



SESSION 1: “PERIVALLON as a platform to fight environmental crime”

PERIVALLON platform, tools and PUCs

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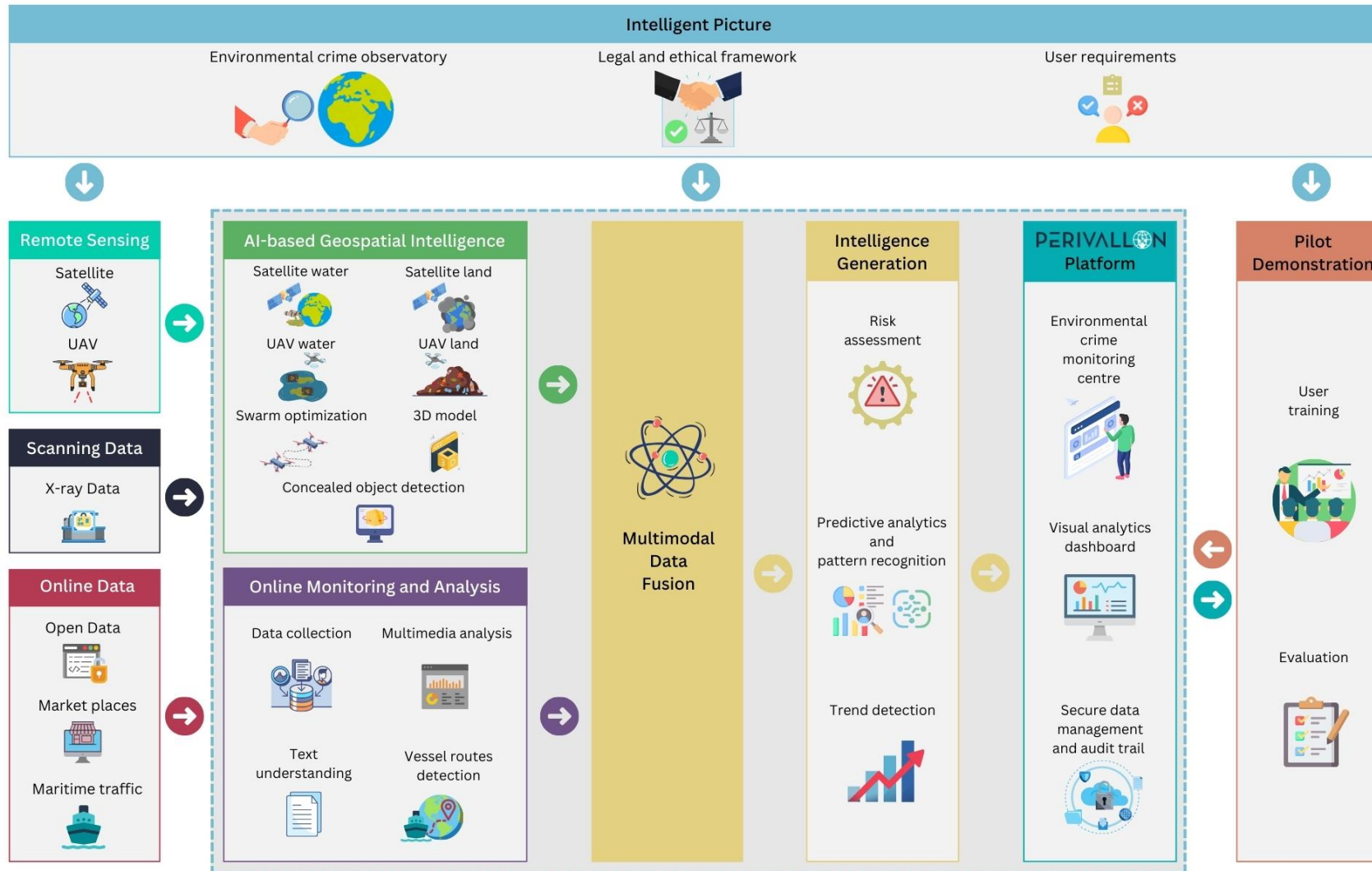
Dissemination level: Public



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PERIVALLON Concept and Interdependencies



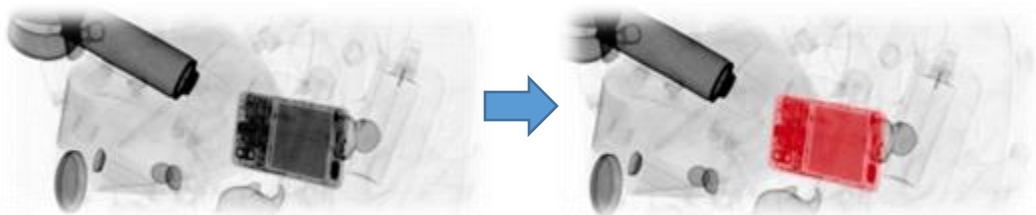
AI-based Geospatial Intelligence, Remote Sensing & Scanning

Earth observation imagery (satellites) & aerial images (UAVs) for detecting activities related to organised environmental crime



Efficient 3D map reconstructions of regions-of-interest

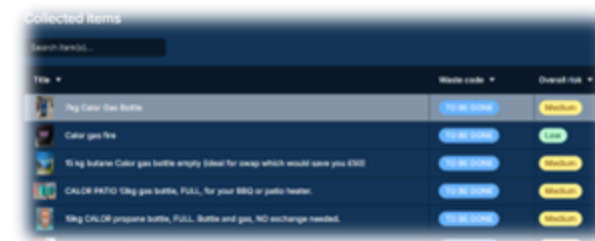
Swarm of drones: autonomous & cooperative missions



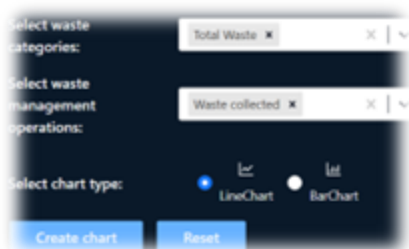
X-ray scanning based on deep learning methods for automated detection of concealed objects

Online Monitoring for Environmental Crime Detection

Discovery, collection, and extraction of relevant content from online Web sources and marketplaces



Monitoring and collection of data related to environmental crime from other online sources (e.g., external databases, data portals, websites, third party APIs)



Understanding the semantics of textual content and extracting useful insights



Recognition of objects of interest and their labels in multimedia content



Analysis of maritime traffic to detect transnational routes and ports related to e-waste crime



PERIVALLON Platform & Intelligent Decision Support System

Fusion of multimodal data & risk assessment for decision support



AI methods for revealing hidden data correlations and patterns, detecting irregularities, identifying trends, and making predictions

Environmental crime monitoring centre dashboard & visual analytics



Secure data management; Audit trail; Reliable & trustworthy information sharing

Integrated PERIVALLON platform



PERIVALLON Pilot Use Cases



PUC1: Illegal waste disposal detection
(IT, EL, SE, RO)



**PUC2: Intentional dumping of
polluting substances in land and water**
(IT, BE)



**PUC3: Transnational illegal trafficking
of waste electronic and electrical
equipment (Europe towards Sub-
Saharan countries)**



**PUC4: Illegal trade in ozone-depleting
substances & HFCs (RO)**



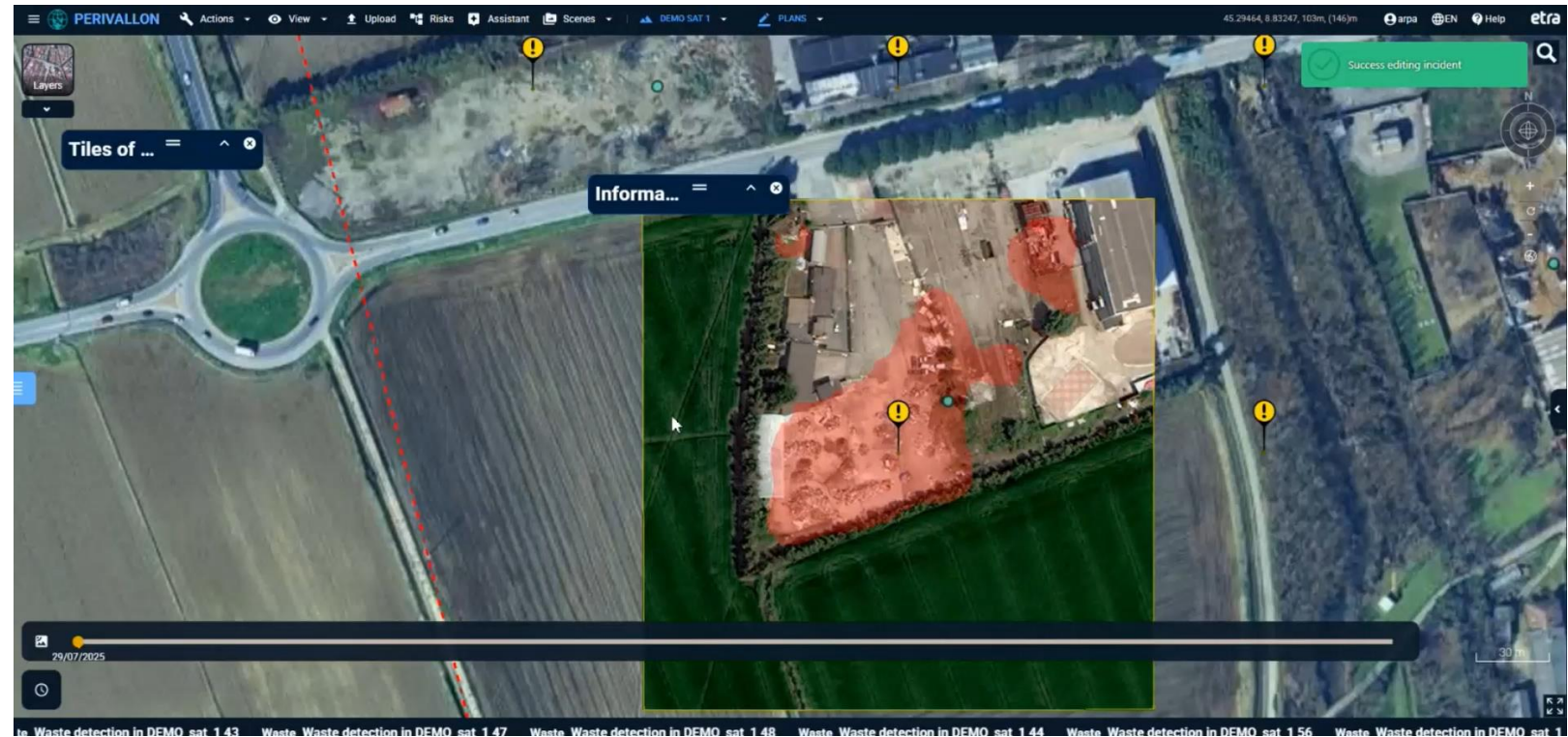
PUC 1: Illegal waste disposal detection

- Geospatial Analysis Through High-Altitude Sensors
- Maximised Surveillance Swarm Optimisation
- Optimised 3D Terrain Mapping
- Geospatial Analysis Through Low-Altitude Sensors



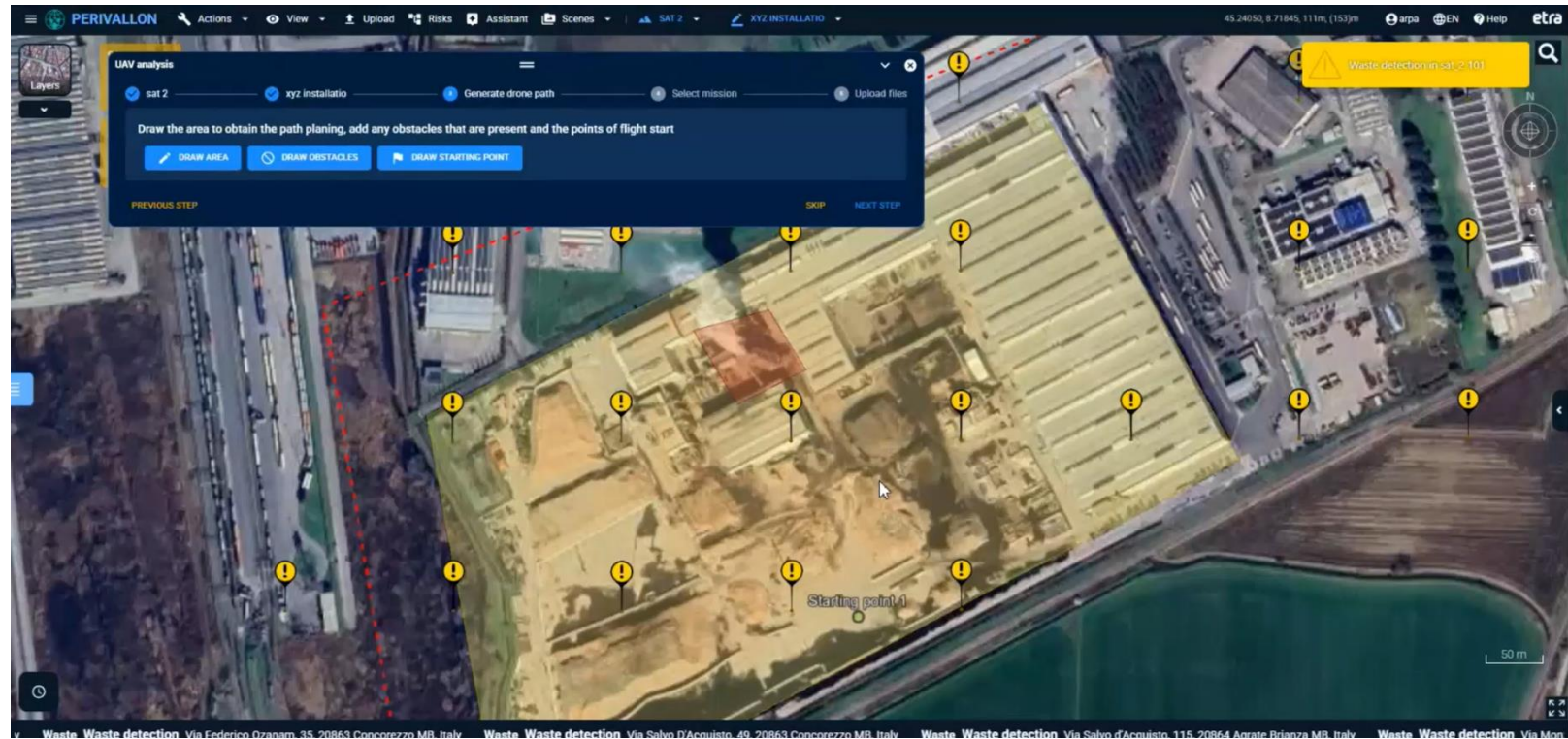
Geospatial Analysis Through High-Altitude Sensors PERIVALLON

- Exploration of satellite high and very high-resolution images for illegal landfills detection
- Incident validation and risk assessment
- Detection of 15 different types of waste



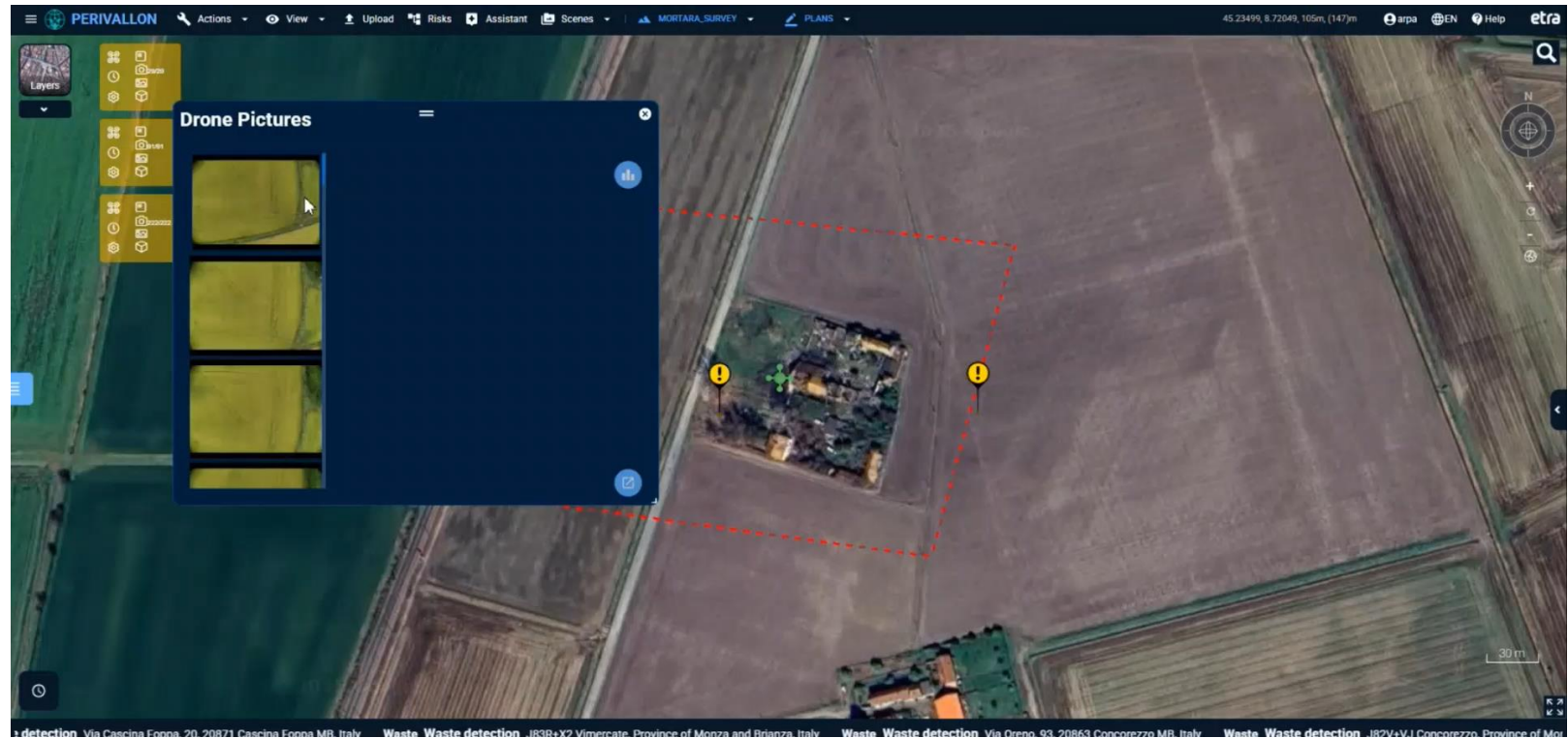
Maximised Surveillance Swarm Optimisation

- Landfill captures by a swarm of drones; balancing speed and accuracy, avoiding obstacles, and reaching inaccessible areas



Optimised 3D Terrain Mapping

- 3D photogrammetric reconstruction
- Waste volume prediction using 3D modelling
- Flat ground fitting
- Orthomosaic reconstruction



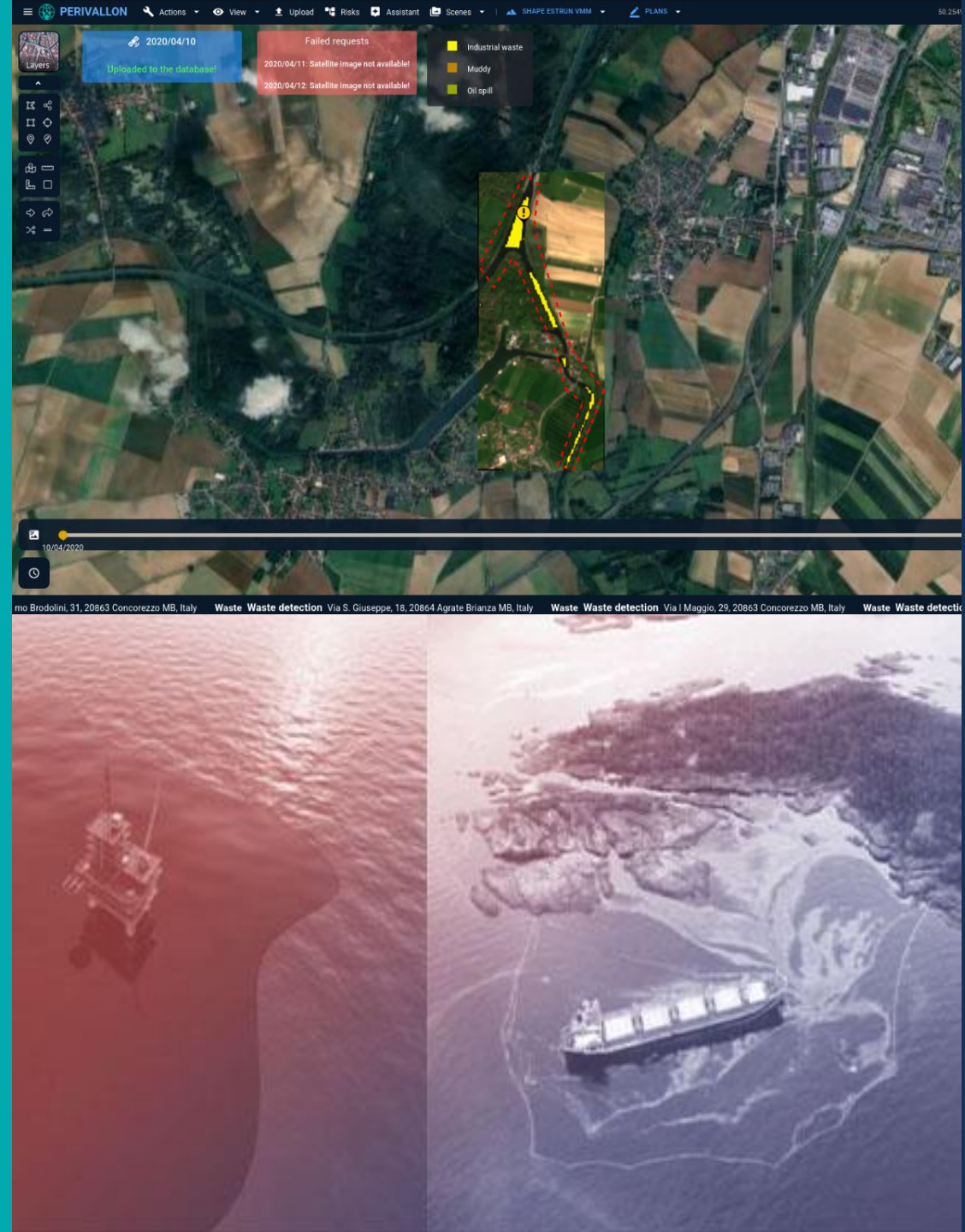
Geospatial Analysis Through Low-Altitude Sensors

- Waste detection through UAV imagery
- 20 materials are supported
- Volume estimations for each waste pile
- Report generation



PUC 2B: Intentional dumping of polluting substances in water

- Geospatial Analysis Through High-Altitude Sensors
- Predictive Analytics and Historical Incidents Exploration
- Geospatial Analysis Through Low-Altitude Sensors



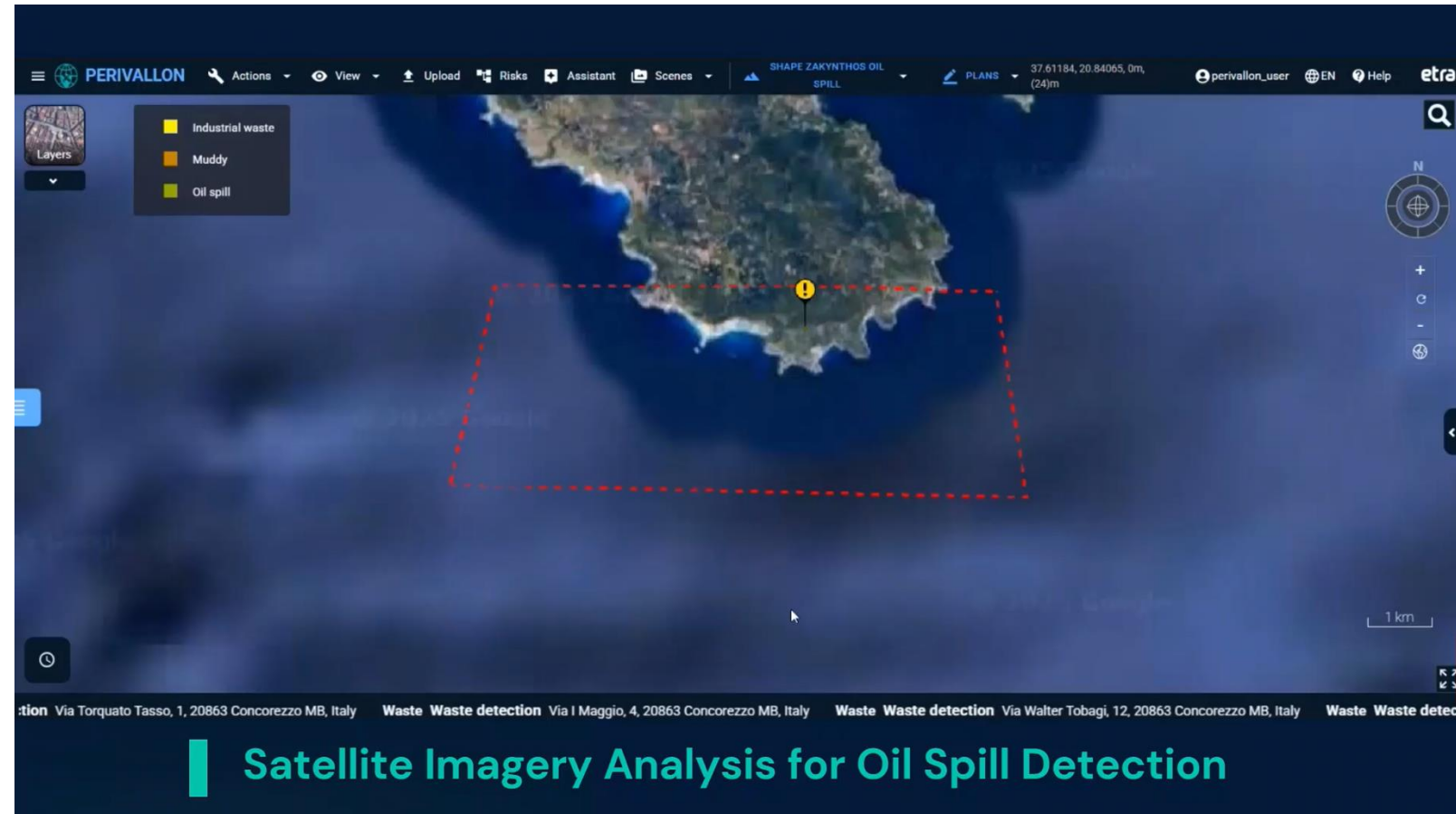
Satellite Imagery Analysis for Industrial Waste Detection

- Systematic analysis of satellite imagery for oil spill, industrial waste and muddy water detection



Satellite Imagery Analysis for Oil Spill Detection

- Systematic analysis of satellite imagery for oil spill, industrial waste, and muddy water detection



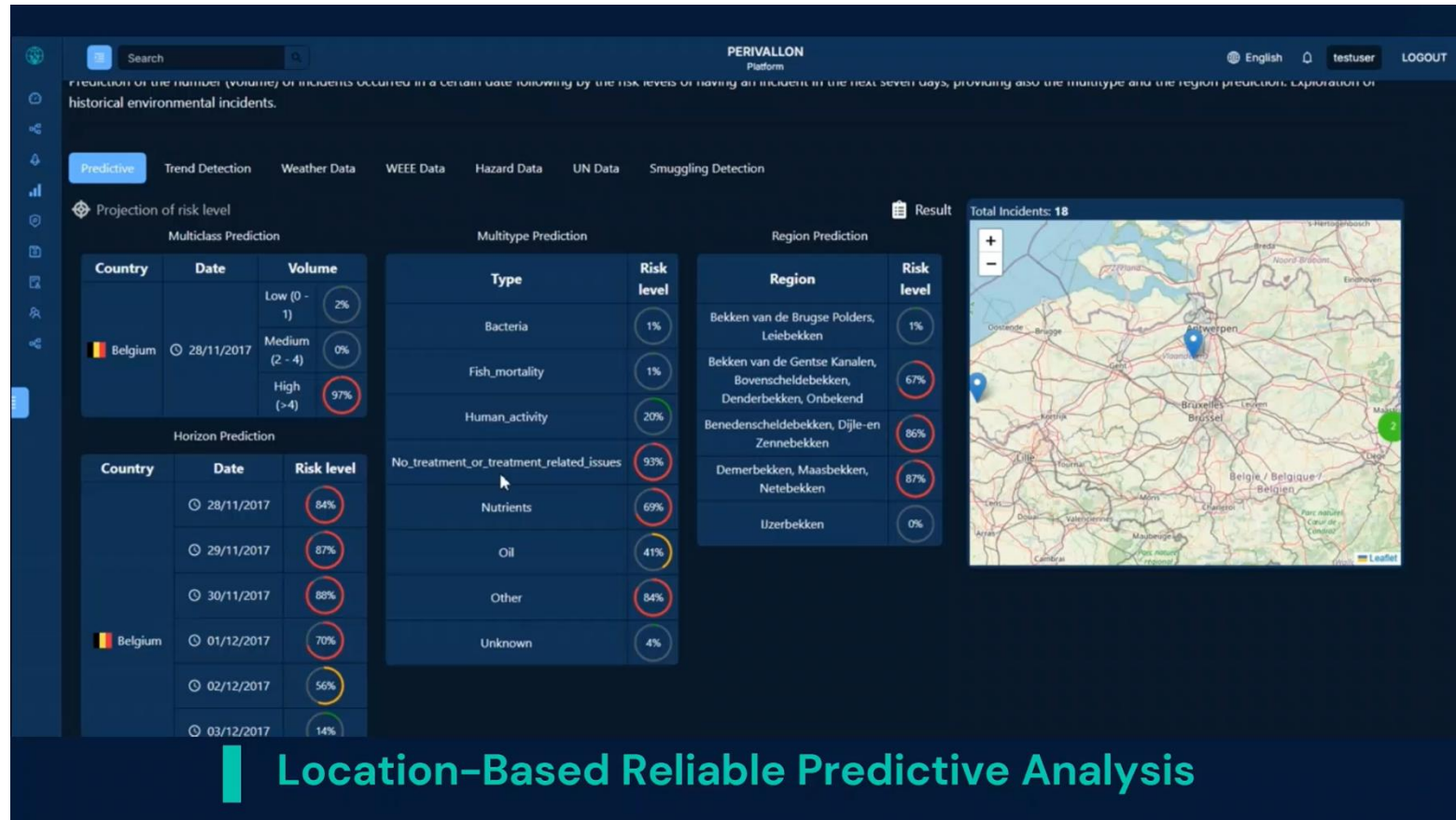
Oil Spill Spread Simulation

- Spread of contaminants simulation for open-sea and inland water bodies using bathymetric and meteorological data



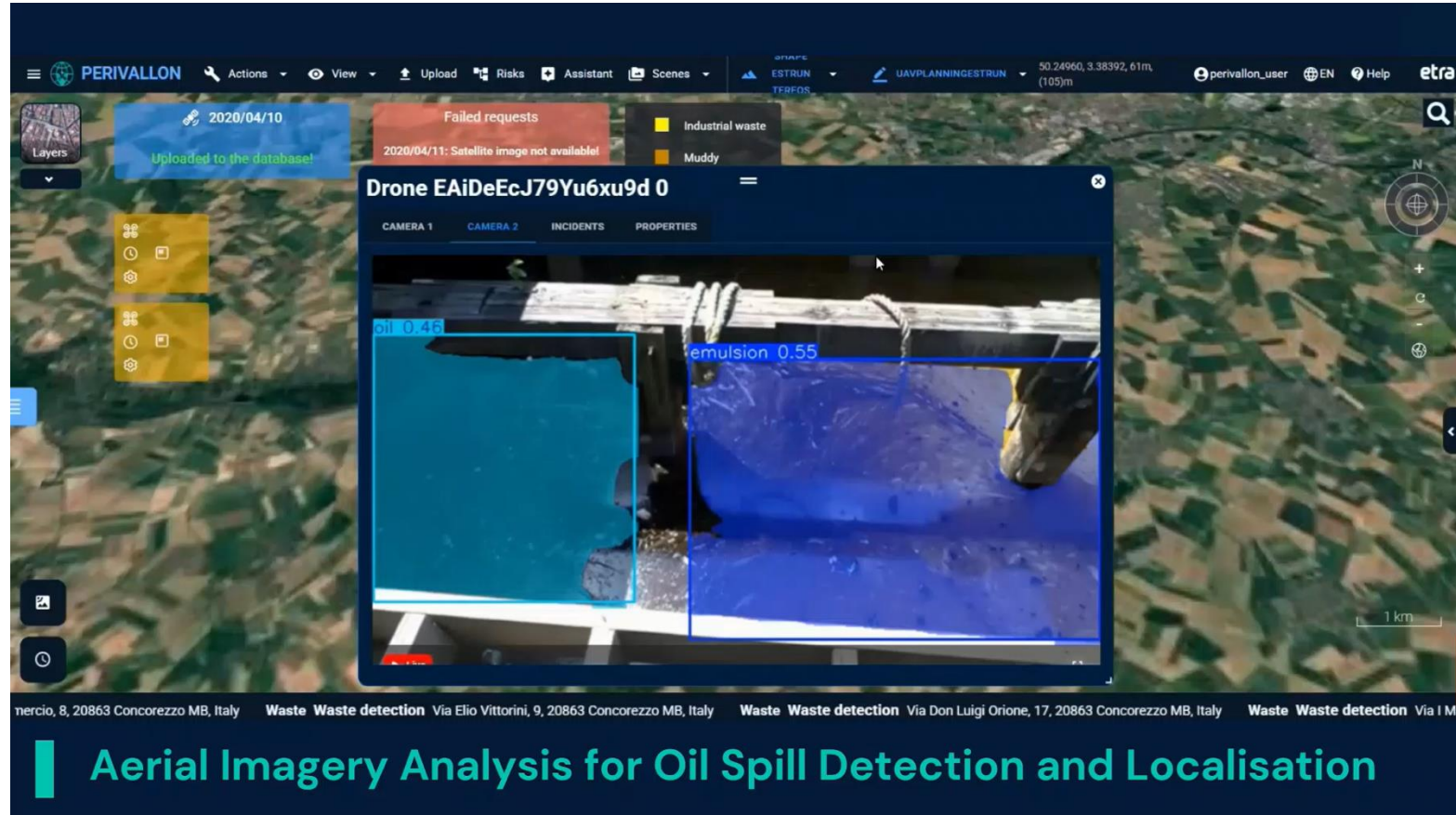
Predictive Analytics and Historical Incidents Exploration

- Location-Based reliable predictive analysis
- Historical Environmental incidents and risks exploration



Geospatial Analysis Through Low-Altitude Sensors PERIVALLON

- Real-time analysis of aerial imagery for the detection and localisation of: Oil spills, Emulsions, Sheens, Ships, and Oil platforms



PUC 3: Transnational illegal trafficking of waste electronic and electrical equipment

- Maritime Traffic Monitoring for Vessel Routes Detection
- Risk Assessment for Maritime Traffic Monitoring
- Trend Detection and Historical Routes Exploration
- Geospatial Analysis Through High-Altitude Sensors



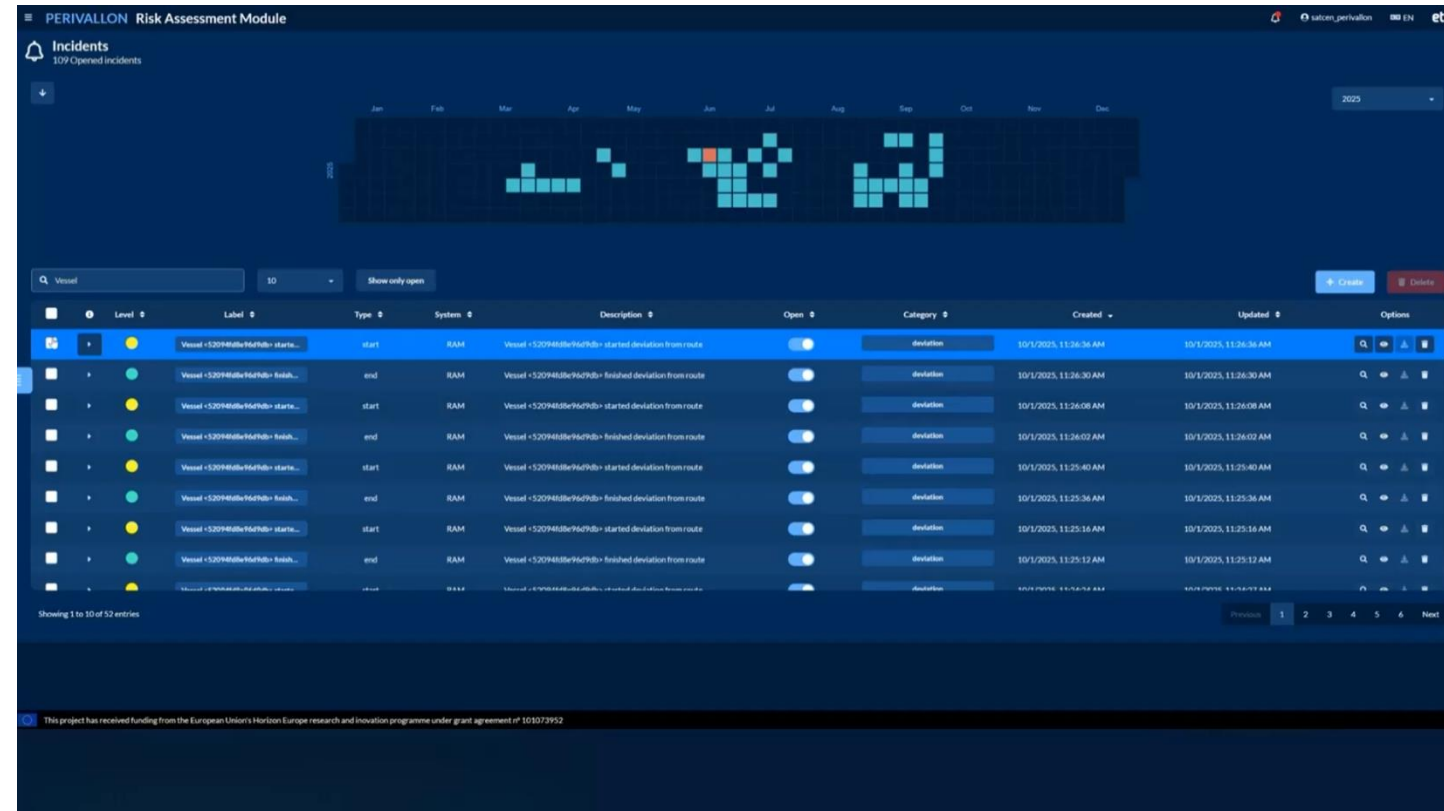
Maritime Traffic Monitoring for Vessel Routes Detection

- Maritime traffic monitoring vessels of interest
- Potential destinations of smuggling routes
- Exploration of the vessel's characteristics



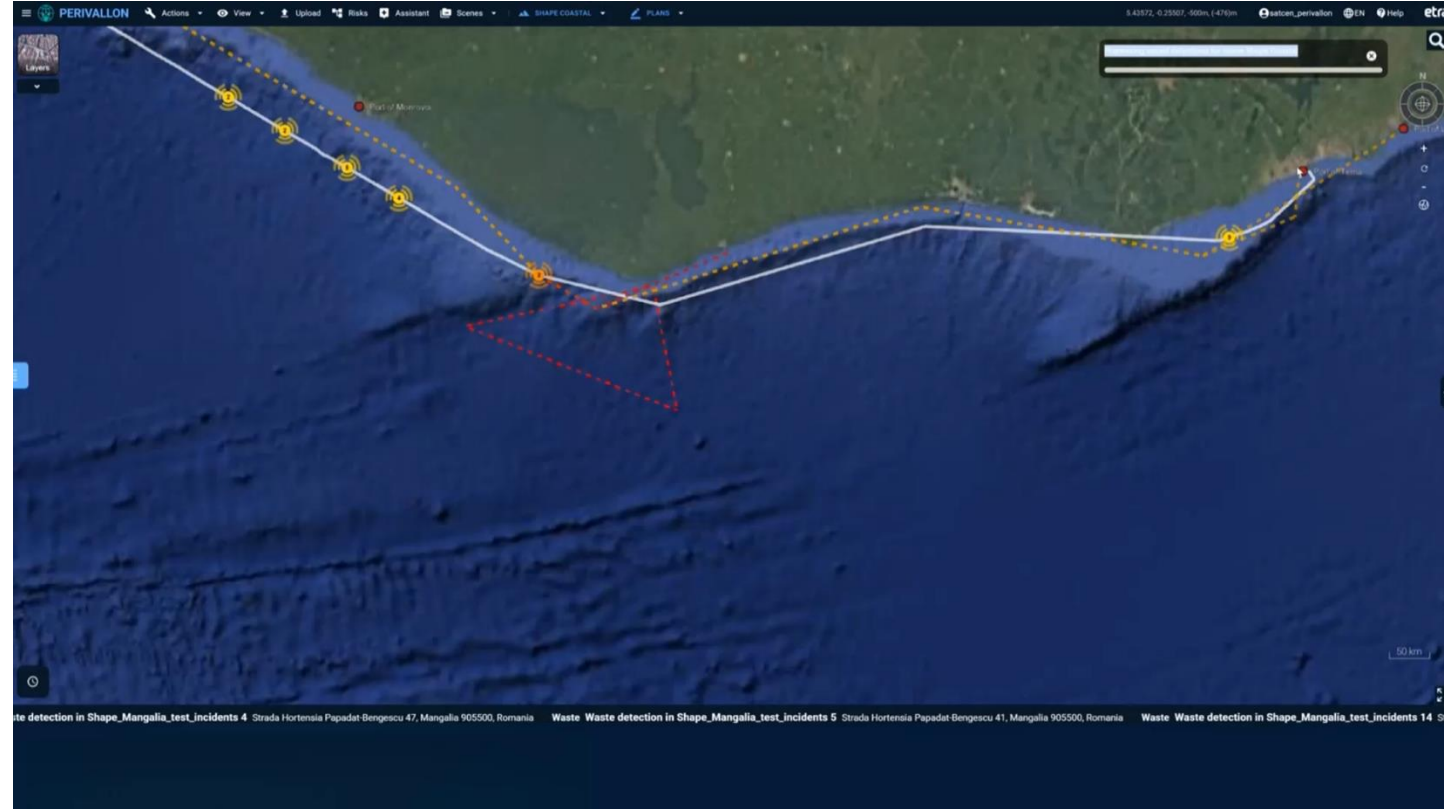
Vessel Routes Risk Assessment

- Historical incidents overview
- Risk assessment and prioritisation considering vessels' characteristics



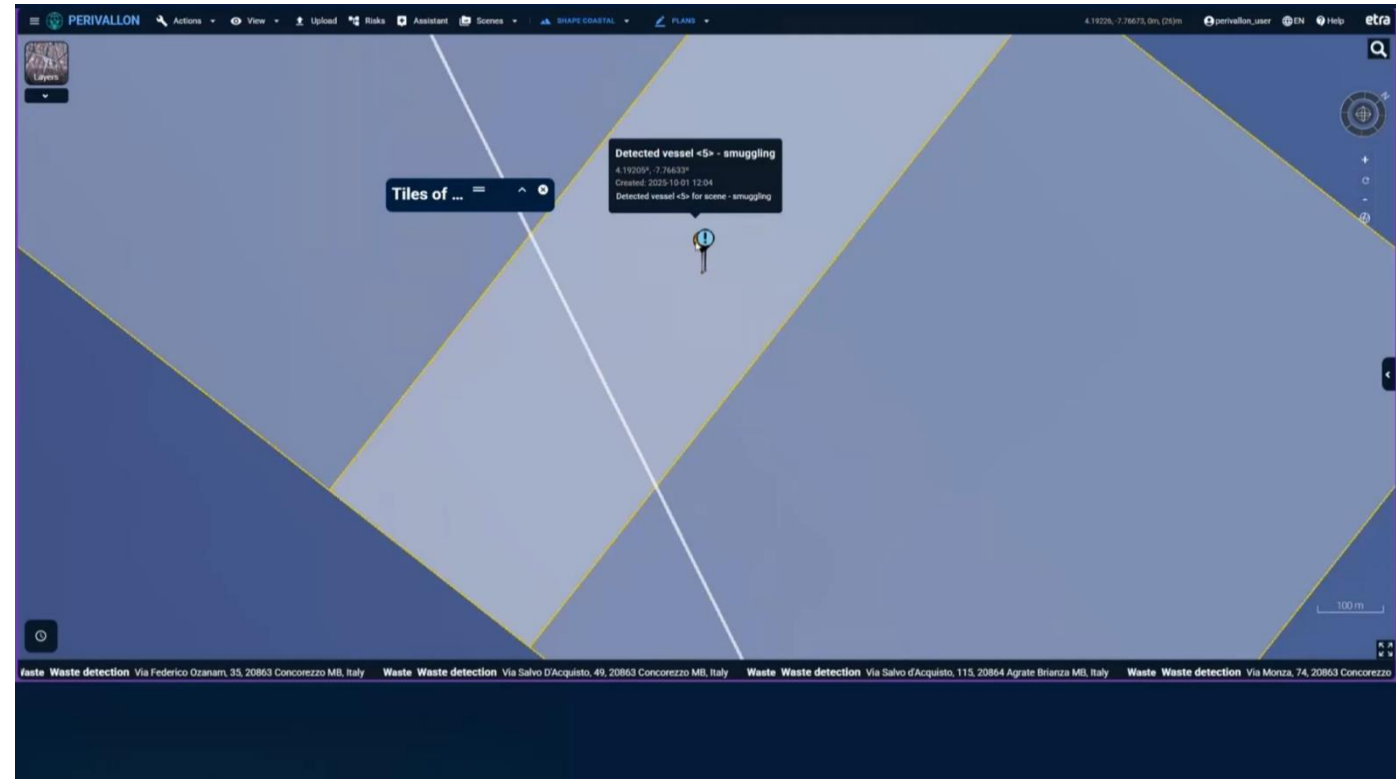
Trend Detection and Historical Routes Exploration

- Trend detection and historical routes exploration
- Identification of potential destination ports of a dark vessel
- Dark vessels historical routes exploration



Geospatial Analysis Through High-Altitude Sensors

- Sentinel-1 SAR analysis for vessel detection and gross tonnage estimation
- Satellite images and AIS data comparison for incident verification



PUC 4: Illegal trade in ozone-depleting substances & HFCs

- Online Content Acquisition Through PERIVALLON Platform
- Textual and Multimedia Analysis
- Trend Detection, Historical and Open Data Exploration
- On-site Analysis and Report Generation

Monitor keyword(s)

Enter keyword to monitor...

Add

CFC ×

HFC ×

Refrigerant ×

chlorofluoromethane ×

R404 ×

Max. numbers of items found (per keyword)

800



Extraction of listing page

Recognized Entities &
Disambiguation

Coreference resolution

ng to use Gumtree delivery or Payments on Gumtree because Gumtree doesn't offer these services currently. Requests from Whatsapp or SMS could be scams""Only access Gumtree from gumtree.com and do not follow links sent by other users""Share photos and ask lots of questions about the items you are buying and selling""If an ad or reply sounds too good to be true, it probably is""Use the Reply to ad button for your safety and privacy""Don't reply to email addresses hidden in text and pictures""Trade in person, use PayPal paying for an item or service to transfer money""Beware of fake Gumtree, eBay or escro

Analysed image



Score detection 95.67%
Grouped No
Material Metal
Size Short
Orientation Standing
Text 12.3 FLO GAS M21

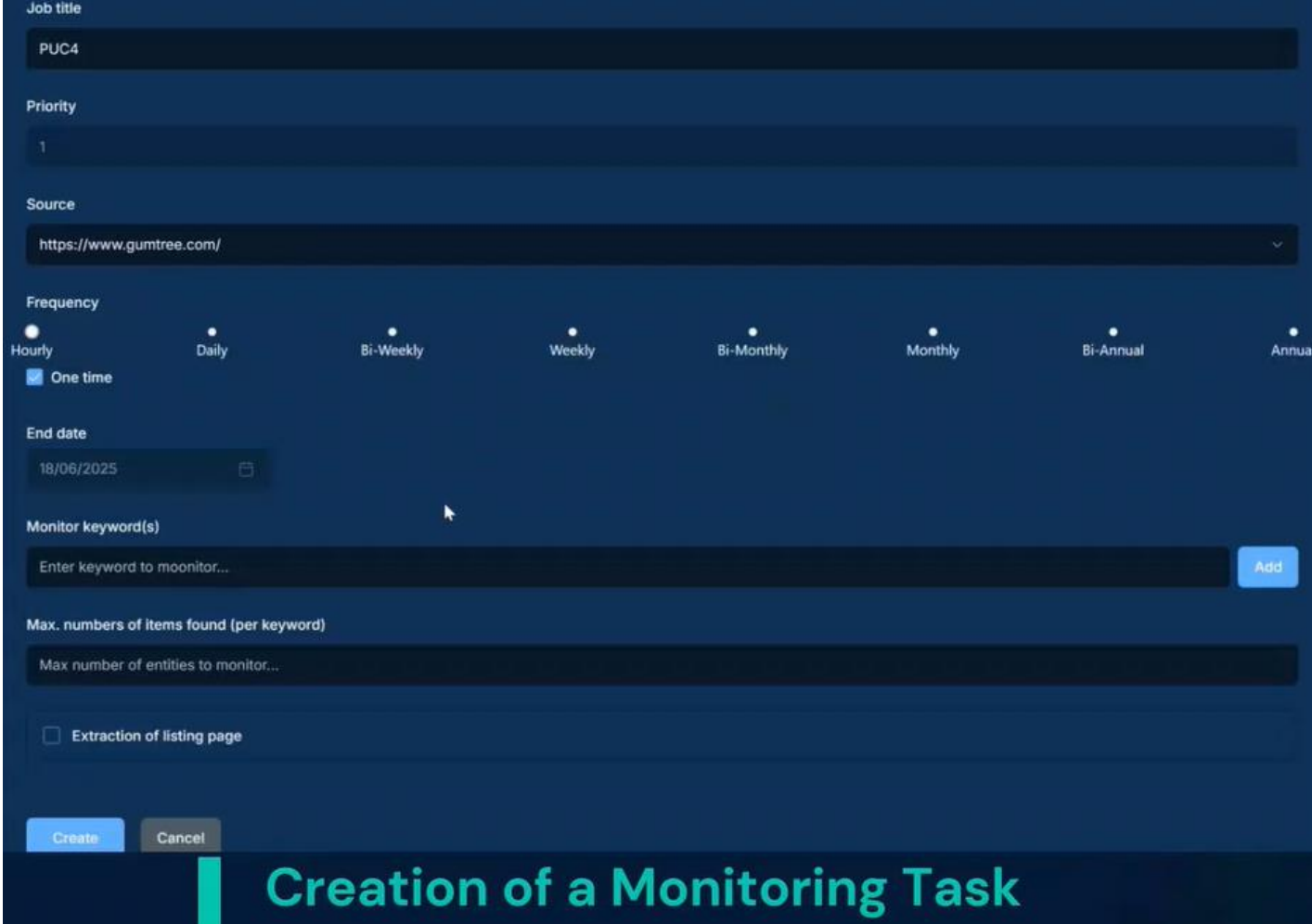
Analysed image



Score detection 92.48%
Grouped No
Material Metal
Size Short
Orientation Standing
Text Isobutane Mix CAMPINGAZ

Content Acquisition tool

- Multiple data sources, e.g., eBay, Gumtree
- Periodically collect
- Adaptable levels of Crawling
- Deep vs shallow
- Prioritisation
- Keywords filtering



The screenshot displays a web form for creating a monitoring task. The form includes the following fields and options:

- Job title:** A text input field containing "PUC4".
- Priority:** A text input field containing "1".
- Source:** A dropdown menu showing "https://www.gumtree.com/" with a downward arrow.
- Frequency:** A row of radio buttons for "Hourly", "Daily", "Bi-Weekly", "Weekly", "Bi-Monthly", "Monthly", "Bi-Annual", and "Annual". Below this row is a checked checkbox for "One time".
- End date:** A date input field showing "18/06/2025" with a calendar icon.
- Monitor keyword(s):** A text input field with the placeholder "Enter keyword to moonitor..." and an "Add" button.
- Max. numbers of items found (per keyword):** A text input field with the placeholder "Max number of entities to monitor..."
- Extraction of listing page:** An unchecked checkbox.
- Buttons:** "Create" and "Cancel" buttons at the bottom left.

Creation of a Monitoring Task

Risk Assessment Across Monitoring Tasks

- Five levels of severity
- Considering the results from multimedia analysis

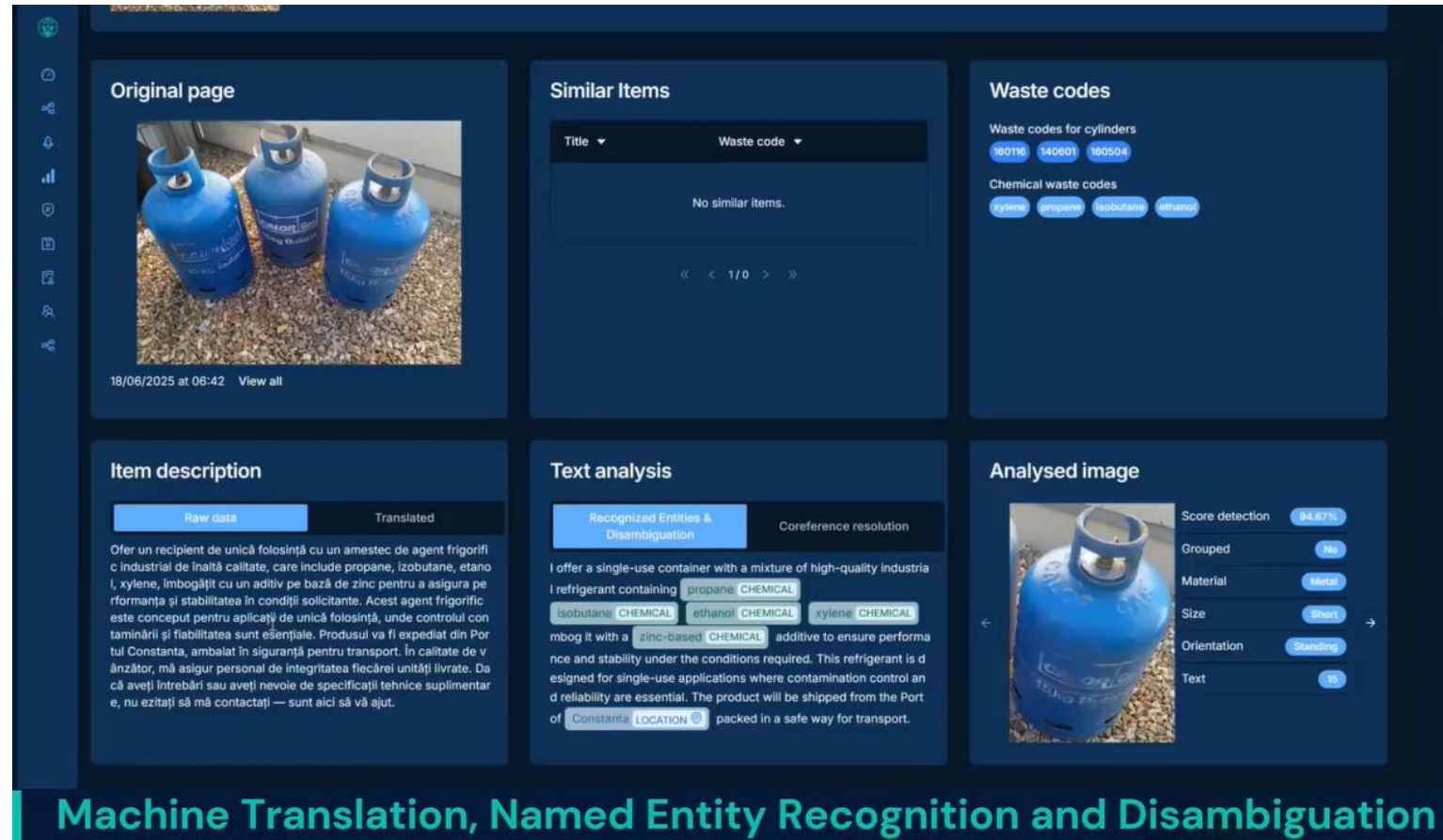
The screenshot displays the PERIVALLON Risk Assessment interface. At the top, a summary bar shows the start date/time (6/18/2025, 9:36 AM), source (https://www.gumtree.com/), total items (5), status (Adhoc), and overall risk (Medium). Below this, the 'Collected items' section features a search bar and a table of items. The table has columns for Title, Waste code, and Overall risk. The items listed are: Gas barbeque large (No risk), Campingaz bottles with gas 904 907 (No risk), Grillstream GSC20MG Two Burner Gas BBQ (Low), Gas fire pit (Low), and Bbq grill rotisserie parts for charcoal or gas (Medium). To the right, the 'Recognized Entities' section shows 'Chemical' (charcoal) and 'Product' (rotisserie, grill) tags, along with an 'Explore trend analysis' button. At the bottom, a teal banner reads 'Risk Assessment on Retrieved Items'.

Title	Waste code	Overall risk
Gas barbeque large	No	No risk
Campingaz bottles with gas 904 907	Yes	No risk
Grillstream GSC20MG Two Burner Gas BBQ	No	Low
Gas fire pit	No	Low
Bbq grill rotisserie parts for charcoal or gas	Yes	Medium

Risk Assessment on Retrieved Items

Machine Translation and Textual Analysis

- More than 100 supported languages for translation
- Recognition of Named Entities, Concepts, and Chemicals
- Entity disambiguation

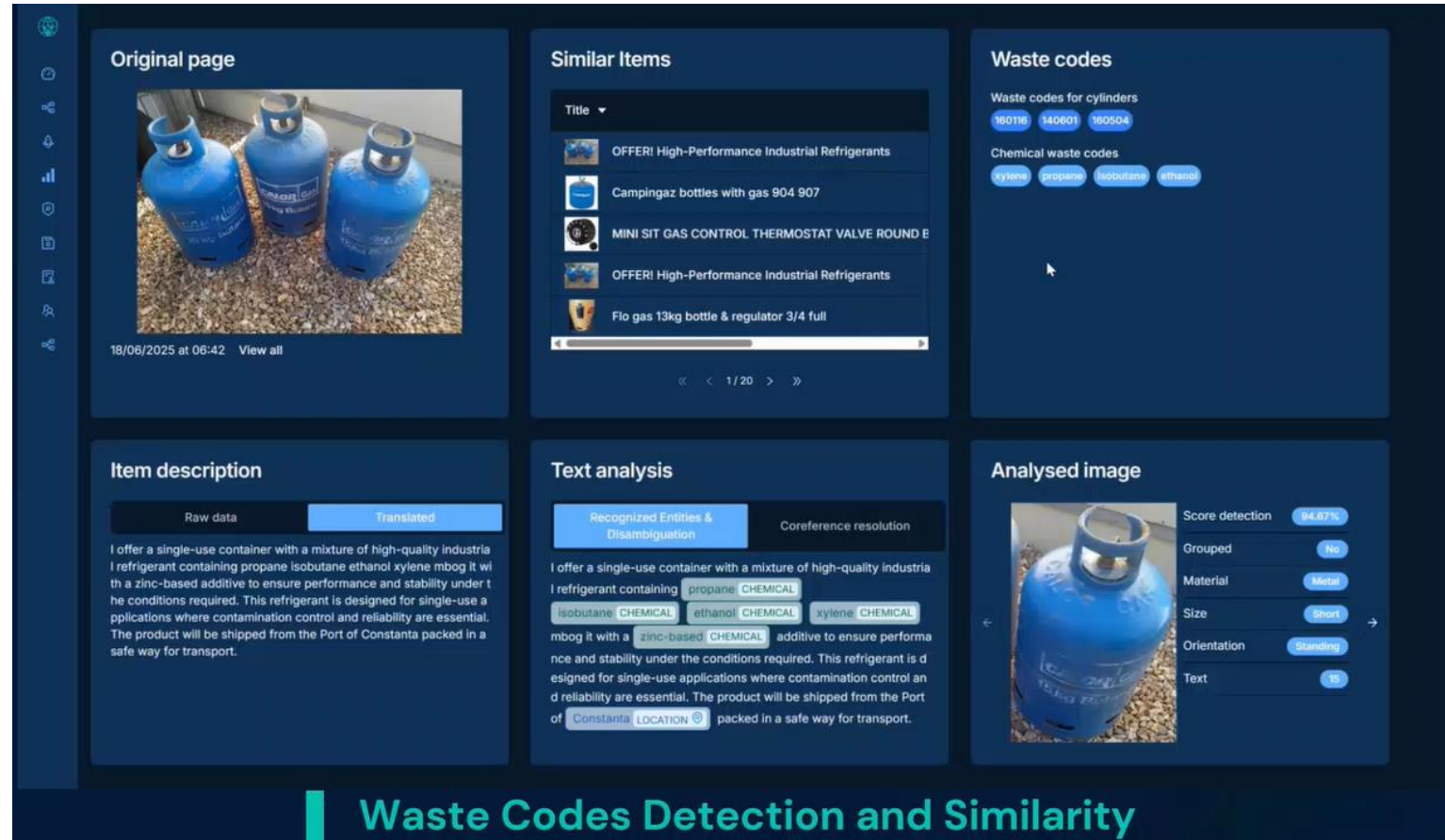


The screenshot displays the PERIVALLON web application interface, which is divided into several panels for analyzing a document. The top-left panel, titled "Original page", shows a photograph of three blue propane cylinders. The top-right panel, "Similar Items", is currently empty, displaying "No similar items." The middle-right panel, "Waste codes", lists codes for cylinders (160116, 140601, 160504) and chemical waste codes (xylene, propane, isobutane, ethane). The bottom-left panel, "Item description", shows the original Romanian text and its English translation. The bottom-middle panel, "Text analysis", displays recognized entities and disambiguation results, such as "propane: CHEMICAL", "isobutane: CHEMICAL", "ethanol: CHEMICAL", "xylene: CHEMICAL", and "Constanta: LOCATION". The bottom-right panel, "Analysed image", shows a processed image of a cylinder with various attributes like "Score detection: 94.67%", "Material: Metal", "Size: Short", and "Orientation: Standing".

Machine Translation, Named Entity Recognition and Disambiguation

Similarity Search and Waste Code Mapping

- Chemicals mapping to waste codes according to EWC
- Retrieval of similar items according to detected waste codes



The screenshot displays the PERIVALLON web application interface, which is organized into several panels:

- Original page:** Shows a photograph of three blue gas cylinders on a gravel surface. Below the image, it indicates the date and time: "18/06/2025 at 06:42" and a "View all" link.
- Similar Items:** A list of items retrieved based on the original image. The items include:
 - OFFER! High-Performance Industrial Refrigerants
 - Campingaz bottles with gas 904 907
 - MINI SIT GAS CONTROL THERMOSTAT VALVE ROUND B
 - OFFER! High-Performance Industrial Refrigerants
 - Flo gas 13kg bottle & regulator 3/4 full
- Waste codes:** Displays waste codes for cylinders: 160116, 140601, and 160504. It also shows chemical waste codes: xylene, propane, isobutane, and ethanol.
- Item description:** A section with two tabs: "Raw data" and "Translated". The "Translated" tab is active, showing a description of a single-use container with a mixture of high-quality industrial refrigerant containing propane, isobutane, ethanol, and xylene. It mentions a zinc-based additive and states that the product will be shipped from the Port of Constanta.
- Text analysis:** A section with two tabs: "Recognized Entities & Disambiguation" and "Coreference resolution". The "Recognized Entities & Disambiguation" tab is active, showing the same text as the "Translated" tab, but with entities highlighted in boxes: propane, isobutane, ethanol, xylene, zinc-based, and Constanta.
- Analysed image:** A section showing the analyzed image of the gas cylinder. To the right of the image, there are several detection metrics:
 - Score detection: 94.67%
 - Grouped: No
 - Material: Metal
 - Size: Short
 - Orientation: Standing
 - Text: 15

At the bottom of the interface, there is a green banner with the text: **Waste Codes Detection and Similarity**

Cylinder Detection and Label Extraction

- Detection of Cylinders and their attributes (size, material, orientation)
- Extraction of labels for the detected cylinders using OCR

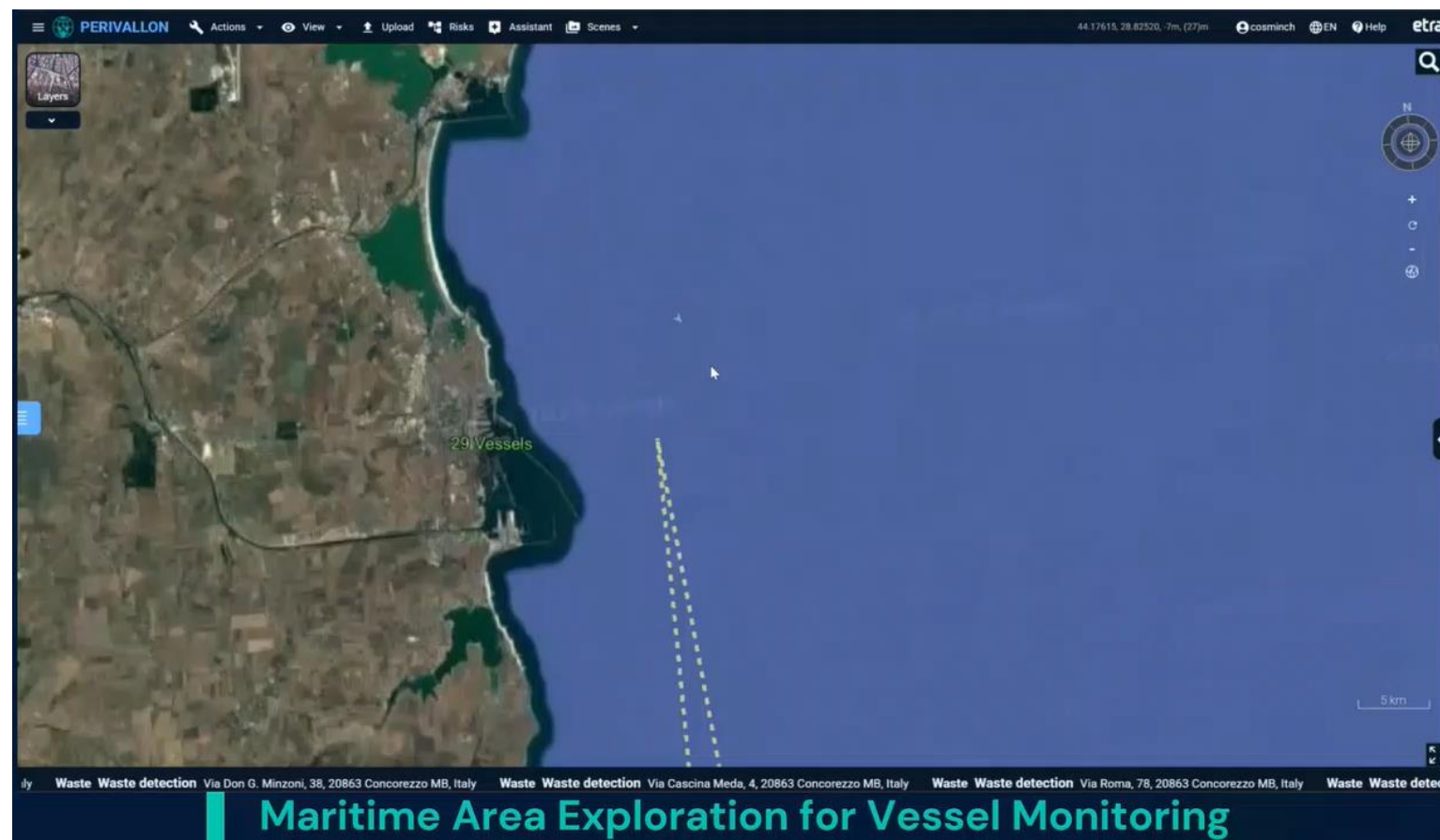
The screenshot displays the PERIVALLON web application interface, which is organized into several panels. On the left, a vertical sidebar contains icons for navigation. The main content area is divided into six panels:

- Original page:** Shows a photograph of three orange gas cylinders. Below the image, it displays the date and time '17/06/2025 at 11:27' and a 'View all' link.
- Similar Items:** Features a search bar with 'Title' and 'Waste code' dropdowns. Below the search bar, it states 'No similar items.' and includes pagination controls showing '1/0'.
- Waste codes:** Lists 'Waste codes for cylinders' with three buttons: '160116', '140601', and '160504'.
- Item description:** Contains two tabs: 'Raw data' (selected) and 'Translated'. Below the tabs, it shows the text 'CALOR 47 kg GAS BOTTLES x 3'.
- Text analysis:** Includes two tabs: 'Recognized Entities & Disambiguation' (selected) and 'Coreference resolution'. Below the tabs, it states 'No recognized entities found.'
- Analysed image:** Shows a single orange gas cylinder. To its right, there are several attributes with corresponding buttons: 'Score detection' (95.77%), 'Grouped' (No), 'Material' (Metal), 'Size' (Short), 'Orientation' (Standing), and 'Text' (CALOR).

At the bottom of the interface, a teal banner contains the text 'Cylinder Detection and Label Extraction'.

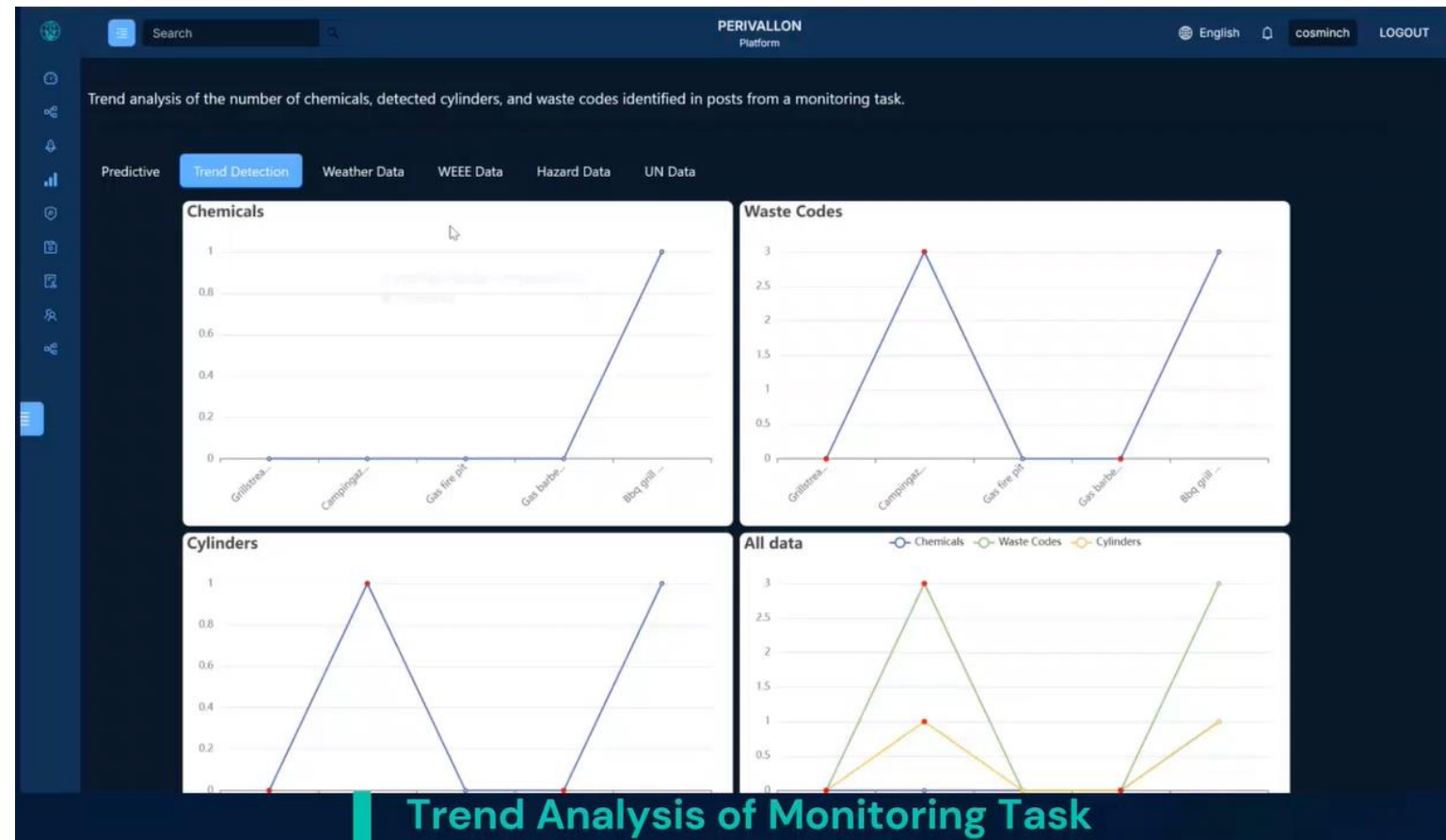
Maritime Area Exploration for Vessel Monitoring

- Maritime area monitoring for vessel route detection



Trend Analysis of Monitoring Tasks

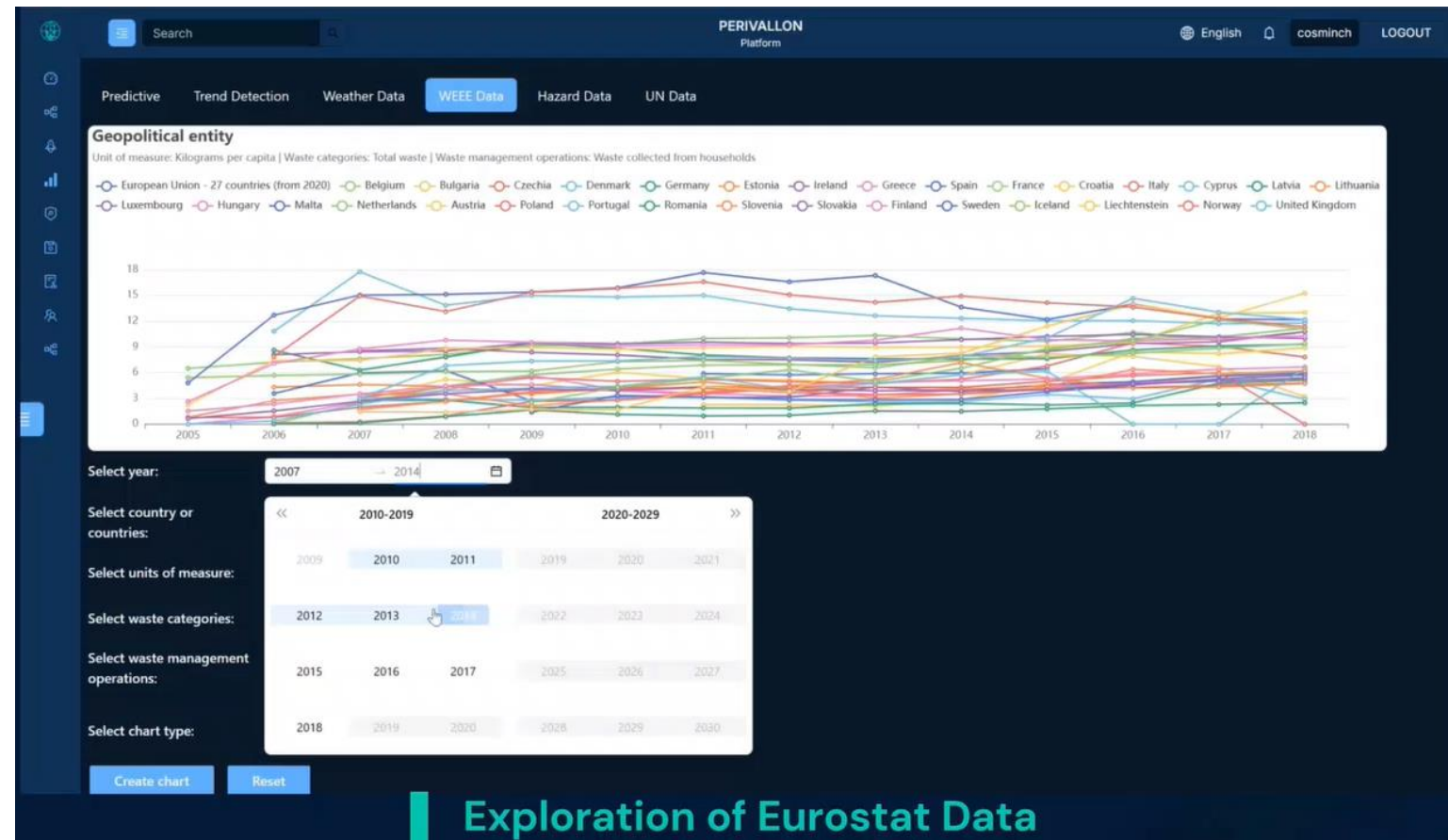
- Trend detection on monitoring tasks leveraging the detected chemicals, objects and the mapped waste codes



Eurostat Data Harvester

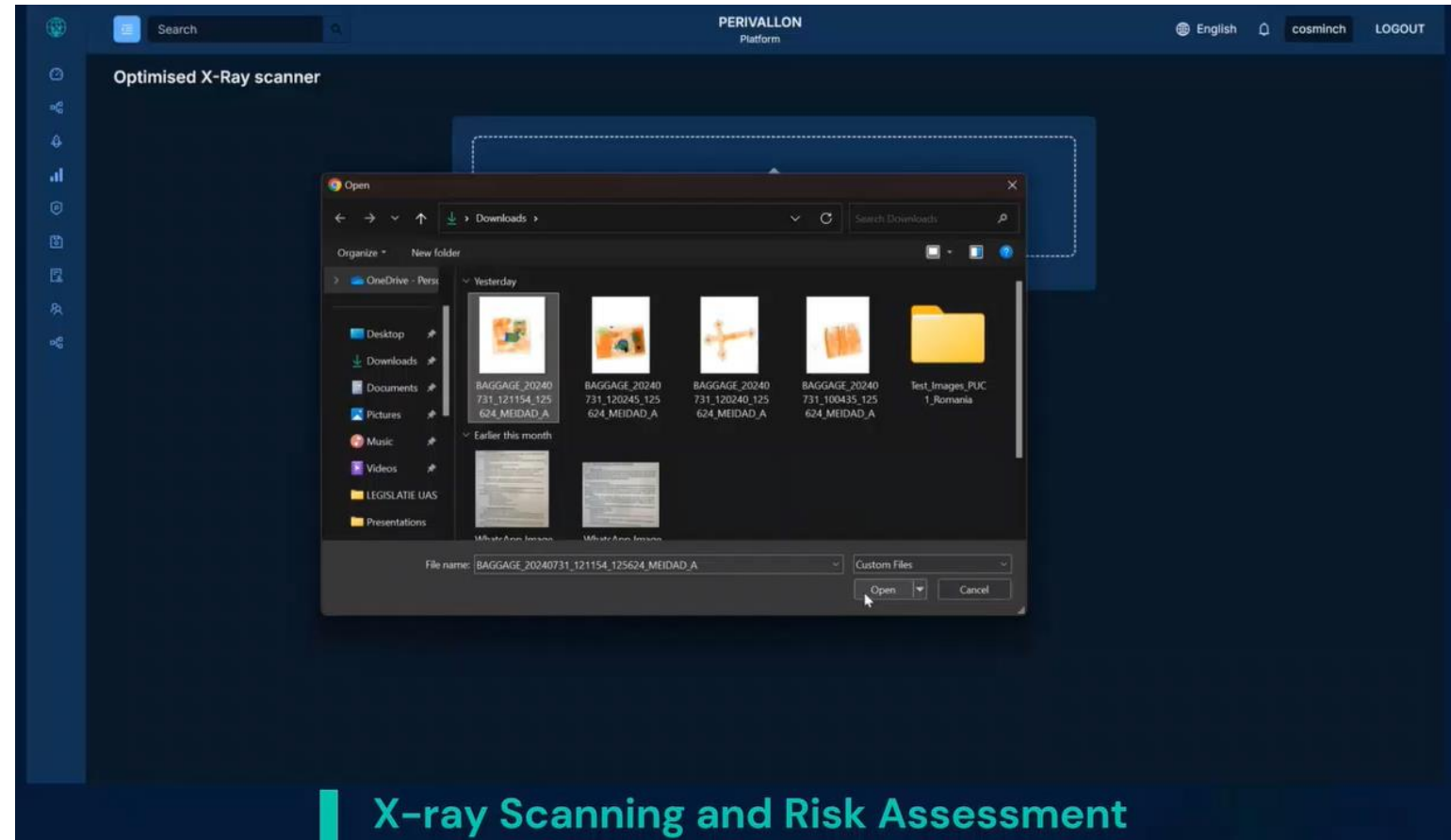
WEEE data harvester supporting:

- Country-based search
- Time (year) based search
- Various chart types
- Various waste categories



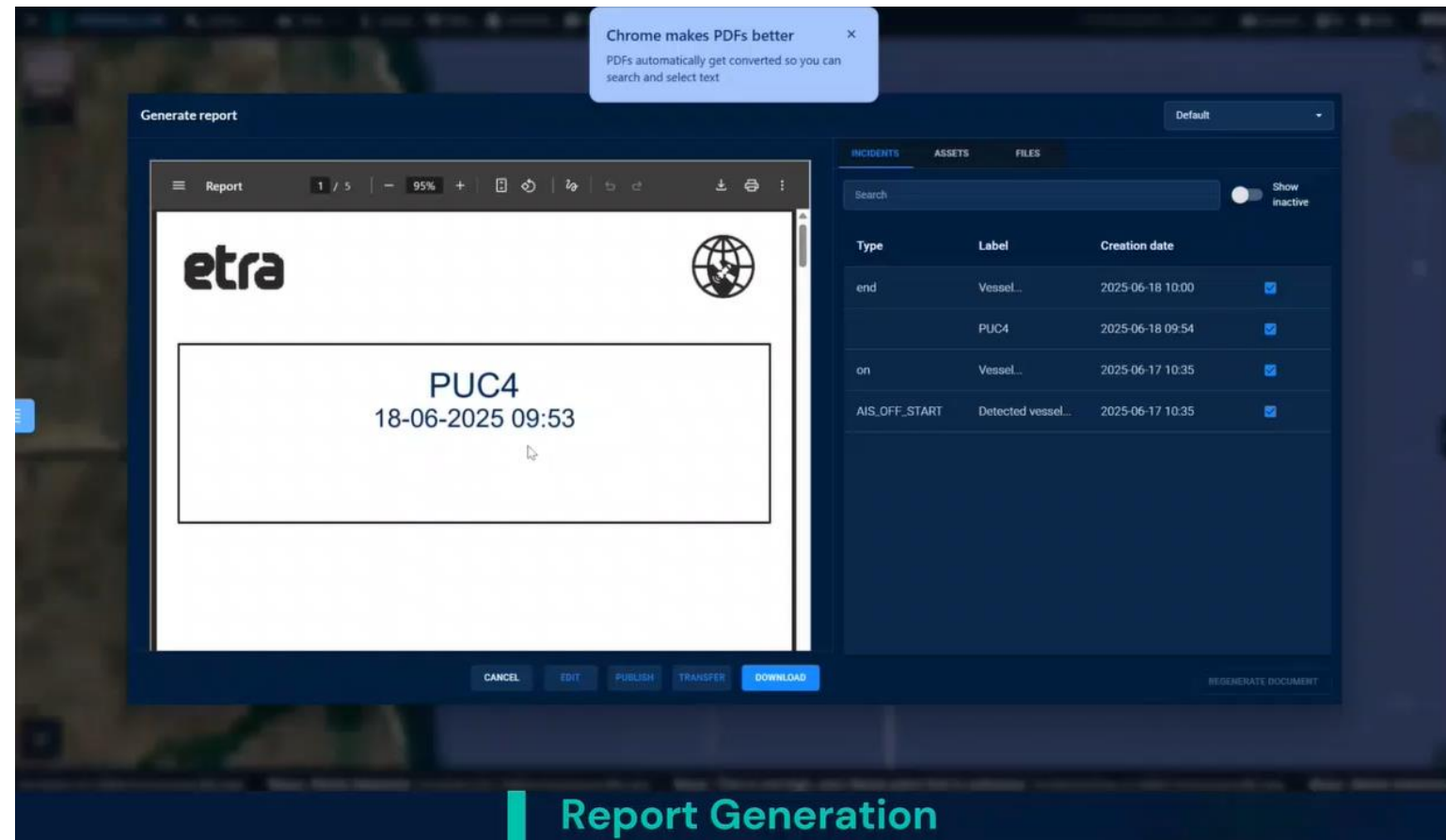
X-ray Scanning And Risk Assessment

- Detection of cylinder-related objects by analysing X-ray imagery
- Risk assessment considering the detection confidence score



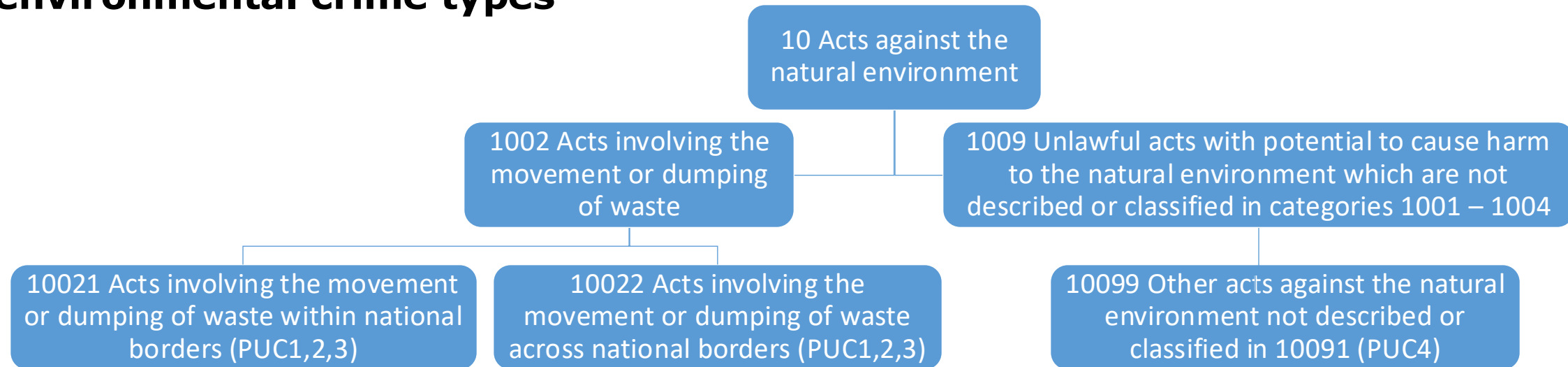
Report Generation

- Generate reports for secure sharing
- Selection capabilities for content inclusion - ranging from the detected images to map snippets



Environmental Crime Observatory

- The developed detection modules of the PERIVALLON platform could detect a list of **hazardous** waste according to the European Waste Catalogue (EWC):
 - 99 unique waste codes belong to 26 unique sub-categories from
 - 19 unique categories covering eight fields of activities
- According to the International Classification of Crime for Statistical Purposes (ICCS), the collection of the 99 waste codes has been further mapped to **environmental crime types**



PERIVALLON 

Thank you!



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