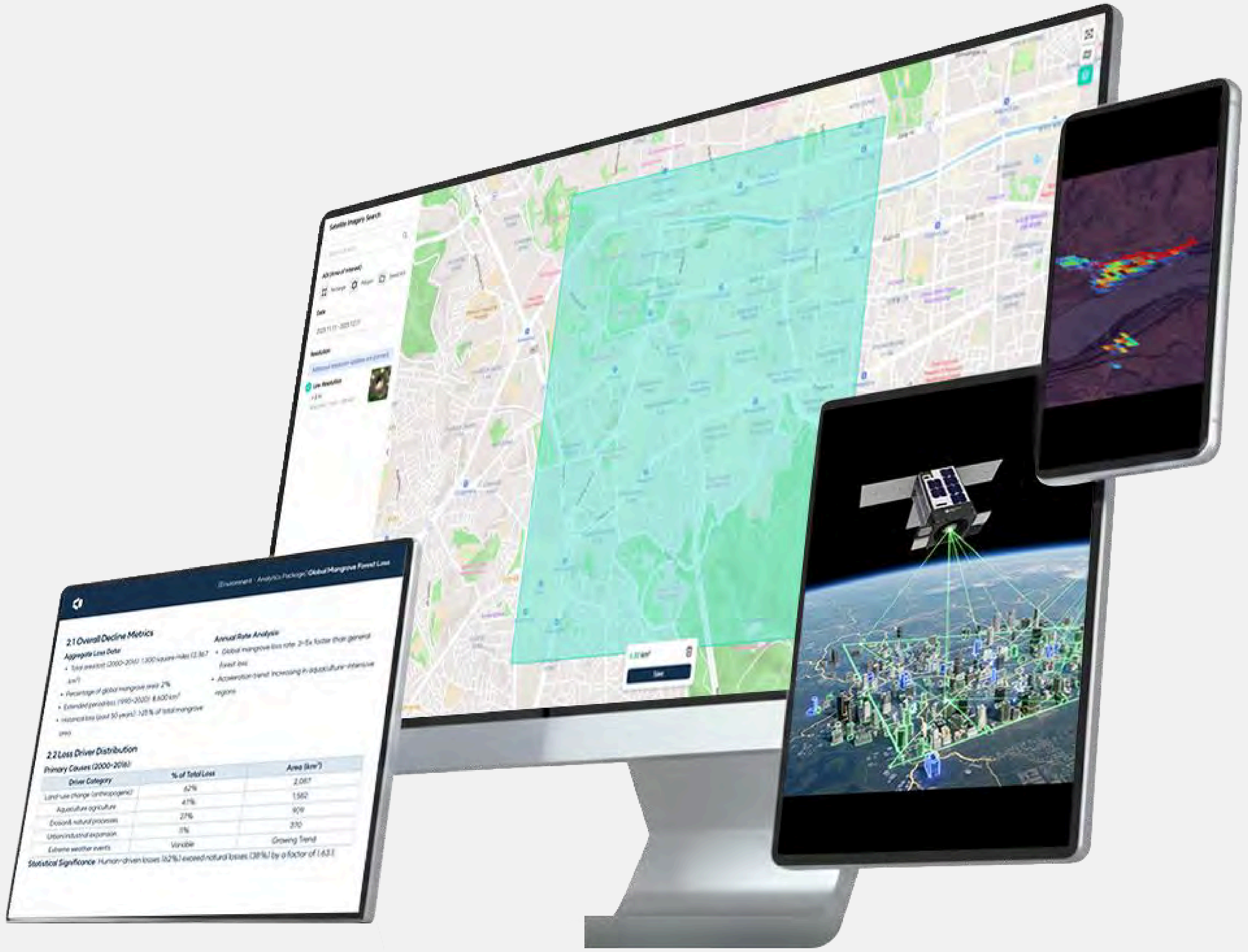






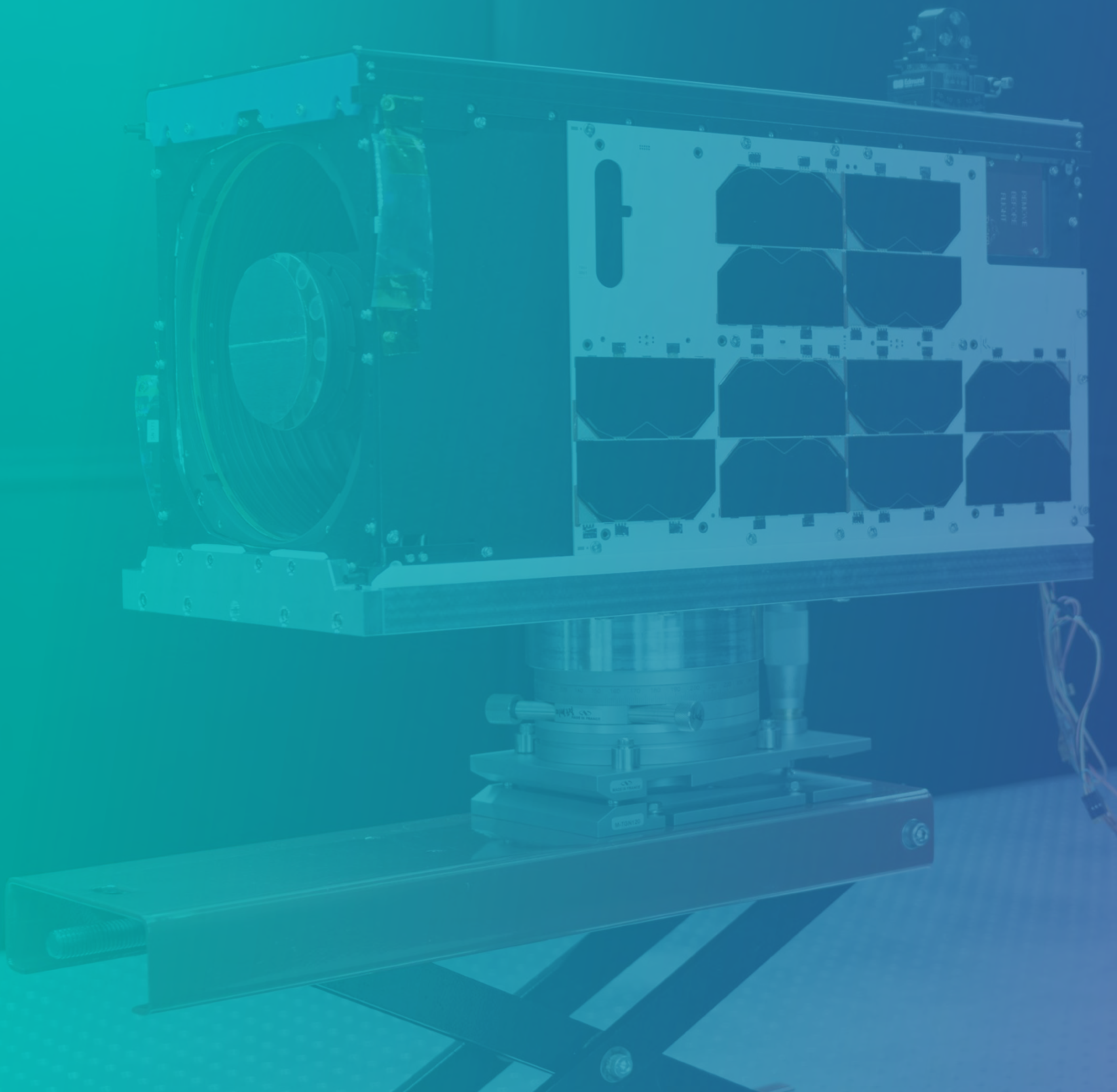
Custom Web Platform

A dedicated platform tailored for your organization



For APIs, additional analysis requests, or detailed customization, please contact us separately

NARA SPACE



02

Natural Disaster Management Solution

Disaster Analytics Coverage

- Wildfire
- Flood
- Landslide / Earthquake / Ground Subsidence

Why Disaster Management Needs Satellite Data

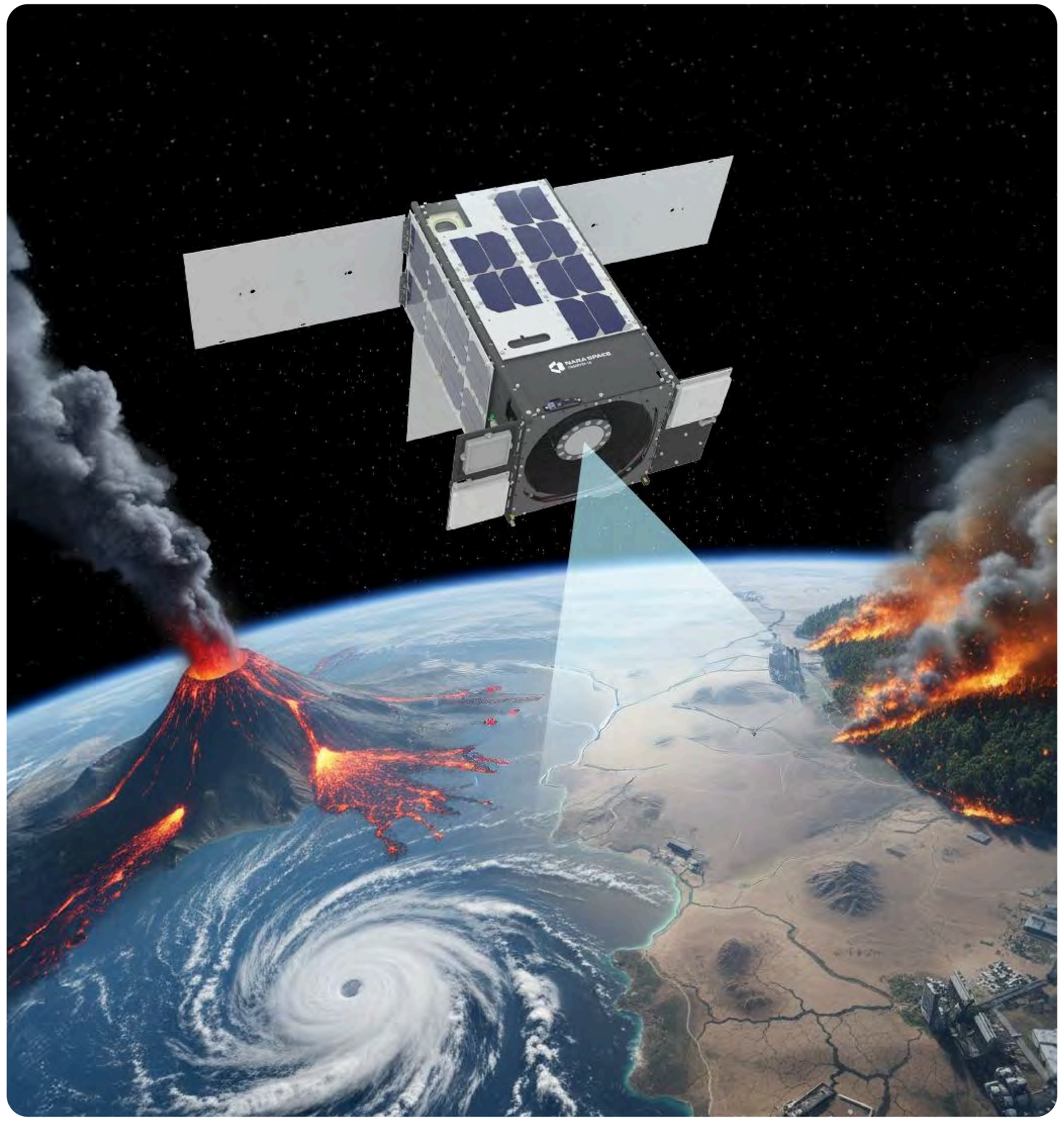
Challenges in Disaster Management

What Satellite Data Provides

Challenges in Disaster Management	What Satellite Data Provides	
Ground surveys are slow, dangerous, and costly	**Rapid Damage Assessment**	Detect floods, wildfires, landslides within hours
Damage reports are often inaccurate or delayed	**Wide-Area Coverage**	Monitoring affercted regions is too dangerous or inaccessible for ground teams
Governments and insurers lack objective, wide-area data	**Objective & Transparent Data**	Independent verification for governments, NGOs and insurers
Difficult to assess economic impact quickly for compensation or recovery	**Historical Comparisons**	Pre-/post-event analysis to measure true impact

Why Disaster Management Needs Satellite Data

Key Applications	Value for Disaster Stakeholders
Governments Disaster response, infrastructure recovery planning, population impact analysis	Save lives with faster situational awareness
Parametric Insurance Trigger payouts automatically using measurable satellite indicators (flood extent, burned area, etc.)	Save money by reducing fraud and speeding up insurance claims
Humanitarian Relief Prioritize aid allocation based on satellite-derived damage maps	Build resilience through long-term risk mapping and early warning systems

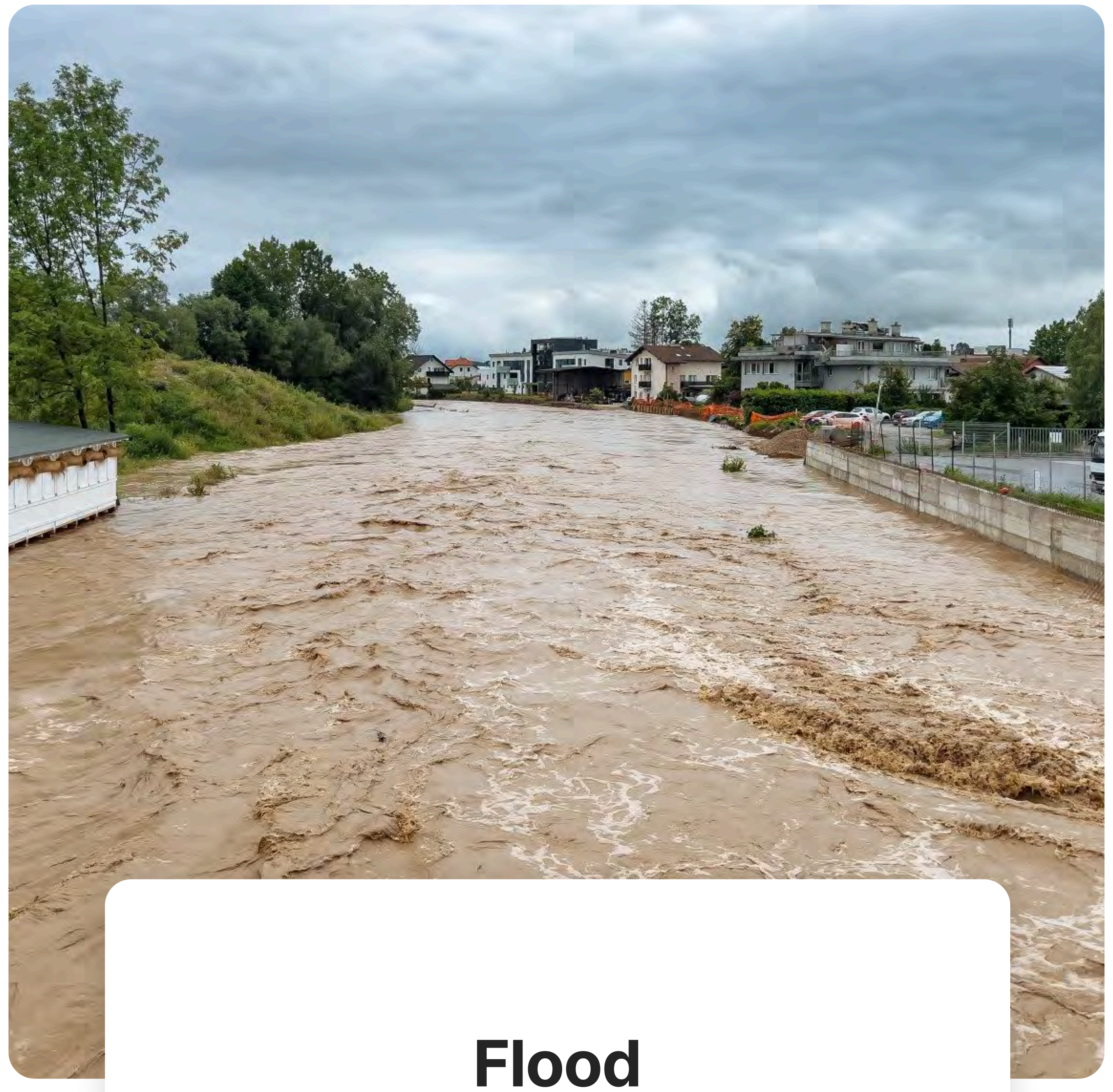


Disaster Analytics Coverage

We provide customized Analytics solutions for each disaster type

Wildfire

Identify the current situation at
a glance by detecting
and grading the damaged area.



Flood

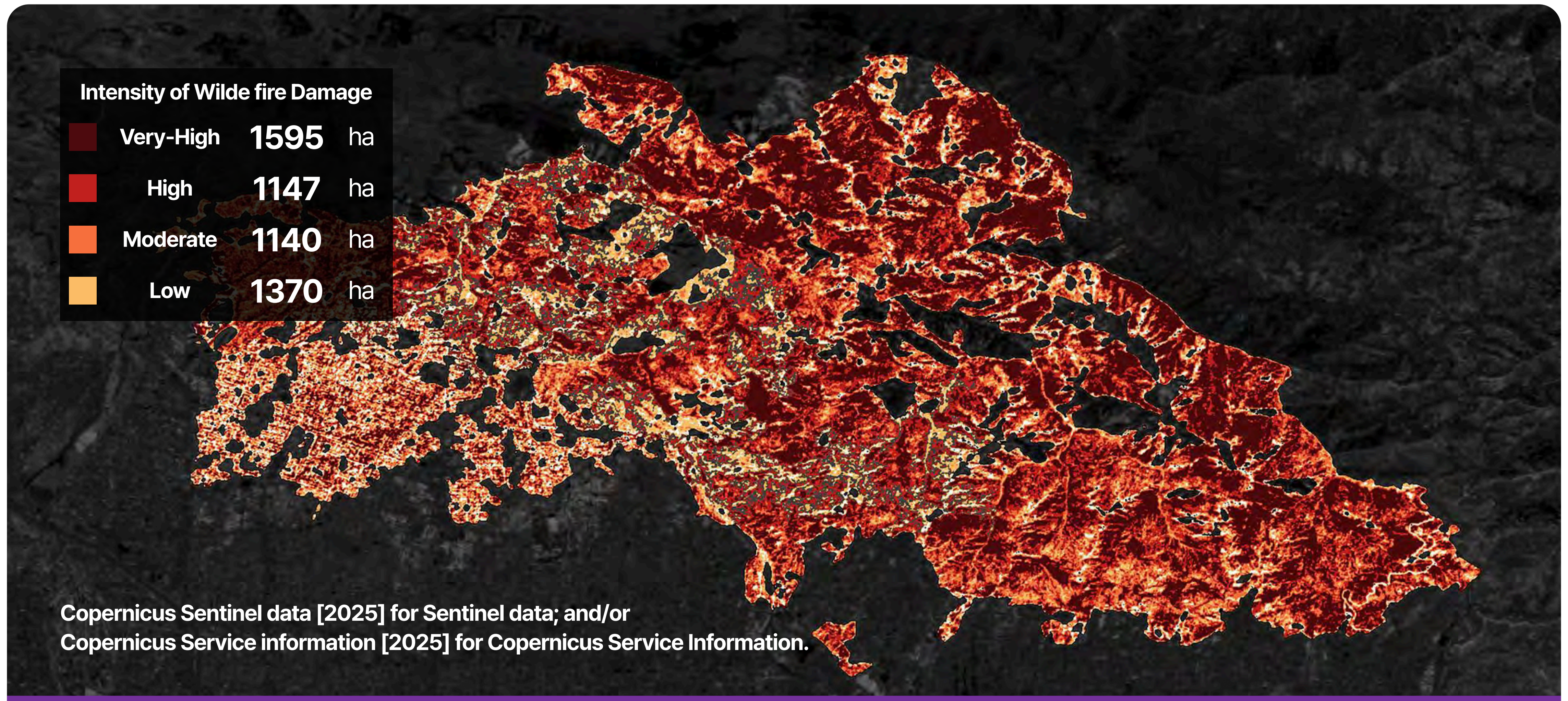
Clearly distinguish flooded
areas that are difficult
to find with optical satellites.

Landslide / Earthquake / Ground Subsidence

We provide high accuracy
with over 1,000 actual
landslide data records.

Wildfire : AI Deep Learning-Based Wildfire Damaged Assessment

2025 Eaton Fire Burned Area



IoU accuracy **0.82**

Technical Specifications

Recommended Resolution	3 m - 10 m
Input Data	RGBN bands Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Accurate detection regardless of the environment

An AI model that maintains high accuracy even under diverse terrain and weather conditions.

2 Reliable Quantified Results

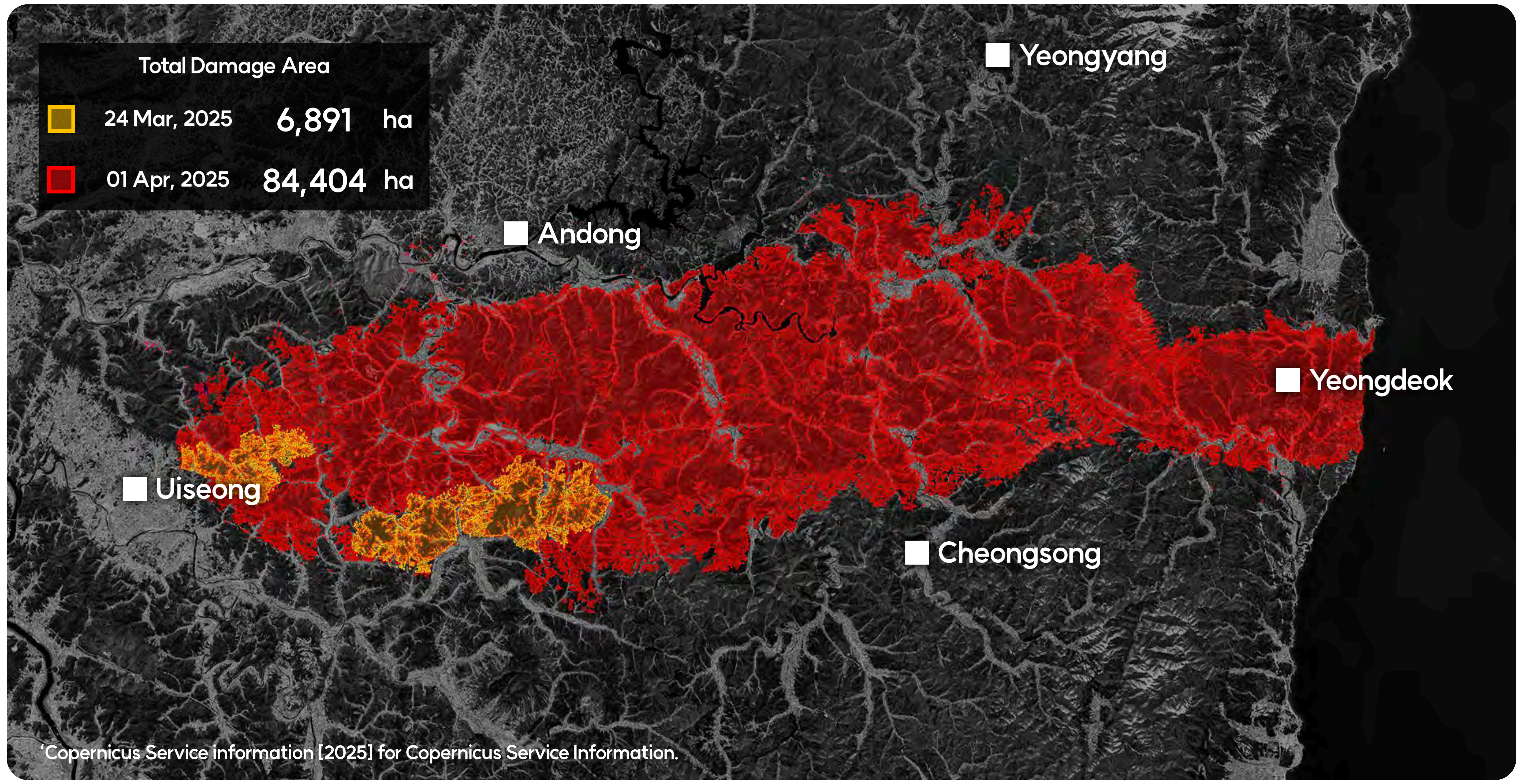
- Providing a Probability Map alongside the detection results allows for confirmation of the certainty of the results as a numerical value from 0 to 100%.
- Offers confidence information necessary for decision-making.

3 Automatic Assessment of Damage Severity

Assesses damage severity alongside area detection, supporting the prioritization of recovery efforts.

Wildfire : Spectral Index-Based Detection of Wildfire Damaged Area

2025 Burned Area Expansion from Uiseong to Yeongdeok



Technical Specifications

Available Resolution	Irrelevant
Input Data	Red&NIR bands or NIR&SWIR bands Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Detection of Damage Invisible to the Naked Eye

Precisely detects subtle damages which cannot be reliably identified by the human eye, using spectral index analytics.

2 Scientifically Backed Assessment of Current Conditions

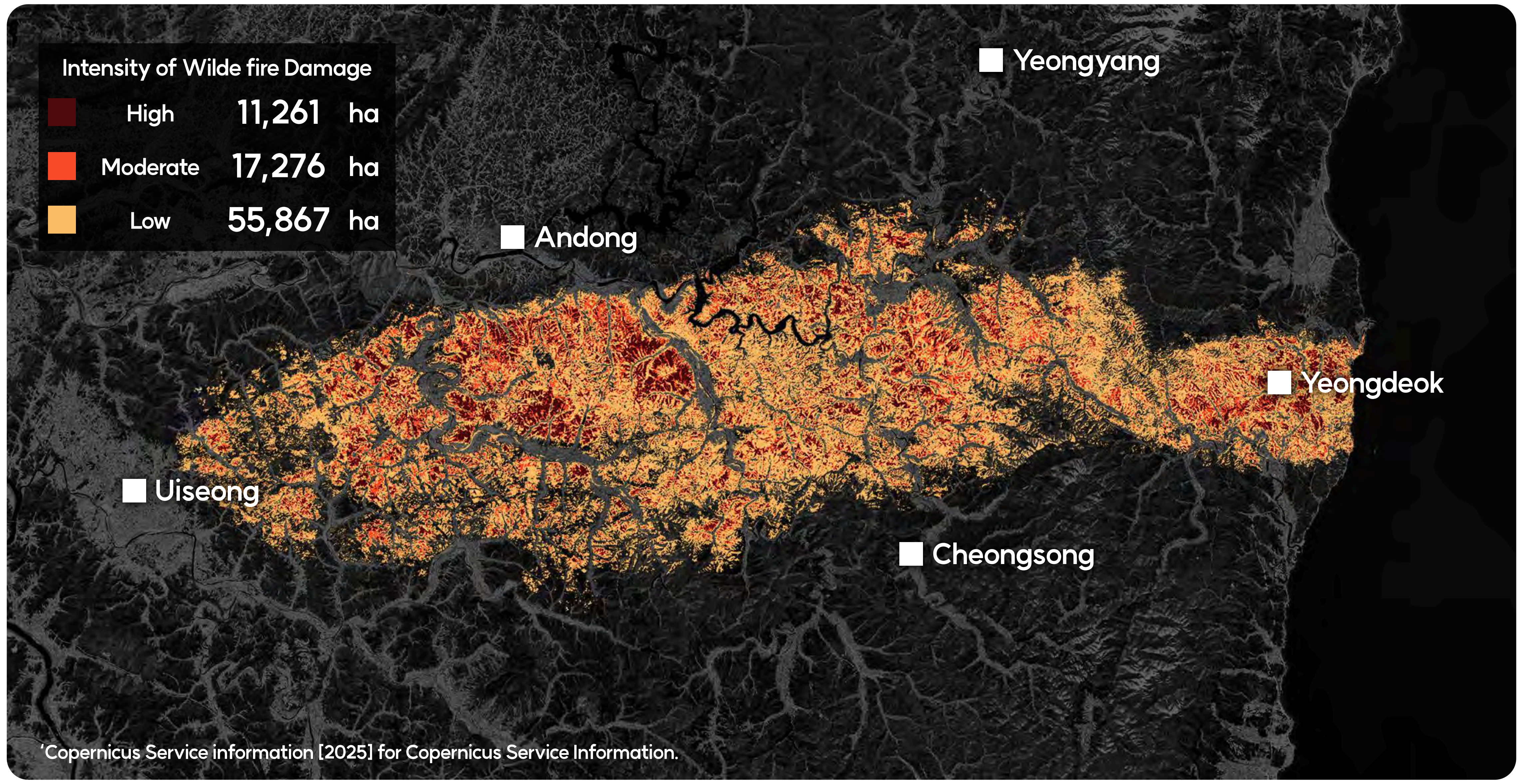
Uses objective data analytics to clearly define the scope and severity of the damage.

3 Flexible Map Resolution Support

Choose the resolution that fits your needs- from wide-area maps for emergency response to high-resolution maps for detailed recovery planning.

Wildfire : Wildfire Damage Levels Classification

2025 Burned Area by Wildfire Severity from Uiseong to Yeongdeok



Technical Specifications

Available Resolution	Irrelevant
Input Data	Red&NIR bands or NIR&SWIR bands Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG) and Vector (GeoJson) separated by Low-Medium-High Severity

Key Advantages

1 Three-Stage Damage Severity Classification

Divides the affected area into three categories: High, Medium, and Low.

2 Color-Coded Damage Map by Severity

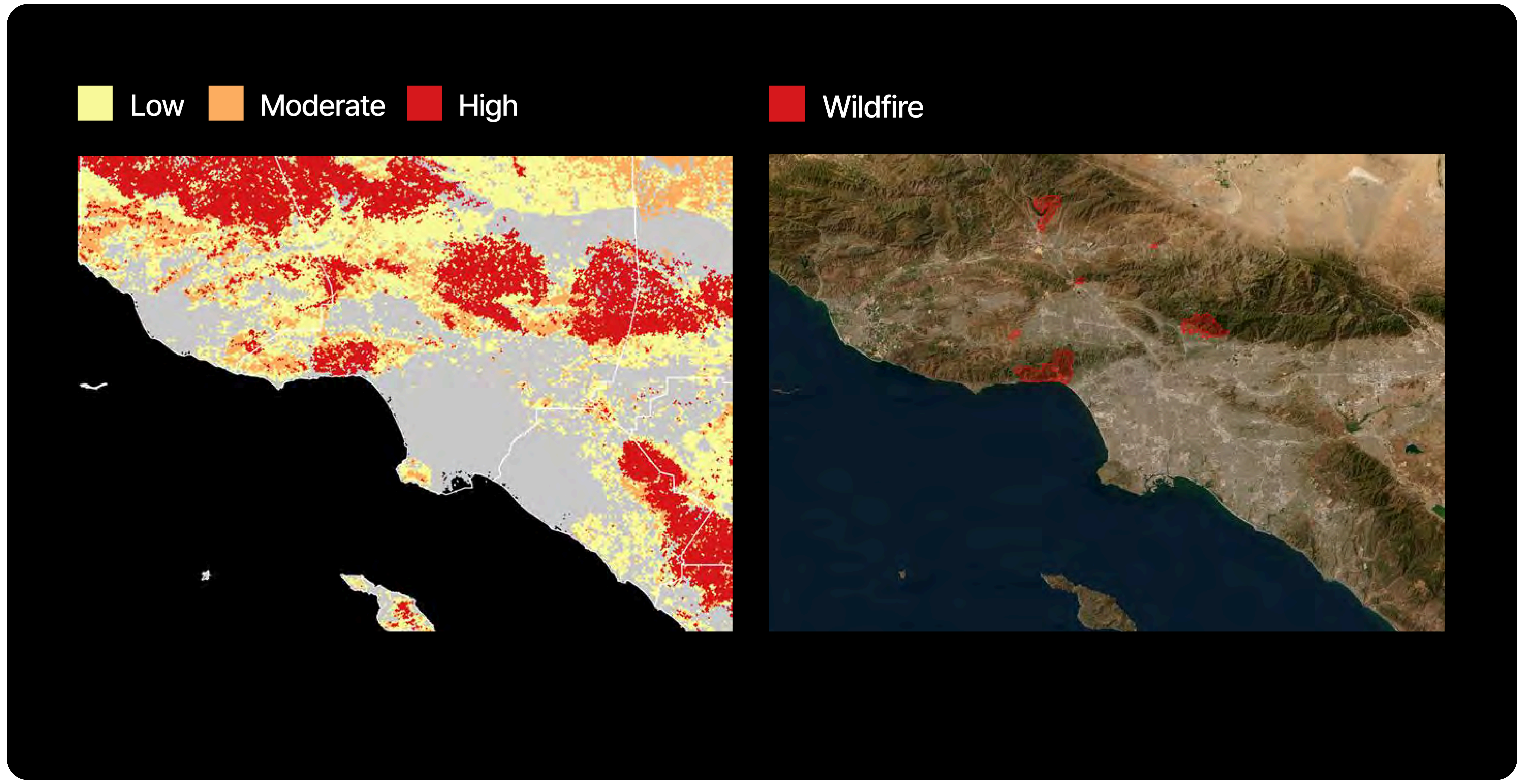
Color-coded maps help users visualize each severity level, allowing them to understand impact at a glance.

3 Customizable Map Resolution by Use Case

Choose the most suitable map resolution for your use case, from high-resolution maps for detailed recovery planning to wide-area maps for emergency response.

Wildfire : Risk Mapping

2023 Southern California Wildfire



Technical Specifications

Recommended Resolution	3 m - 10 m
Input Data	PlanetScope, Sentinel-2, Landsat-8, DEM, Wind velocity, VPD, Relative humidity and so on, Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Pinpointing high-risk areas

Analyze environmental data and satellite imagery to accurately map the extent of vulnerable regions.

2 Anticipating wildfire risk

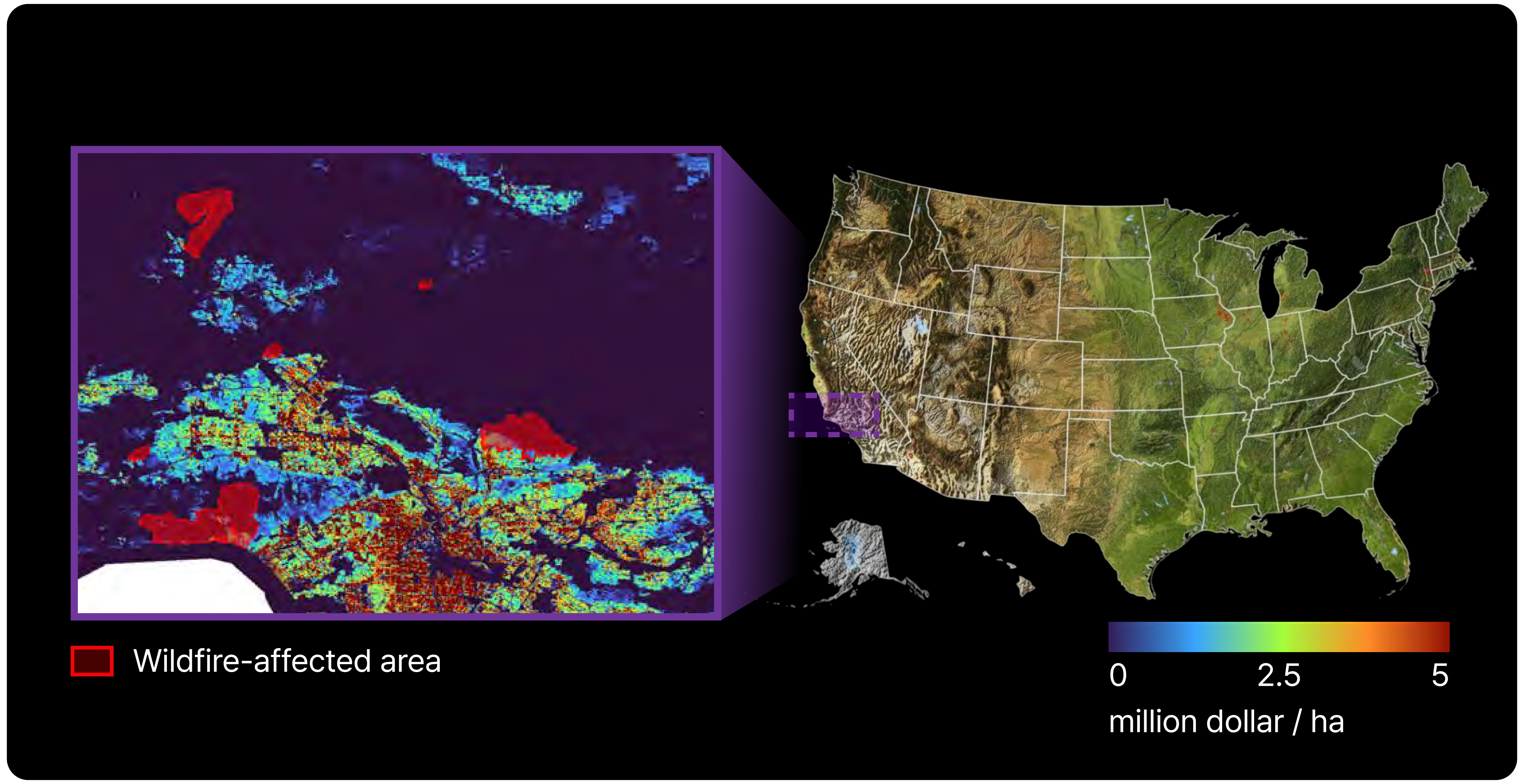
Leverage meteorological and climatological data to estimate spatial risk levels in advance of wildfire event.

3 Intuitive, color-coded risk visualization

Color-coded risk levels and clearly highlighted risk zones allow even non-experts to instantly understand both the severity and spatial extent of risk.

Wildfire : Damage Cost Estimation

2025 Southern California Wildfire



Technical Specifications

Available Resolution	100 m
Input Data	Sentinel-2, Landsat-8, Population data, GDP, etc., Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Development of a map that quantifies disaster damage in monetary terms

Database expected damage costs in the event of a disaster, presenting differentiated damage costs based on the type of disaster.

2 Allows rapid estimation of damage cost upon disaster occurrence

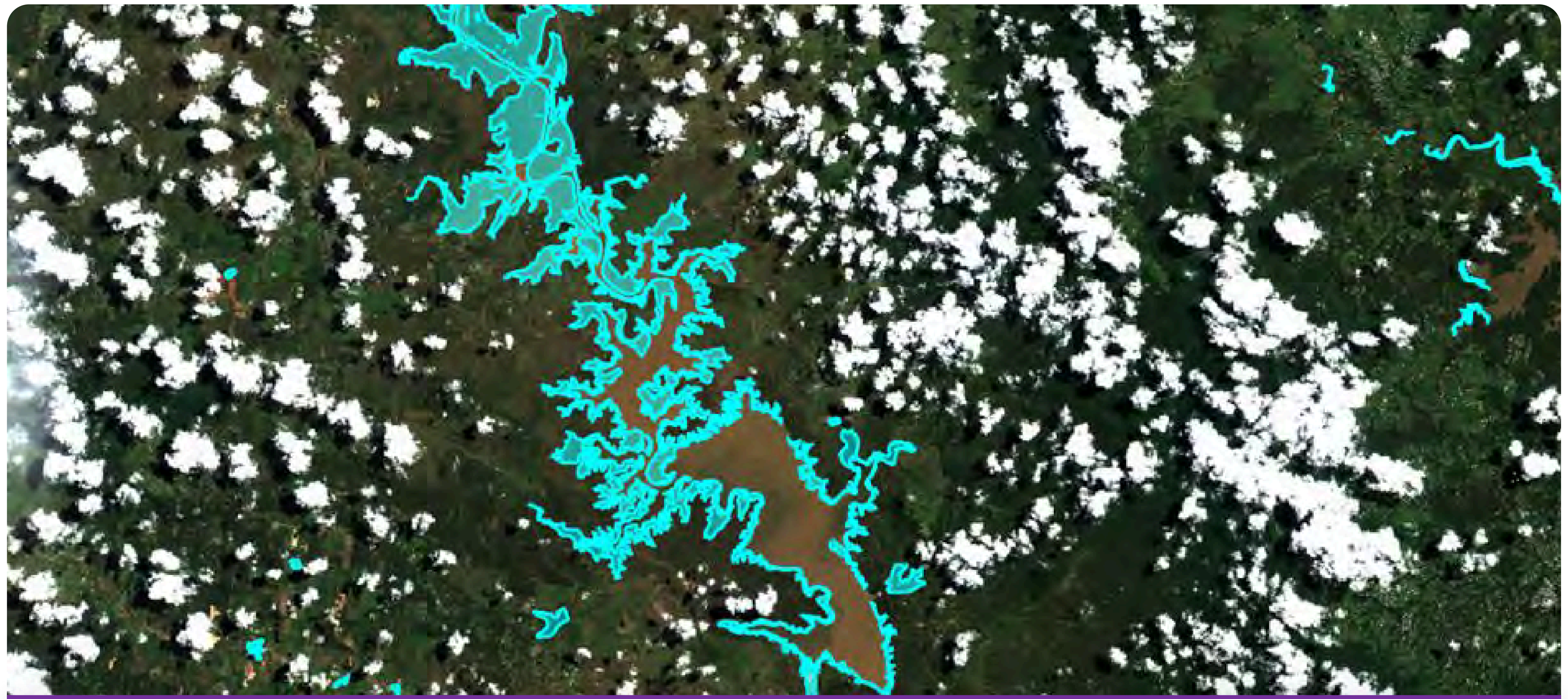
By combining diverse spatial data, such as real estate and infrastructure information, with the actual damage area, the total damage cost can be calculated quickly immediately after a disaster.

3 Assessment of Damage Scope on a Wide Scale

By quickly assessing the overall damage distribution using satellite imagery covering a vast area, the data can be utilized for determining emergency response priorities.

Flood : AI Deep Learning-Based Flood Damaged Area Assessment

Applied the 2022 Eastern Australia Flood



IoU accuracy **0.8**

Technical Specifications

Recommended Resolution	3 m
Input Data	RGBN bands
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Highly Precise Water Body Detection

Our deep-learning models identify water-covered areas with high precision.

2 Pre- and Post-Flood Comparative Analytics

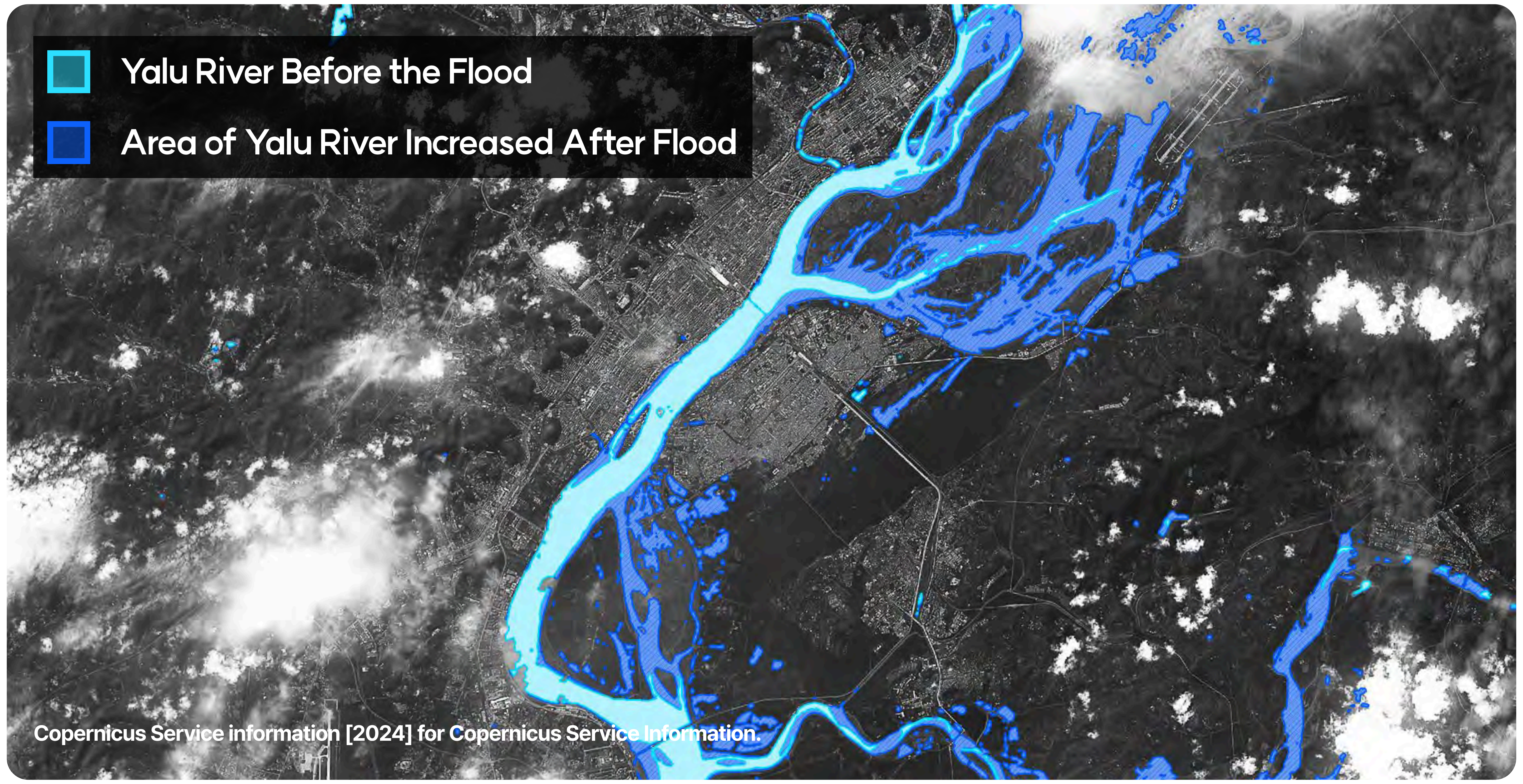
Measures the true extent of flooding by comparing water-coverage changes across pre- and post-event satellite data.

3 Reliable Analytics Results

By combining detection and probability maps, we provide a clear numerical measure of result confidence.

Flood : Spectral Index-Based Detection of Flood-Damaged Area

2024 flood case in the vicinity of Sinuiju, North Korea



Technical Specifications

Available Resolution	Irrelevant
Input Data	Green&NIR bands or NIR&SWIR bands Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Detection of Damage Invisible to the Naked Eye

Precisely detects subtle damages which cannot be reliably identified by the human eye, using spectral index analytics.

2 Scientifically Backed Assessment of Current Conditions

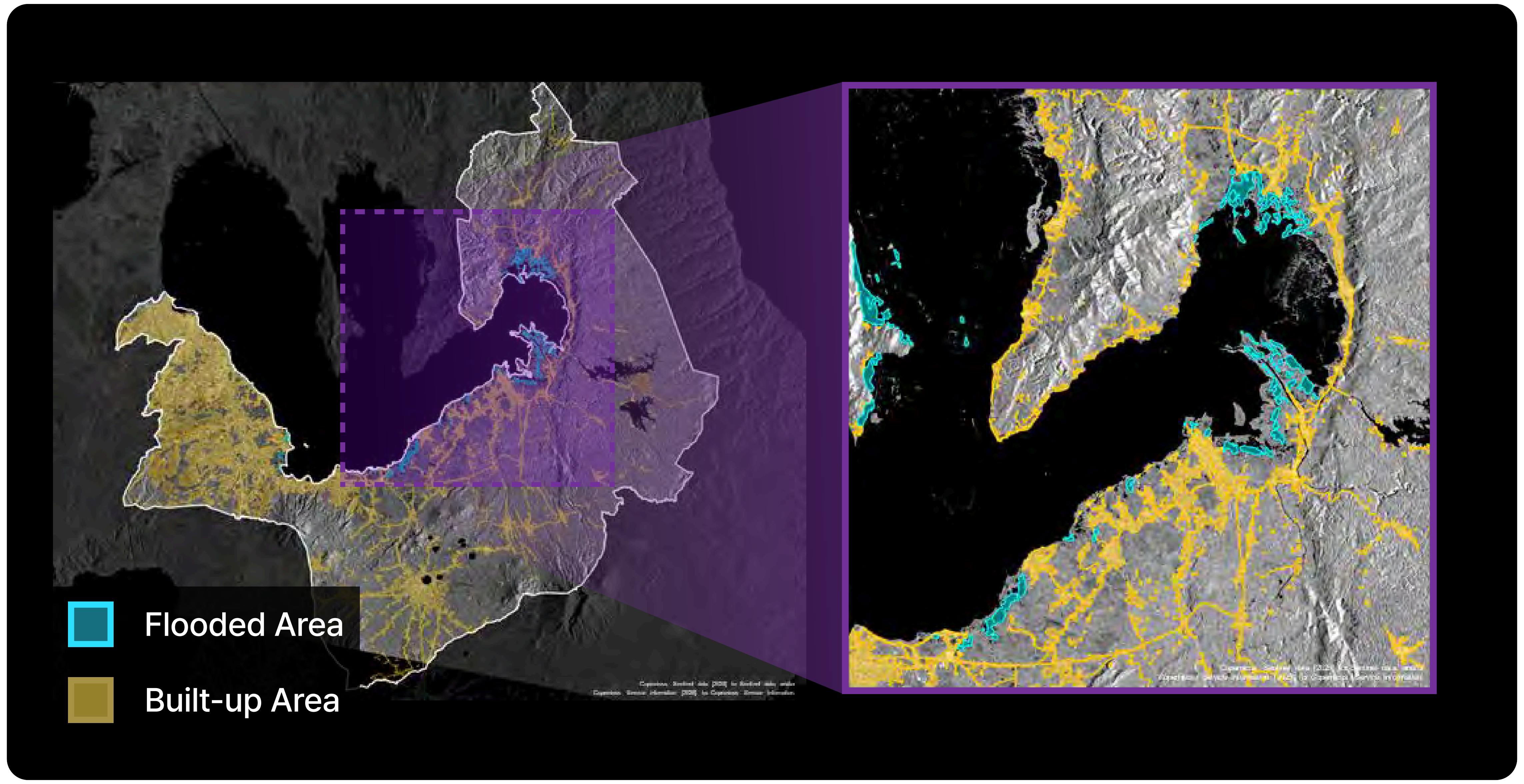
Uses objective data analytics to clearly define the scope and severity of the damage.

3 Flexible Map Resolution Support

Choose the resolution that fits your needs- from wide-area maps for emergency response to high-resolution maps for detailed recovery planning.

Flood : SAR-Based Flood Damage Area Detection

2024 Flooded Area Detection Result in Laguna



Technical Specifications

Available Resolution	10 m ~
Input Data	SAR Backscatter Coefficient Images Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Pre- and Post-Disaster Flood Extent Detection

Uses SAR (Synthetic Aperture Radar) data to monitor flooded areas before and after a disaster, even under cloud, fog, or nighttime conditions.

2 High-Precision Analytics Using Water Surface Reflection Properties

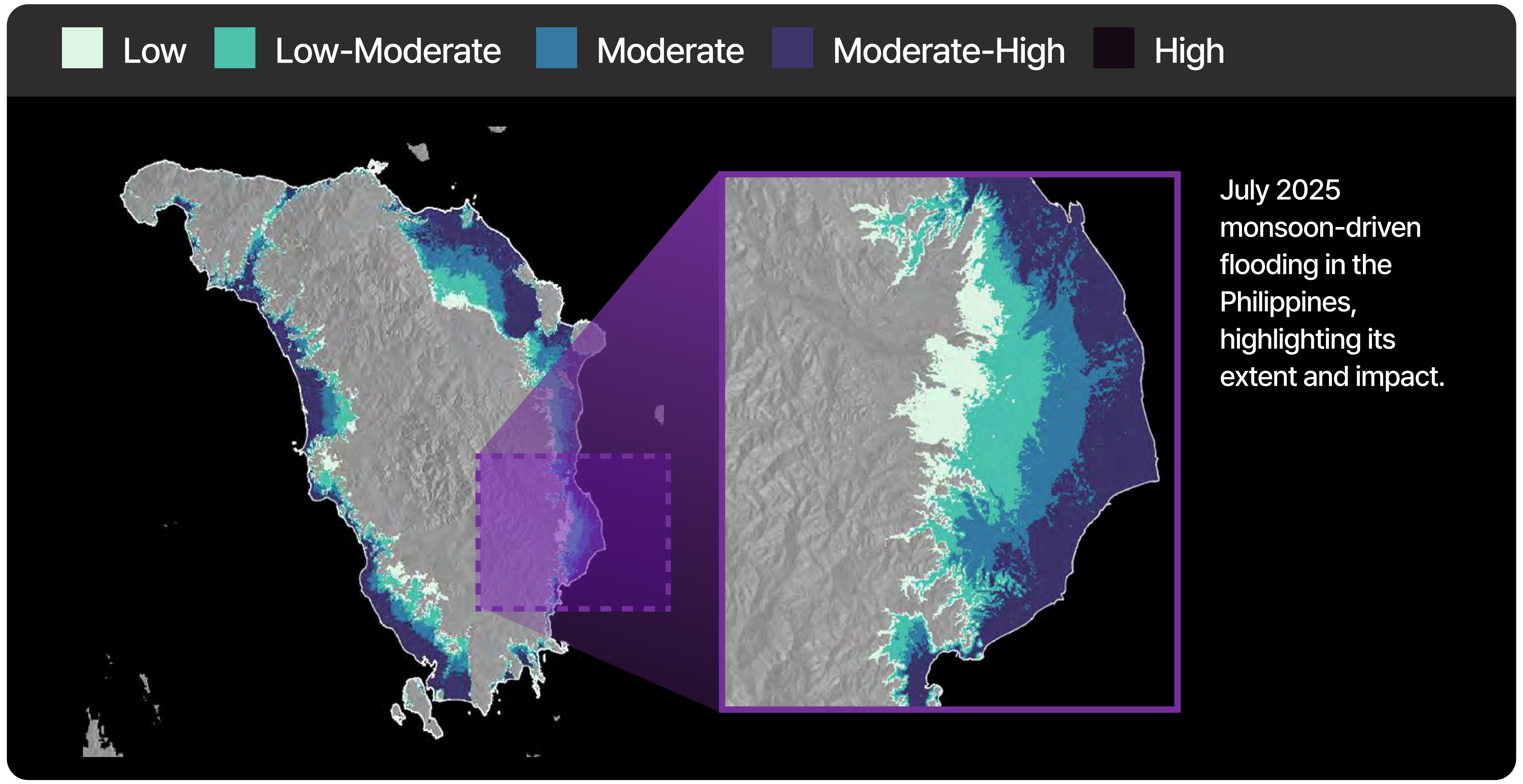
Analyzes changes in radar backscatter from water surfaces to accurately map flooding, including in areas not accessible to optical.

3 Optimized for Time-Critical Disaster Response

Enables rapid analytics without weather or cloud limitations, supporting timely damage assessment and urgent response operations.

Flood : Risk Mapping

2025 Monsoon-driven flooding



July 2025 monsoon-driven flooding in the Philippines, highlighting its extent and impact.

Technical Specifications

Recommended Resolution	3 m - 10 m
Input Data	Sentinel-1 (SAR), Sentinel-2 (EO), Land cover and DEM, Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Reliable monitoring in any weather, day or night

By fusing optical and SAR satellite imagery, we can continuously monitor flood-affected areas, even through cloud cover or in complete darkness.

2 High-precision flood risk mapping with terrain insights

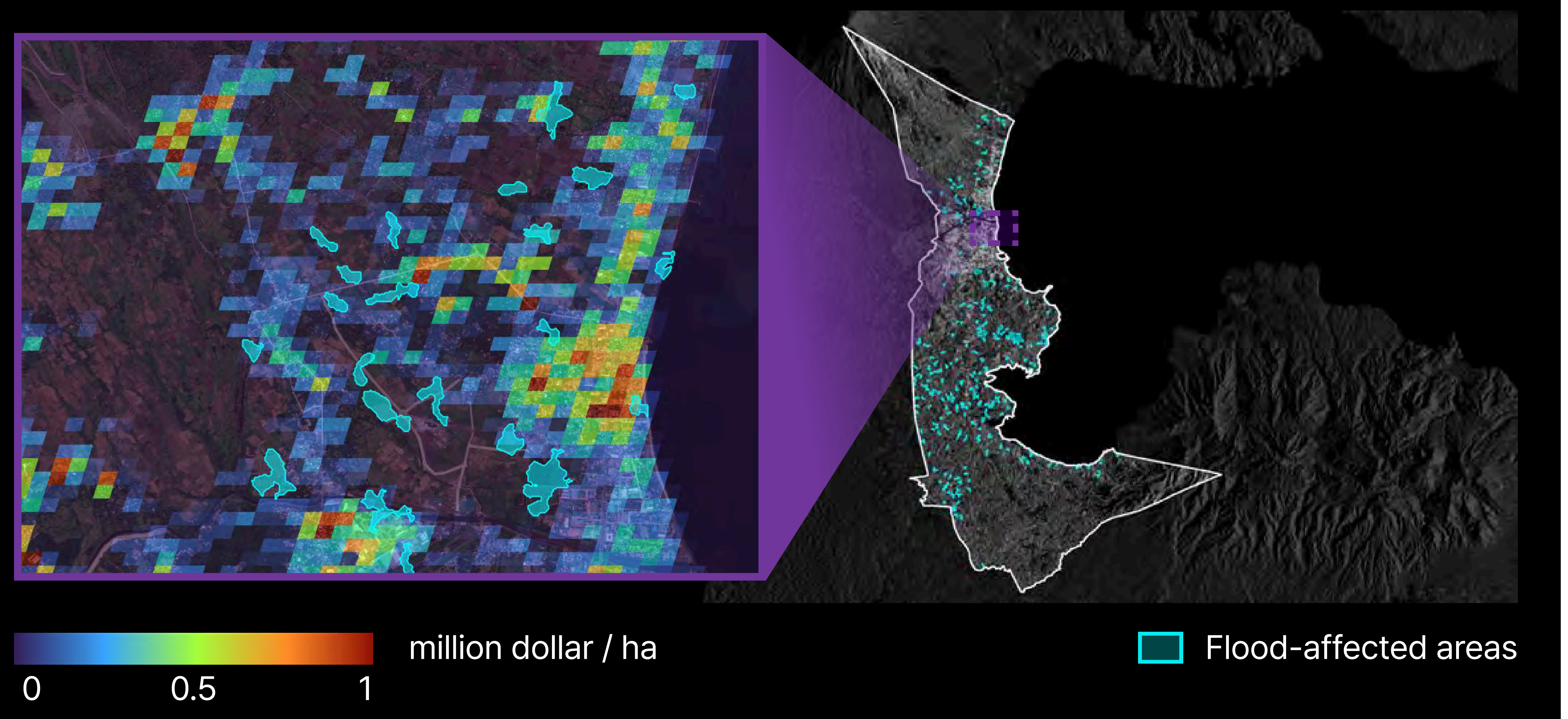
Integrating Digital Elevation Models (DEM) with drainage network data enables precise analysis of topography-driven flood-vulnerable zones and water flow paths.

3 Early identification of river flooding and low-lying area inundation risks

Provide timely, location-specific insights into areas vulnerable to river overflow or low-elevation flooding, enabling faster decision-making, proactive mitigation, and reduced secondary damage.

Flood : Damage Cost Estimation

2025 Legazpi City, Philippines



Technical Specifications

Available Resolution	100 m
Input Data	Sentinel-2, Landsat-8, Population data, GDP, etc., Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Development of a map that quantifies disaster damage in monetary terms

Database expected damage costs in the event of a disaster, presenting differentiated damage costs based on the type of disaster.

2 Allows rapid estimation of damage cost upon disaster occurrence

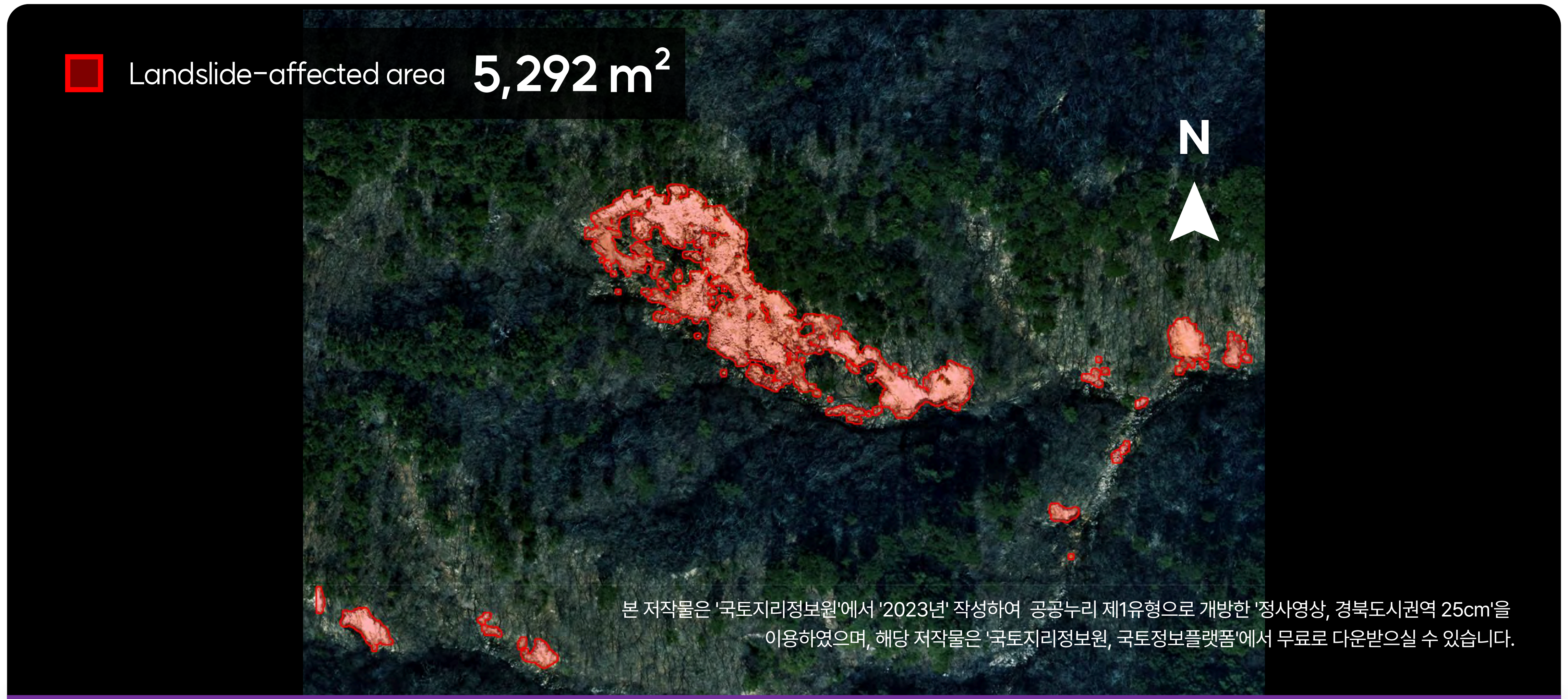
By combining diverse spatial data, such as real estate and infrastructure information, with the actual damage area, the total damage cost can be calculated quickly immediately after a disaster.

3 Assessment of Damage Scope on a Wide Scale

By quickly assessing the overall damage distribution using satellite imagery covering a vast area, the data can be utilized for determining emergency response priorities.

Landslide / Earthquake / Ground Subsidence : AI Deep Learning-Based Landslide Damaged Assessment

2022 Gyeongju soil landslide case caused by heavy rain



IoU accuracy **0.85**

Technical Specifications

Recommended Resolution	3 m
Input Data	RGBN bands Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Accuracy Proven Across Diverse Terrain

Trained on more than 1,000 real-world landslide cases from mountainous, hilly, and other regions worldwide, our models maintain high accuracy across different geographic environments.

2 Reliable Quantified Results

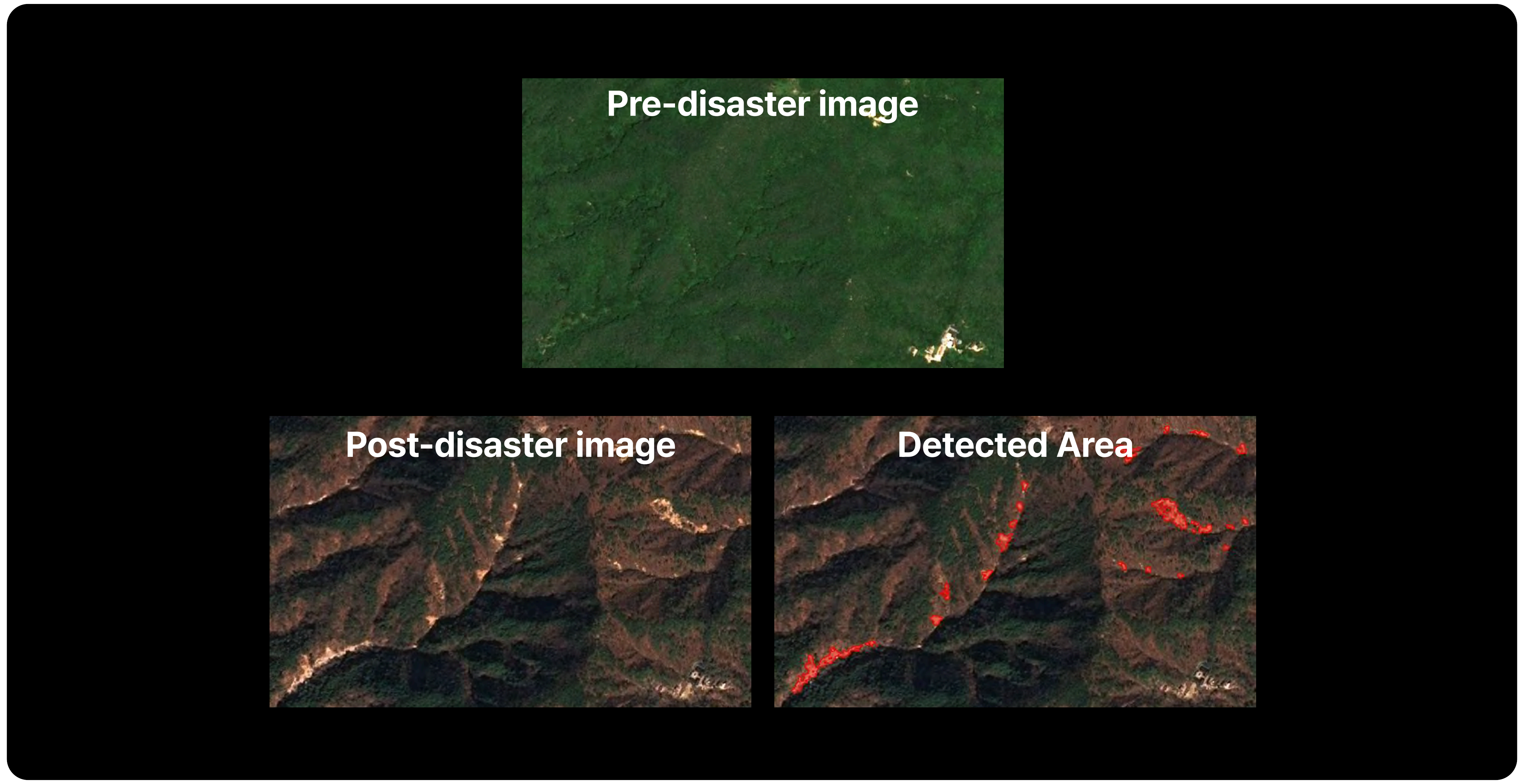
By providing both probability and classification maps, detection confidence is quantified on a 0–100% scale, giving decision-makers reliable results they can confidently act on.

3 Multiple Output Formats for Immediate Use

Delivers data ready for direct use in GIS software and web platforms, available in both raster (GeoTIFF, PNG) and vector (GeoJSON) formats.

Landslide / Earthquake / Ground Subsidence : Spectral Index-based Detection of Landslide Damage Areas

2022 Typhoon Hinnamnor Landslide: Mt. Toham, Gyeongju



Technical Specifications

Recommended Resolution	Irrelevant
Input Data	RGBN Bands Before and After a Landslide
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Landslide-Optimized Spectral Analytics

Accurately tracks changes from vegetation loss to exposed soil using advanced spectral index analytics.

2 Multi-Satellite Ready

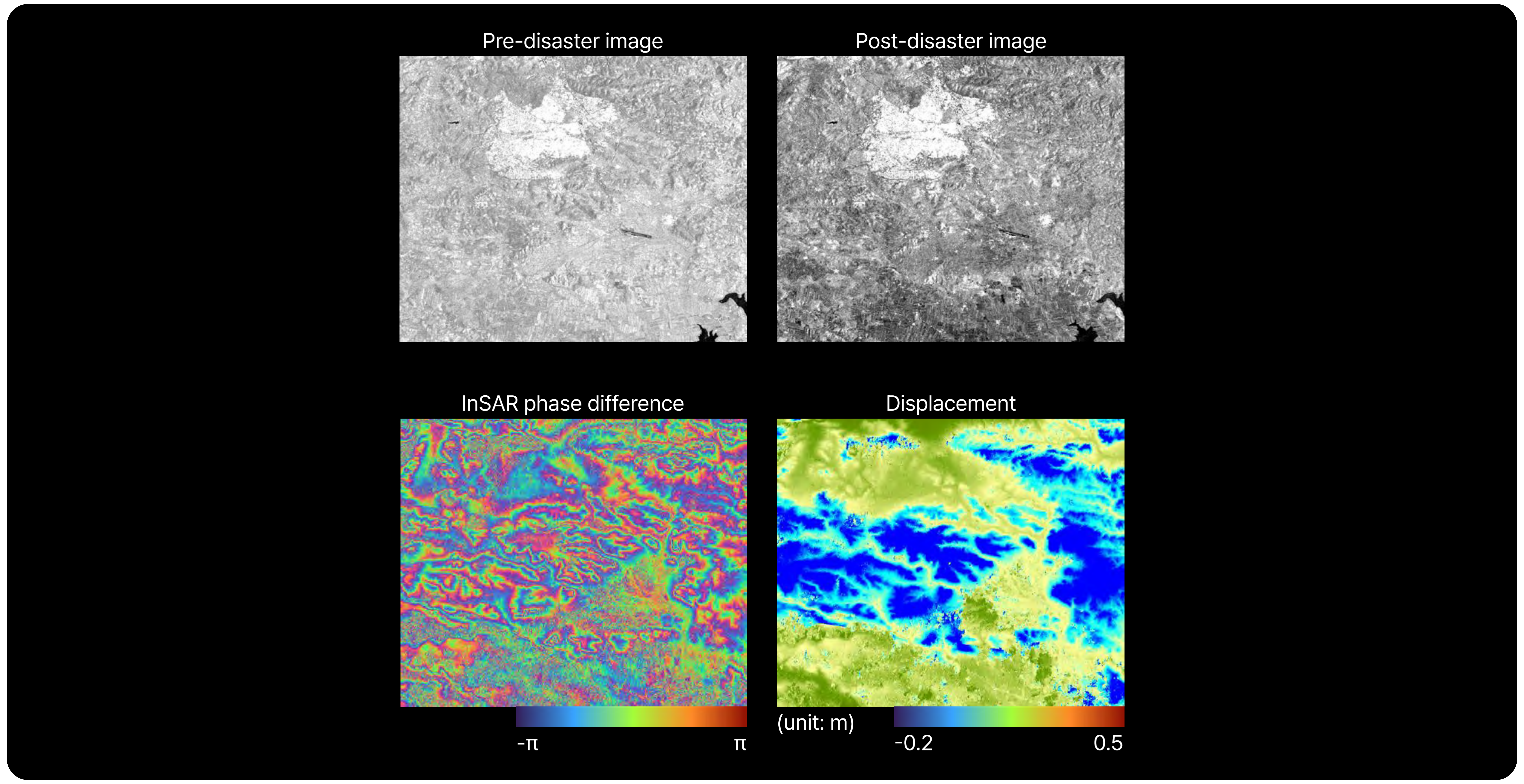
Seamlessly applies to major optical satellite sources, including Sentinel-2, Landsat 8/9, and PlanetScope, for flexible integration into existing workflows.

3 Wide-Area Rapid Monitoring

Delivers fast analytics of extensive mountainous regions using satellite imagery across multiple resolutions.

Landslide / Earthquake / Ground Subsidence : InSAR-Based Ground Subsidence Monitoring

2023 Türkiye-Syria Earthquake



Technical Specifications

Available Resolution	10 m
Input Data	SAR SLC Image Before and After the Event
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Standardized, Automated Analytics Workflow

From satellite data acquisition to subsidence calculation, all processing is automated through a standardized workflow, ensuring fast delivery and consistent analytics quality.

2 Rapid Wide-Area Diagnosis

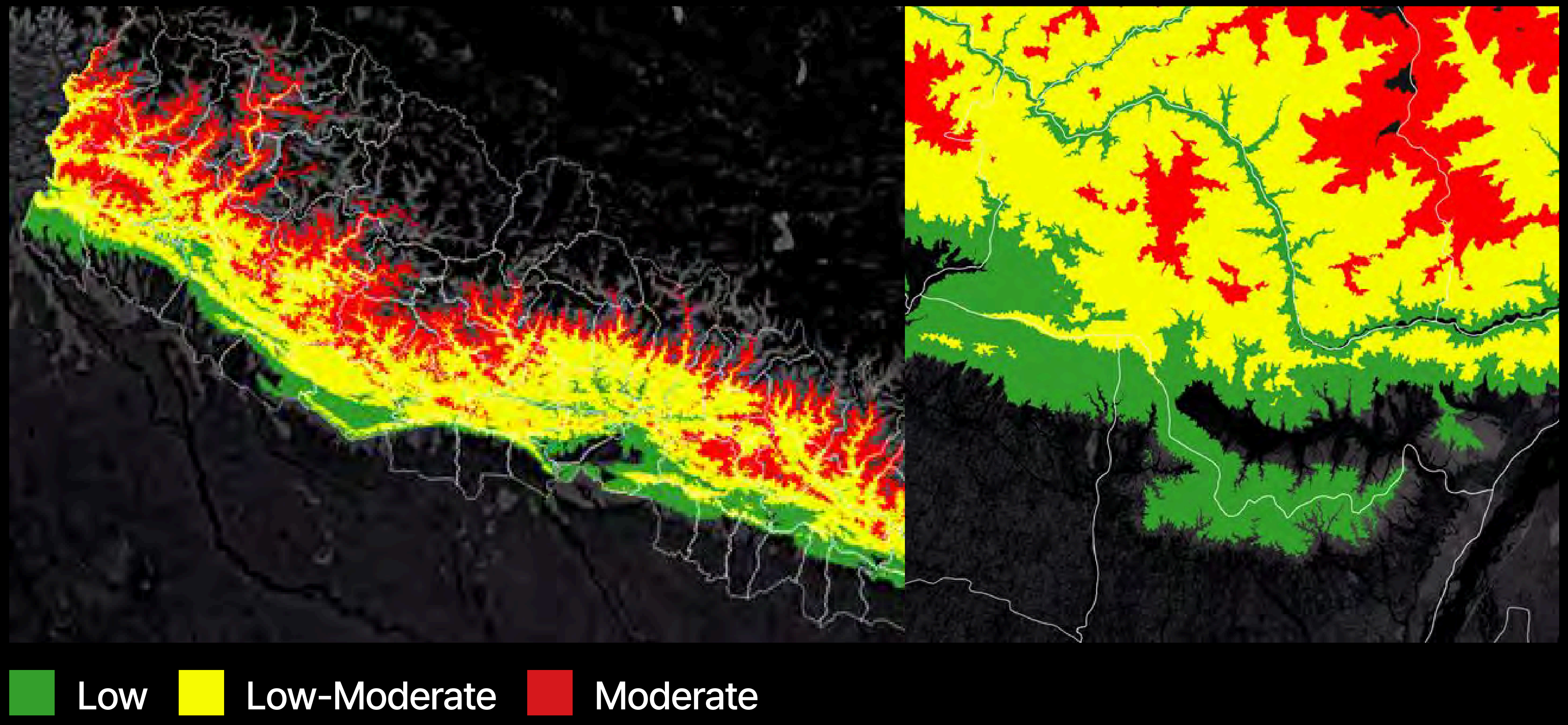
Quickly analyzes tens of square kilometers using satellite imagery, enabling timely provision of ground displacement insights across large areas.

3 Millimeter-Level Precision in Displacement Measurement

Measures ground subsidence with millimeter-level accuracy—including subsidence velocity and cumulative displacement—providing quantitative data you can trust for critical decisions.

Landslide / Earthquake / Ground Subsidence : Risk Mapping

2024 Nepal landslide triggered by record-breaking rainfall



Technical Specifications

Recommended Resolution	3 m - 30 m
Input Data	Sentinel-2 (EO), Land cover, DEM, Slope, Precipitation, Soil moisture, Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Specify the risk area

Analyzing data with high spatial resolution to specifically identify locations at risk of damage.

2 Joint Utilization of Geological, Soil, and Climate Factors

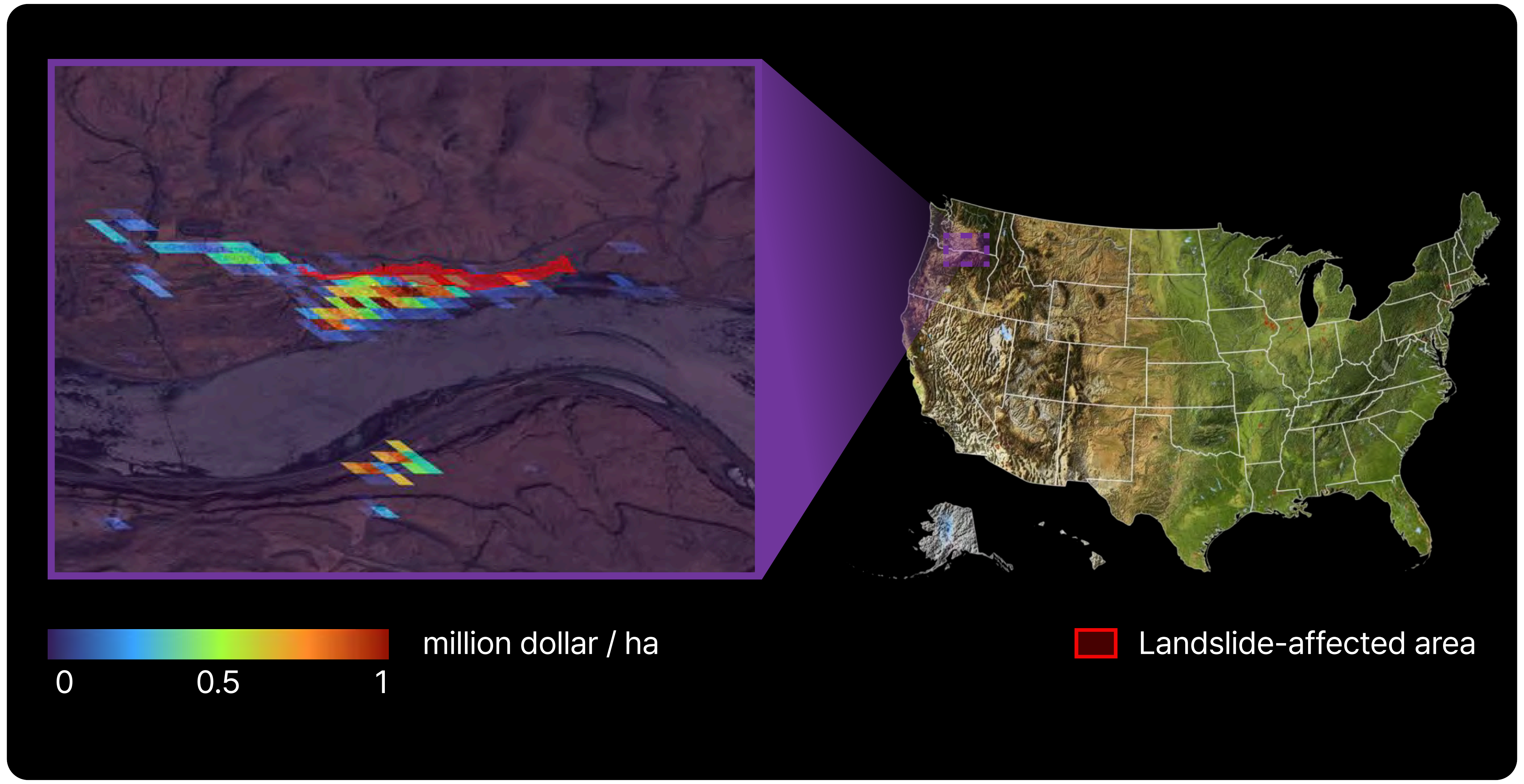
By integrating diverse topographical and climate data, such as slope, land cover, precipitation, and soil moisture, landslide-vulnerable areas are analyzed from multiple perspectives.

3 Predicting the risk area of landslides

Based on topographical and climate conditions, information is provided by predicting areas with a high probability of landslide occurrence in advance.

Landslide / Earthquake / Ground Subsidence : Damage Cost Estimation

2023 Wisheram, Washington State, USA



Technical Specifications

Available Resolution	100 m
Input Data	Sentinel-2, Landsat-8, Population data, GDP, etc., Before and After the Disaster
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Development of a map that quantifies disaster damage in monetary terms

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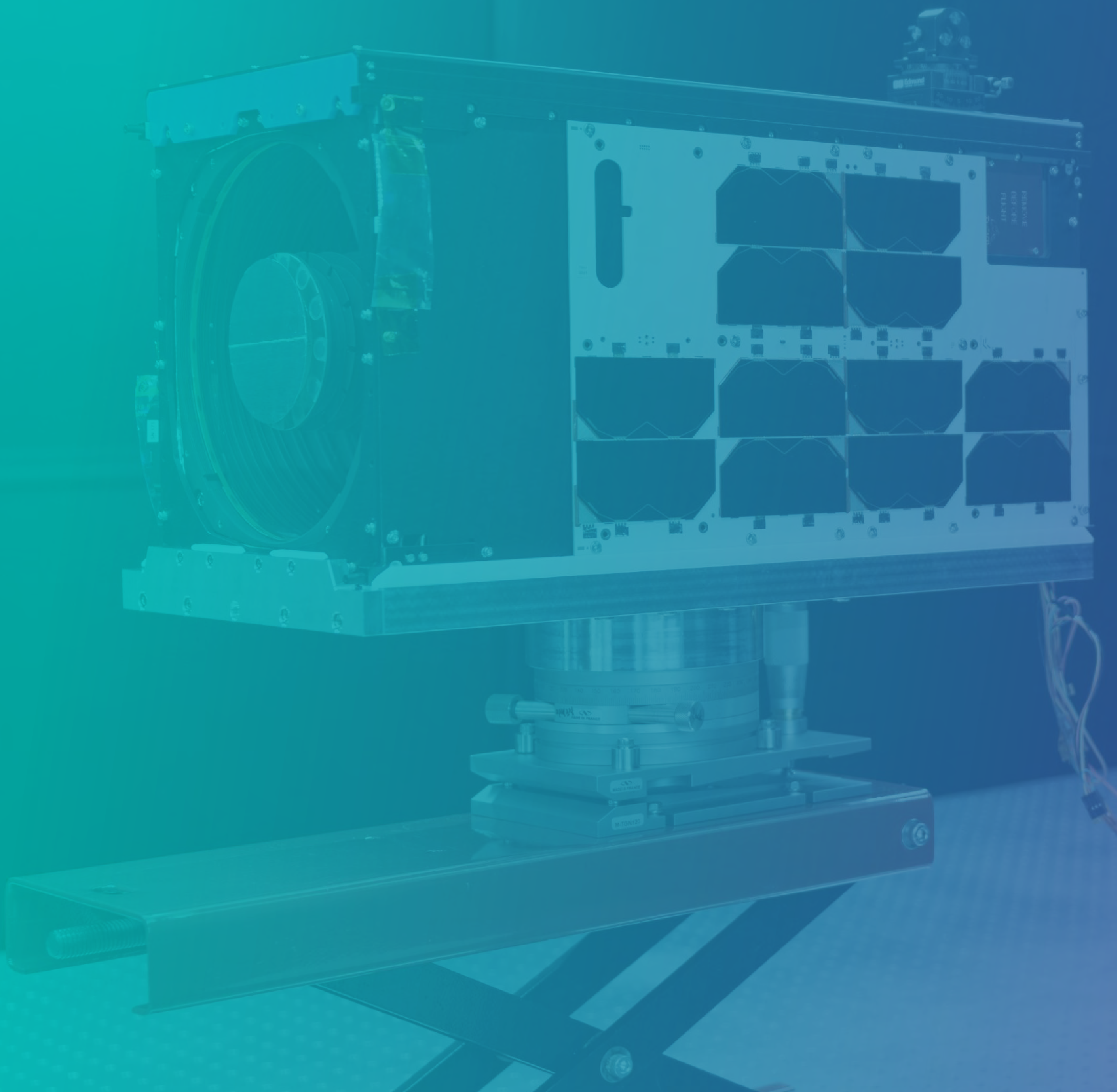


03

Core Analytics Technologies

Object Detection

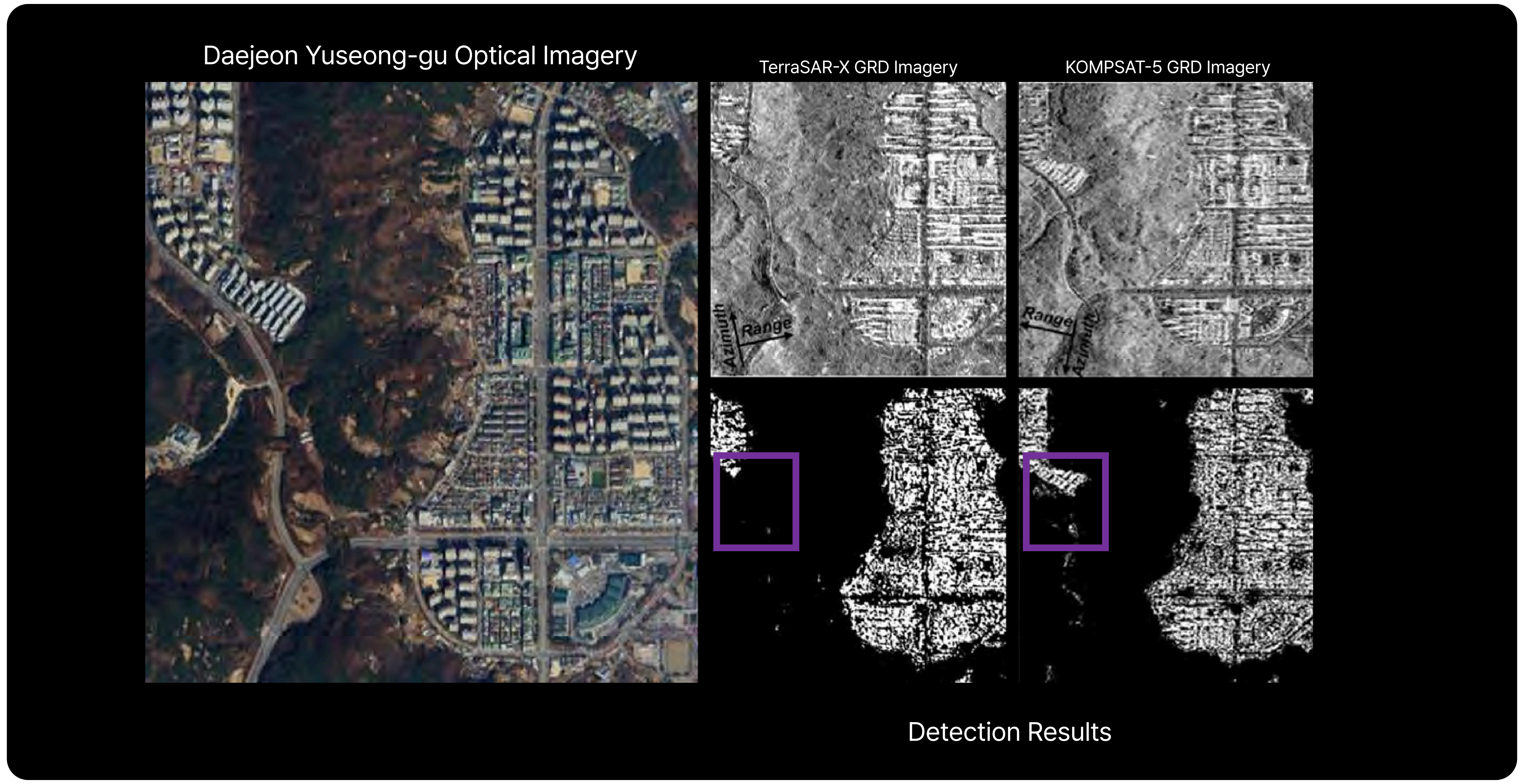
SR (Super Resolution)

Gap-Filling

Gen AI (Generative AI)

Object Detection : Urban Area Detection Based on SAR Imagery

Daejeon Yuseong-gu Optical Imagery



Technical Specifications

Available Resolution	3 m (TerraSAR-X), 5 m (KOMPSAT-5)
Input Data	SAR GRD Image Before and After the Event
Output Format	Raster (GeoTIFF, PNG)

Key Advantages

1 Extraction of building-specific SAR scattering mechanisms

Achieve high-precision detection by analyzing building-specific SAR scattering behaviors—such as shadowing and double-bounce effects—far surpassing the limitations of traditional backscatter-only analysis.

2 High-precision detection of urban environments

Using extracted morphological features, our solution can accurately identify densely built-up zones and urban structures, enabling valuable applications in urban planning, infrastructure monitoring, and post-disaster damage assessment.

3 Comparative analytics across multiple imagery types

Enable robust cross-verification by comparing not only identical SAR images but also data from different SAR sensors, providing a more comprehensive and multi-layered analytical perspective.

Object Detection : Optical Image-Based Building Detection

Mandalay, Myanmar

0.84

mIoU accuracy on test data with resolution under 1 meter

Technical Specifications

Recommended Resolution	~ 1 m
Input Data	RGB band
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

Key Advantages

1 Robust Object Detection Model Built on Global Datasets

By jointly training on diverse domestic and international datasets, the model ensures consistent and stable performance regardless of regional characteristics or environmental variations.

2 High-Precision Urban Area Detection through Ultra-High-Resolution Training

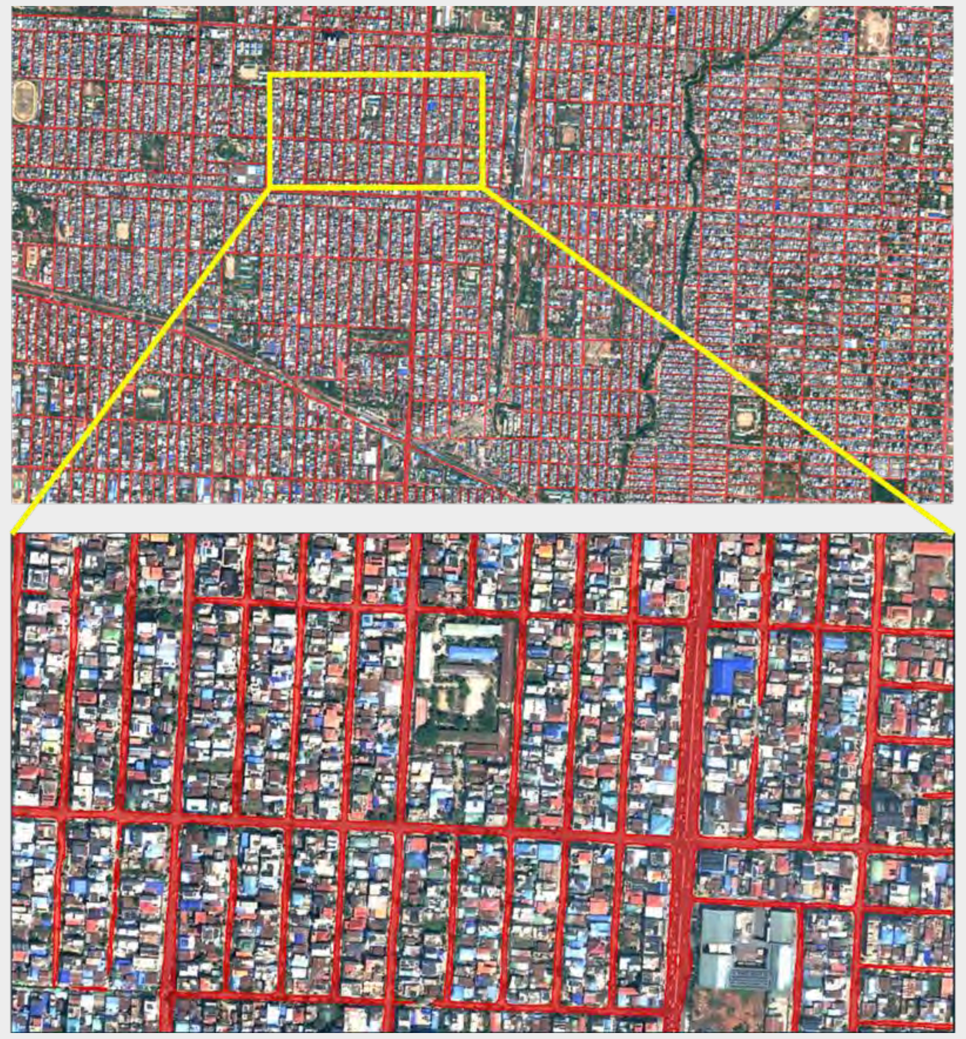
Accurately detects building boundaries with mIoU 0.84 on imagery with spatial resolution finer than 1 meter.

3 High-Speed Analysis Enabled by an Efficient Inference Model

Achieves fast inference of approximately 13 seconds per 1000 × 1000 pixel input, enabling rapid and accurate detection across large-scale spatial areas.

Object Detection : Optical Image-Based Road Detection

Mandalay, Myanmar



0.84

mIoU accuracy on test data with resolution under 1 meter

Technical Specifications

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Input Data	RGB band
Output Format	Raster (GeoTIFF, PNG), Vector (GeoJson)

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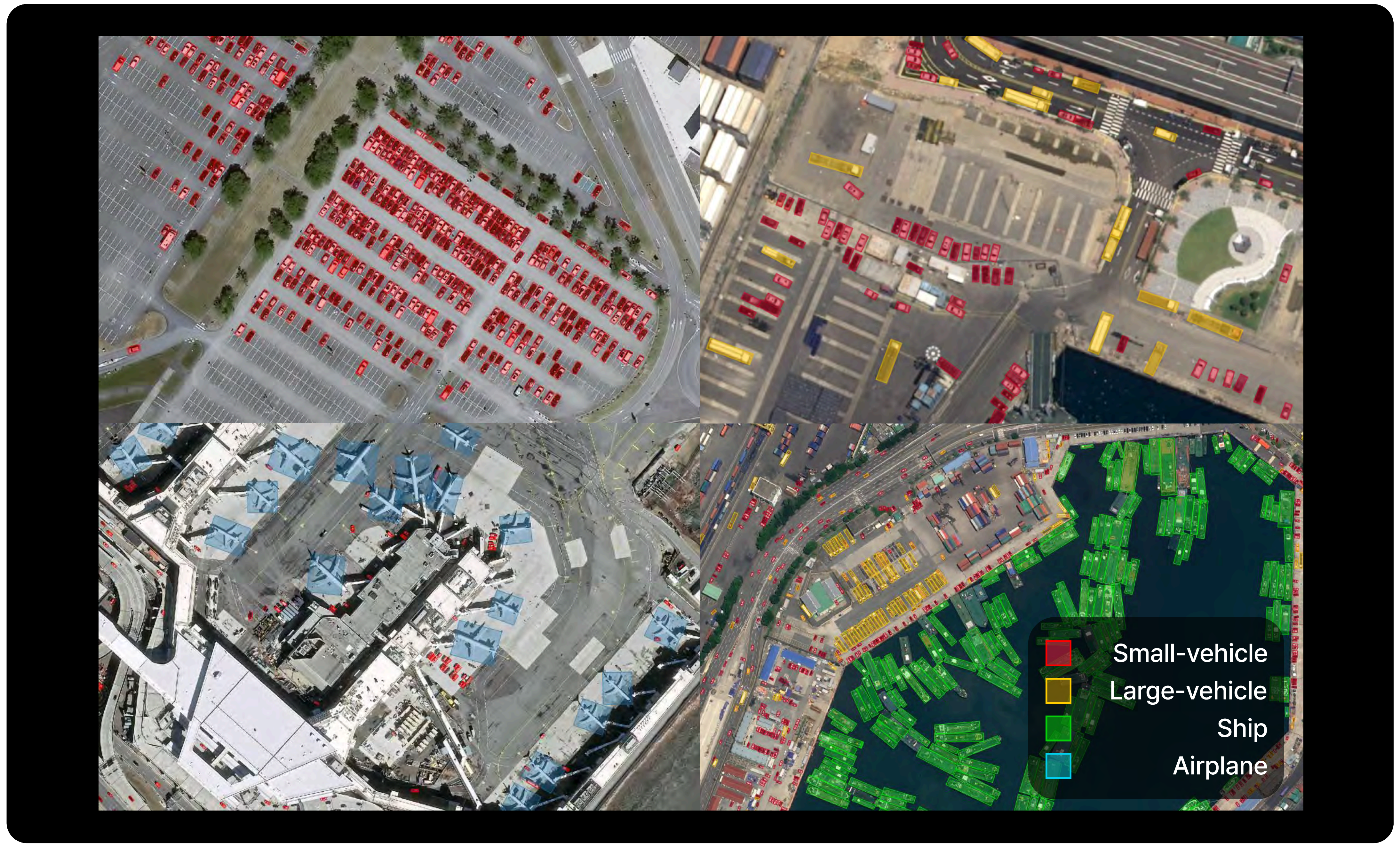
Object Detection : Transportation Means



Key Advantages

1 Training on multi-resolution satellite and aerial imagery

Leveraging datasets such as Pleiades, Pleiades Neo, and DOTA, we combine imagery at various resolutions with Super-Resolution (SR) outputs to deliver robust detection performance at 0.5 m–class high resolution.

2 Enhanced accuracy through Super-Resolution integration

By sharpening object boundaries with advanced Super-Resolution technology, we simultaneously improve detection accuracy and the visual quality of the results.

3 High-precision detection across five transportation classes

The model distinguishes multiple transportation asset types—such as fire trucks, heavy vehicles, ships, and aircraft—achieving an average recall above 0.98 accuracy across five transportation classes.

Technical Specifications

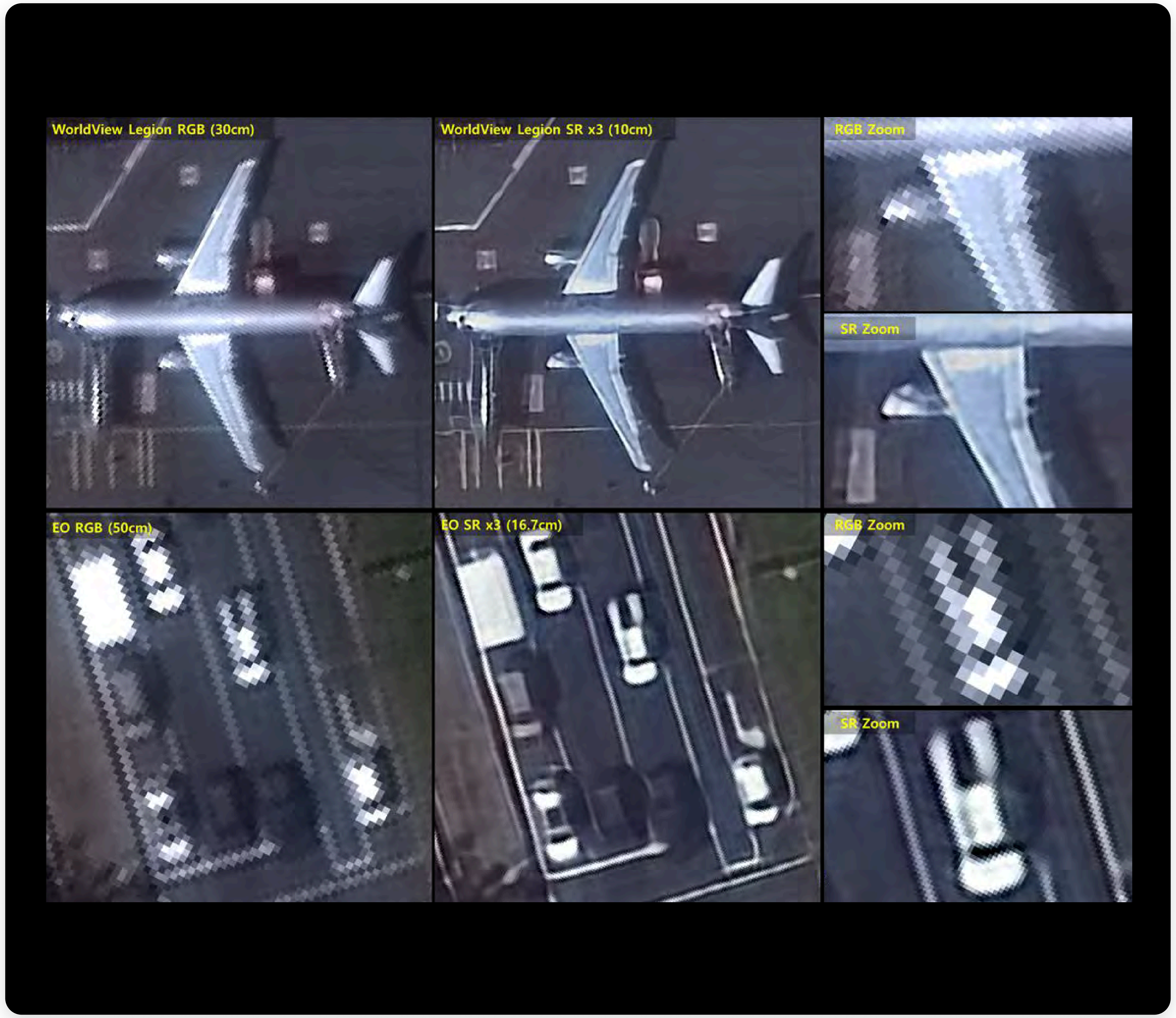
Recommended Resolution	~ 0.5 m
Training Data	Self-Constructed Data (Pleiades, Pleiades Neo), DOTA Dataset (Satellite and Aerial Imagery), AI Hub (Kompsat-3, Kompsat-3A)
Input Data	RGB band
Output Format	Vector (GeoJson, SHP)

Transportation Means Object Detection Accuracy

Class	Small Vehicles	Large vehicles	Ships	Airplanes	Average
Recall	0.98	0.93	1.00	1.00	0.98
AP	0.90	0.73	0.94	0.90	0.87

Super Resolution

3X Super Resolution to a WorldView Legion (30 cm) image



Key Advantages

1 High-quality super-resolution tailored to your satellite imagery

Incorporates satellite-specific characteristics—such as brightness, noise patterns, and atmospheric effects—to preserve original features while enhancing spatial resolution, enabling more precise object detection and analysis.

2 Fast processing of large-scale imagery through model lightweighting and optimization

By lightweighting the model and optimizing inference, high-volume, large-area satellite imagery can be processed at high speed, ensuring both high throughput and consistent image quality.

3 Maximizing value from existing low-resolution imagery and reducing costs

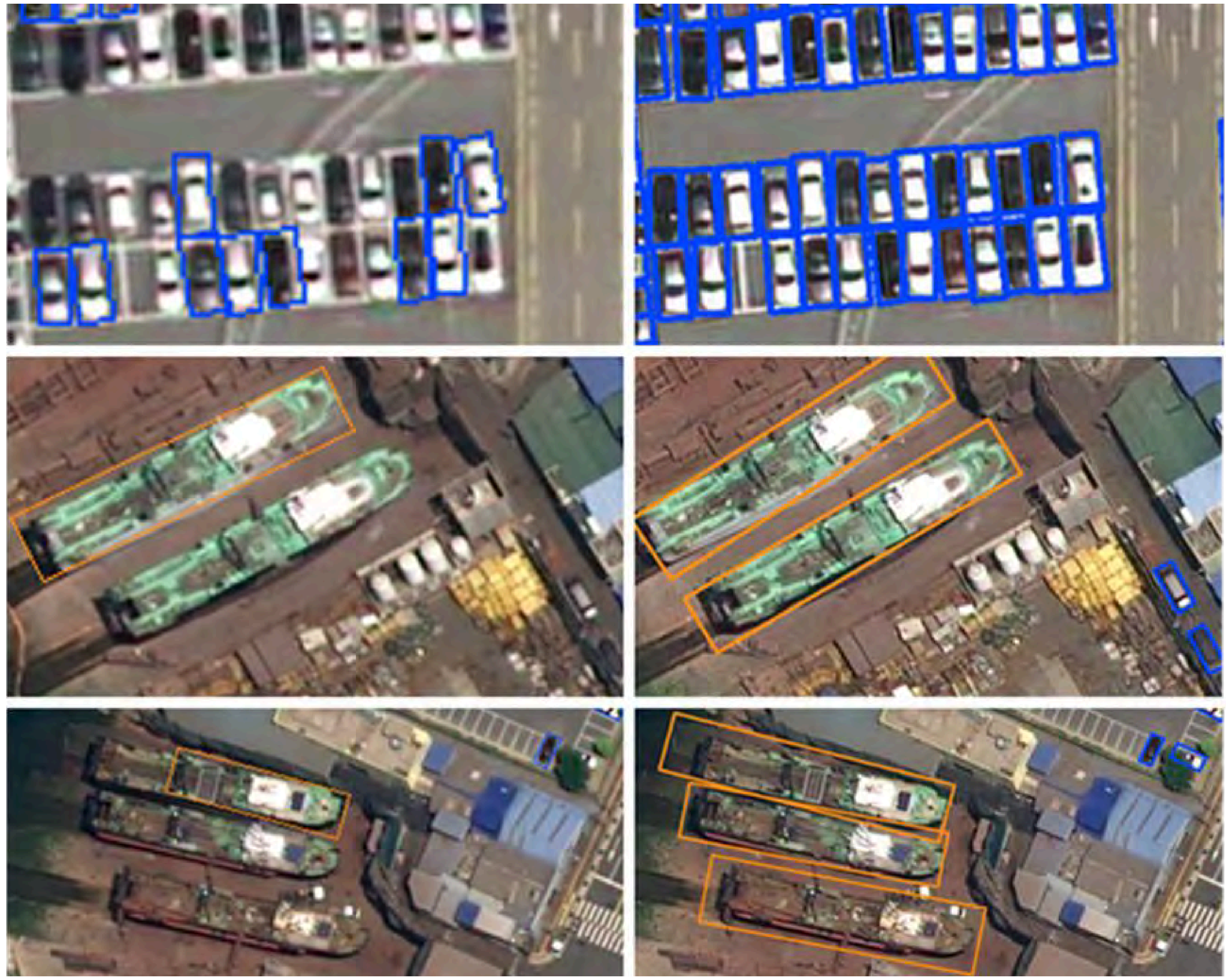
By upscaling existing low-resolution archives—such as Landsat and Sentinel—into high-resolution products, you can reduce reliance on costly high-resolution acquisitions while significantly increasing data utilization.

4 Boosting accuracy across multiple analysis workflows

Applying super-resolution enhances performance in change detection, object detection, and disaster monitoring, improving both detection accuracy and overall analysis quality.

Super Resolution

Accuracy Improvement After SR Application



Performance Improvement Cases Before / After SR Application

Performance Improvement Cases Before/After SR Application					
Class	Small Vehicles	Large vehicles	Ships	Airplanes	Average
Recall	0.61 → **0.98**	0.84 → **0.93**	0.97 → **1.00**	1.00 → **1.00**	0.85 → **0.98**
AP	0.59 → **0.90**	0.55 → **0.73**	0.89 → **0.94**	0.98 → **0.90**	0.75 → **0.87**

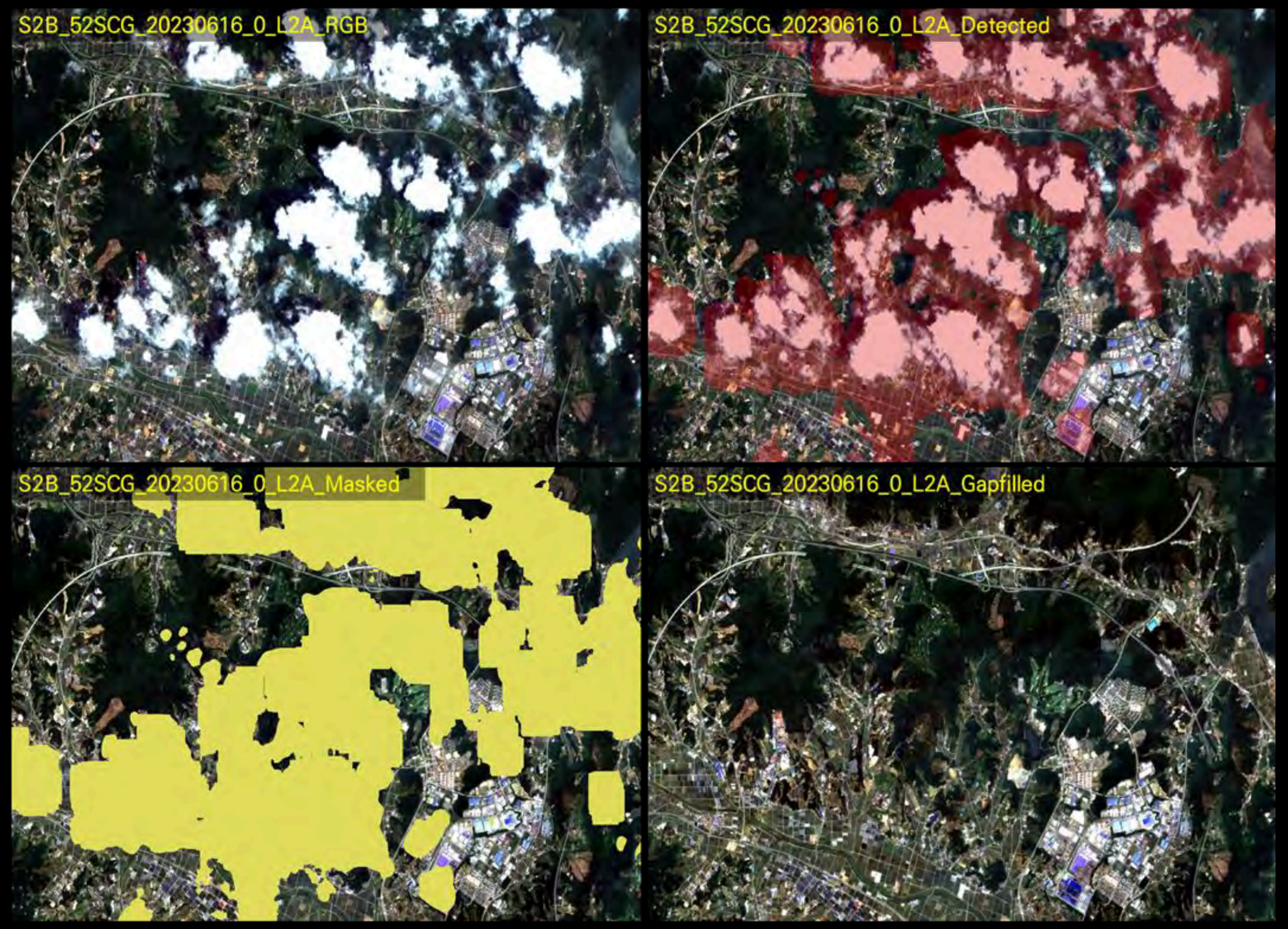
Technical Specifications

Recommended Resolution	0.3 m - 10 m
Applicable Satellites	Applicable to more than 20 high- to low-resolution satellite types
Input Data	RGB / RGBN
Output Format	Raster (GeoTIFF, PNG / 8bit , 16bit)

Gap-Filling

The images illustrate the cloud and cloud-shadow masking and gap-filling process applied to Sentinel-2 (10 m) imagery for the Korean peninsula

Gap-filling



Technical Specifications

Recommended Resolution	~ 30 m
Training Data	Landsat 8-9 (30 m) , Sentinel-2 (10 m)
Input Data	RGB + a
Output Format	Raster (GeoTIFF, PNG / 8bit , 16bit)

Key Advantages

1 Deep learning–based precise cloud detection

Leveraging advanced deep learning models, cloud-covered areas are detected far more accurately than with conventional threshold-based methods.

2 Continuous monitoring without cloud constraints

By reconstructing areas obscured by clouds and cloud shadows, continuous observation becomes possible without interruption, while preserving both spatial and temporal resolution.

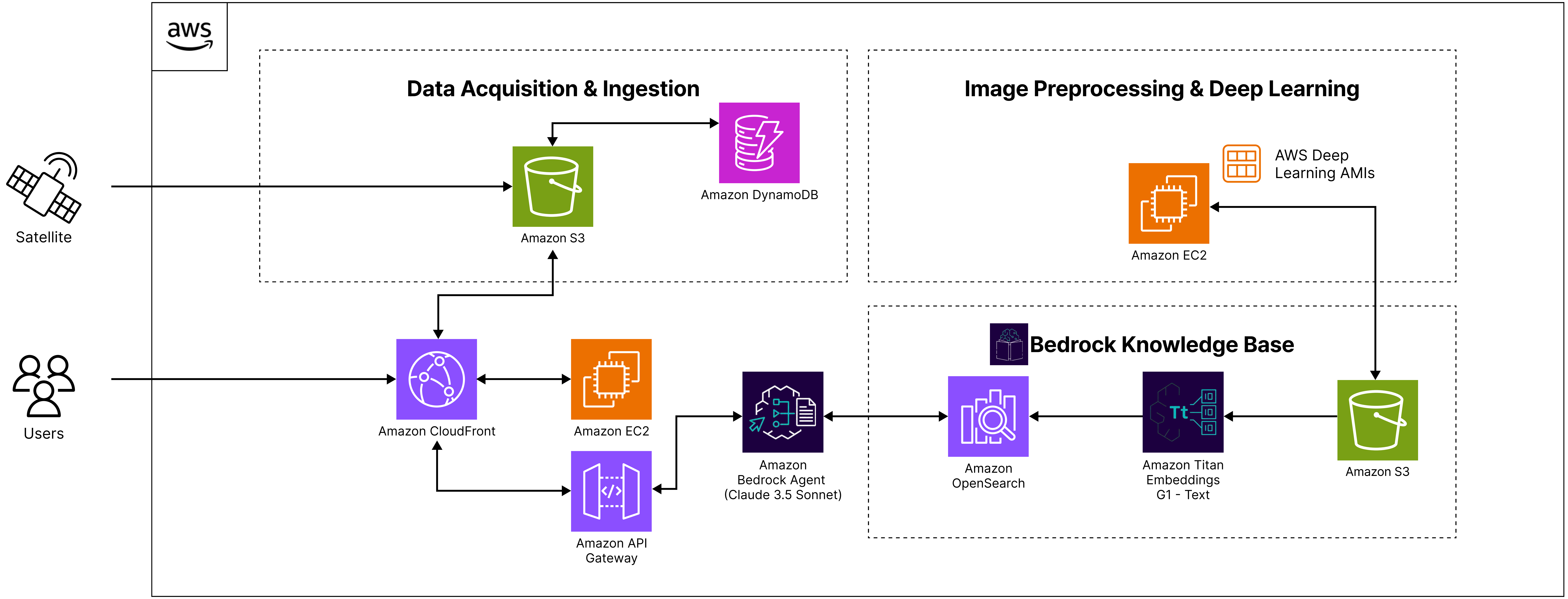
3 Seamless restoration of cloud-obscured areas

Advanced machine learning algorithms naturally reconstruct missing regions, preserving land-cover patterns even in complex terrain.

4 Purpose-built for time-series intelligence

Delivers gap-free time-series imagery for use cases that demand continuous monitoring, including land-cover change detection, agricultural monitoring, and water resource management.

Automatic Reporting Using Gen AI



Key Advantages

1 Save time

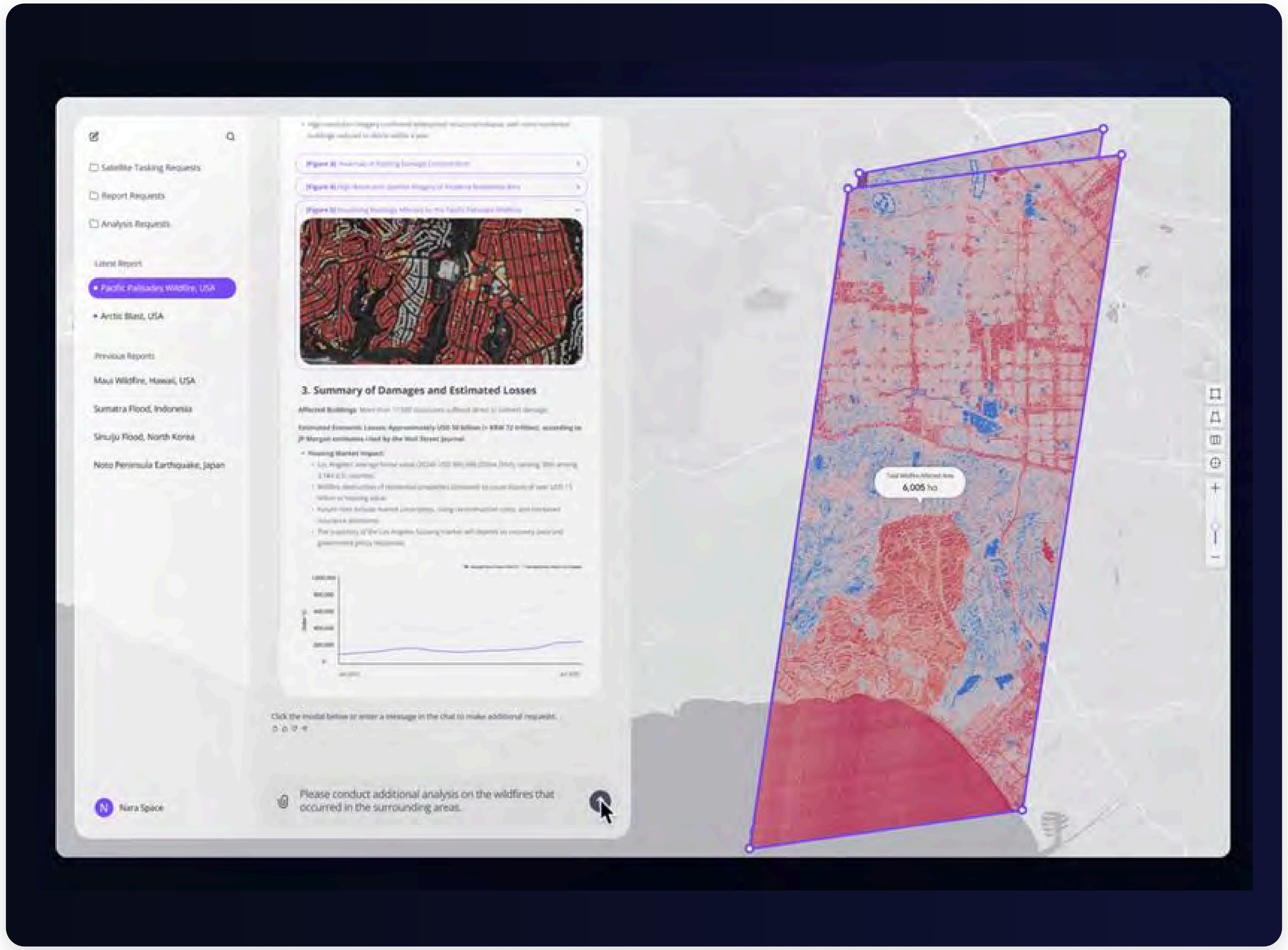
By leveraging Gen AI, report generation is dramatically reduced, enabling actionable insights in record time.

2 Minimized Hallucinations

By leveraging a rich, domain-specific knowledge base, the system significantly reduces hallucinations and delivers reliable analytical results.

Gen AI-Based Customer-Specific Copilot System

Copilot System Example



Key Advantages

1 User-friendly chatbot interface

An intuitive, conversational system that lets users easily request satellite image analysis and receive their results in no time.

2 Proactive, automated reporting

When a disaster occurs, the system automatically runs the analysis and delivers a report to the user, without requiring any manual request.

3 On-demand, deeper analysis

Once an initial report has been generated, users can immediately request additional or more detailed analyses to support in-depth decision-making.

4 24/7 Availability

The Gen AI system delivers essential information instantly, without time constraints or waiting periods, enabling timely decision-making during critical moments.

NARA SPACE

Thank you

Contact us: sales@naraspace.com