

COASTAL MARINE LITTER OBSERVATORY CMLO

CMLO Manual

Scidrones
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REVISION HISTORY

Version	Date	Author	Description of Changes
1.0	2025-09-16	Scidrones	Initial release
	2026-05-18	Scidrones	

1. Introduction

CMLO is a web-based platform designed to detect, map, and monitor marine litter in coastal zones using Unmanned Aerial Systems (UAS) and machine learning.

Users upload drone images to the platform in the form of flights. Once uploaded, the system generates pseudo-mosaics and automatically detects artificial litter across seven litter categories. Following detection, CMLO produces litter density reports and maps to support monitoring and decision-making.

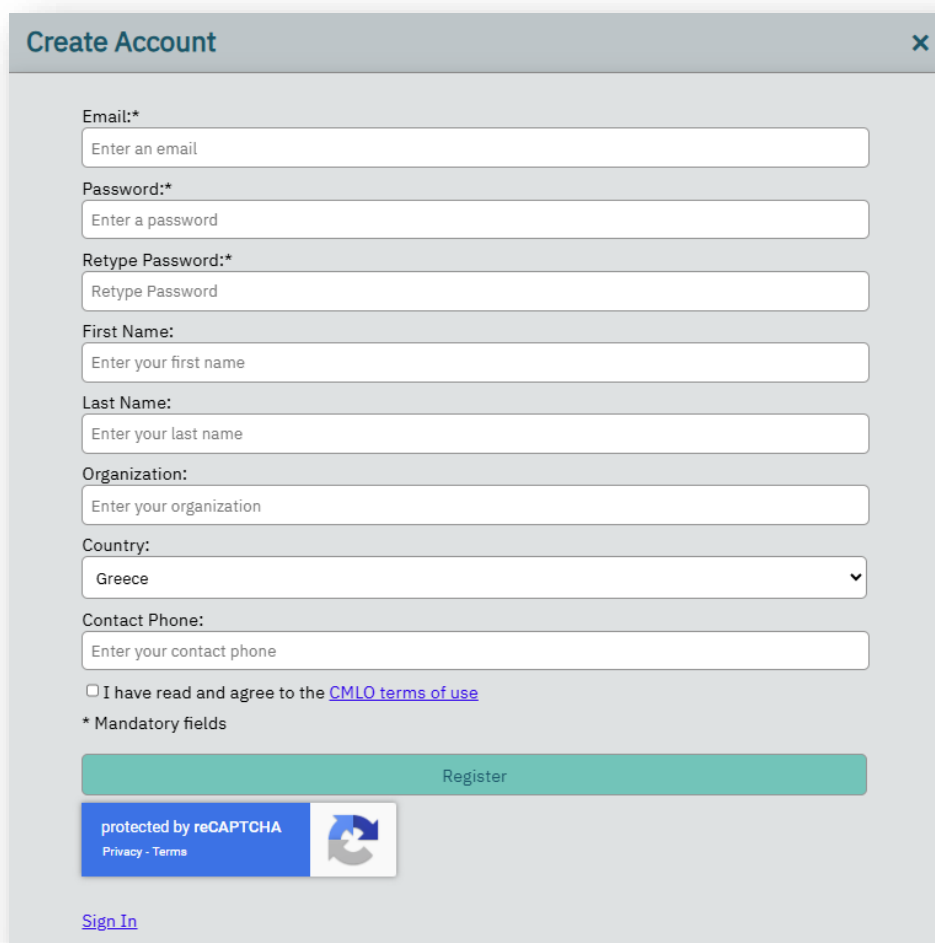
To ensure privacy, all uploaded data undergoes an advanced anonymization process before any analysis or processing takes place.

Keywords: marine litter, coastal areas, litter density, drone imagery.

2. User Registration

To gain access to CMLO's functionality, a user must first register.

- Registration is initiated by clicking the "User" button on the top bar, which opens the login and registration panel.
- To register, the user must provide a valid email address and a password, and accept CMLO's Terms of Use.
- After submission, a confirmation email is sent to the provided address. The user must click the included link to complete the registration process.



The screenshot shows a 'Create Account' form with the following fields and elements:

- Email:*** Text input field with placeholder 'Enter an email'.
- Password:*** Text input field with placeholder 'Enter a password'.
- Retype Password:*** Text input field with placeholder 'Retype Password'.
- First Name:** Text input field with placeholder 'Enter your first name'.
- Last Name:** Text input field with placeholder 'Enter your last name'.
- Organization:** Text input field with placeholder 'Enter your organization'.
- Country:** Dropdown menu with 'Greece' selected.
- Contact Phone:** Text input field with placeholder 'Enter your contact phone'.
- I have read and agree to the [CMLO terms of use](#)
- * Mandatory fields
- Register** button (teal)
- protected by reCAPTCHA (blue box with reCAPTCHA logo and links for Privacy - Terms)
- [Sign In](#) link (blue)

Once registered, the user can log in:

- The user enters their registered email and password.
- For security, a one-time token is also sent to the user's email. This token must be entered to complete the login process.

Sub-User Management (optional)

CMLO supports a hierarchy of accounts to facilitate organizational use:

- Each organization has one super-user ("administrator" account).
- The super-user can create and manage sub-users ("children" accounts).

Sub-user functionality is particularly useful for organizations with multiple contributors uploading data.

Permissions:

- The super-user can view and manage all flights created by sub-users.
- Each sub-user can only view and manage their own flights.
- A user has the option to make their flight public to the organization.

3. Application Interface

3.1 Top bar

3.1.1 Edit Account

The Edit Account panel allows users to manage their personal account, application-related settings, and (when applicable) organization-related sub-user accounts via separate sections.

Account Management

- Edit account details: Update personal information and user-related attributes.
- Change password: Set a new password for your account.
- Delete account: Permanently remove your CMLO account.

Application Settings

In this section, users can define default application options, such as:

- Default basemap
- AI default confidence level
- Other CMLO preferences

Sub-User Management

In this section a super-user (organization “administrator”) can create and manage sub-users (“children”).

Edit Account [Close]

Profile Settings Group Delete

Email:*
superviewer

Change Password

First Name:
superviewer

Last Name:
superviewer

Organization:
Scidrones

Country:
Greece

Contact Phone:
Enter your contact phone

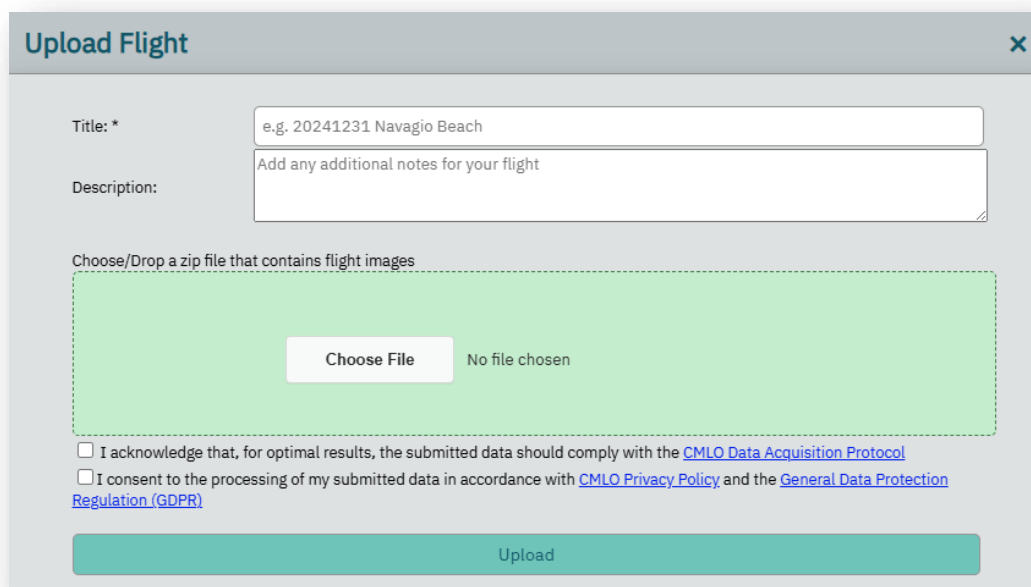
Update Account Profile

3.1.2 Flight Upload

The Flight Upload panel is a core CMLO functionality. It allows users to upload flights (i.e., drone imagery) for processing.

Uploading a Flight

1. Open the Flight Upload panel.
2. Enter a Flight Title.
3. Select a ZIP file containing the drone imagery.
 - There is no limitation on the number of images.
 - The internal folder structure inside the ZIP file does not matter (images may also be stored in subdirectories).
 - The only requirement is that the images follow the CMLO Data Acquisition Protocol provided in the panel.
4. Accept the following by checking the corresponding boxes:
 - CMLO Data Acquisition Protocol
 - CMLO Privacy Policy & GDPR Regulation
5. Click Upload to begin the process.



The screenshot shows the 'Upload Flight' panel with the following fields and options:

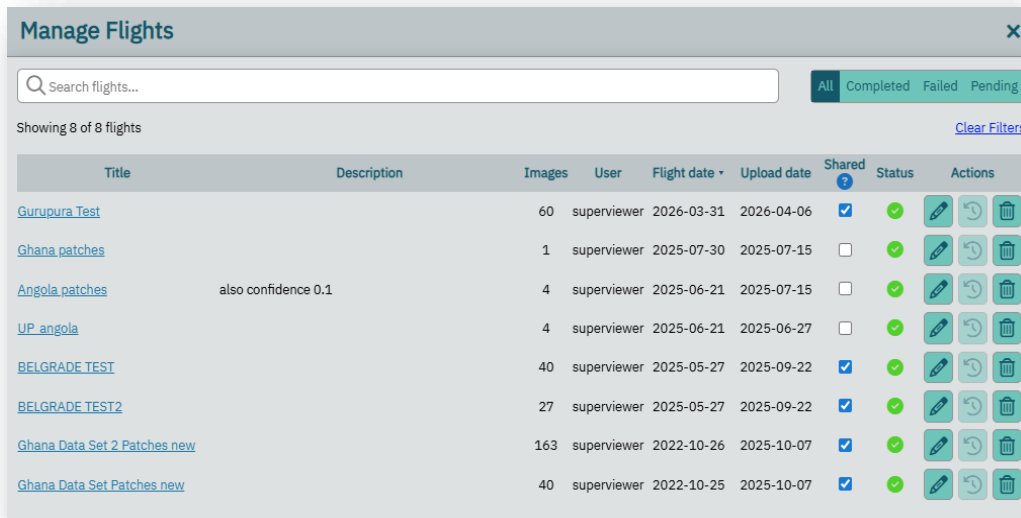
- Title:** * e.g. 20241231 Navagio Beach
- Description:** Add any additional notes for your flight
- File Selection:** Choose/Drop a zip file that contains flight images. A green dashed box contains a 'Choose File' button and the text 'No file chosen'.
- Consent:** Two checkboxes with links:
 - I acknowledge that, for optimal results, the submitted data should comply with the [CMLO Data Acquisition Protocol](#)
 - I consent to the processing of my submitted data in accordance with [CMLO Privacy Policy](#) and the [General Data Protection Regulation \(GDPR\)](#)
- Upload:** A large teal button labeled 'Upload'.

Processing

- Once the upload is complete, CMLO automatically begins processing the images.
- The user who uploaded the flight (and their administrator, if applicable) can monitor the flight's status from the Flight Management Panel.
- When processing is finished, the user will receive a flight processing email with the final status.
- Any errors encountered during processing will also be displayed in the Flight Management Panel.

3.1.3 Flight Management

The Flight Management Panel allows users to view and manage all uploaded flights, along with their processing status.



Title	Description	Images	User	Flight date	Upload date	Shared	Status	Actions
Gurupura Test		60	supervisor	2026-03-31	2026-04-06	<input checked="" type="checkbox"/>	✓	
Ghana patches		1	supervisor	2025-07-30	2025-07-15	<input type="checkbox"/>	✓	
Angola patches	also confidence 0.1	4	supervisor	2025-06-21	2025-07-15	<input type="checkbox"/>	✓	
UP_angola		4	supervisor	2025-06-21	2025-06-27	<input type="checkbox"/>	✓	
BELGRADE TEST		40	supervisor	2025-05-27	2025-09-22	<input checked="" type="checkbox"/>	✓	
BELGRADE TEST2		27	supervisor	2025-05-27	2025-09-22	<input checked="" type="checkbox"/>	✓	
Ghana Data Set 2 Patches new		163	supervisor	2022-10-26	2025-10-07	<input checked="" type="checkbox"/>	✓	
Ghana Data Set Patches new		40	supervisor	2022-10-25	2025-10-07	<input checked="" type="checkbox"/>	✓	

Main Interface

The panel displays a flight table with the following columns:

- Title: The flight's name (clickable link to load the flight).
- Description: A short description of the flight (if provided).
- Number of Images: The total number of valid uploaded drone images.
- Flight Dates: The date(s) associated with the flight.
- Organization-wide Public Status*: Indicates whether the flight is shared with other users in the same organization.
- Processing Status Icon: Visual indicator of the flight's processing state (pending, completed, failed).
- Flight Options: Available actions for each flight:
 - Edit flight attributes
 - Reprocess flight
 - Delete flight

Search and Filters

- A search box allows filtering flights by title.
- Status filters let the user view only flights with a specific status (i.e., completed, failed, pending)

Loading a Flight

- To load a completed flight, click on its Title in the flight table.
- The selected flight will open automatically in the Flight Panel, pre-populating its data.

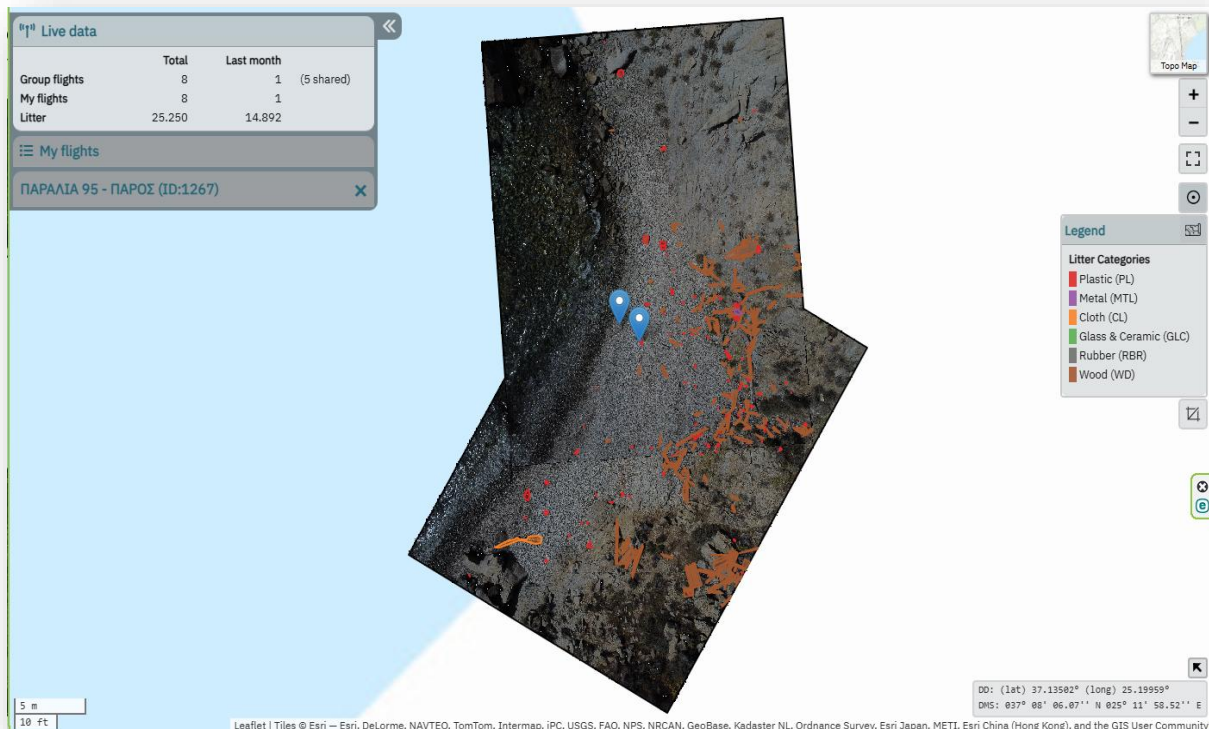
*Flight Public Status:

- When a user belongs to an organization, they may choose to make their flight public to the organization by selecting the public checkbox.

- Public flights are visible to all users within the same organization through the Flight Panel.

3.2 Map

The Map is the central component of the CMLO application. It provides an interactive view of all flight data and serves as the main workspace for monitoring and analysis.



Map UI Controls

The following options & buttons are available on the map interface:

- Mini map
- Legend: Legend is automatically updated when flight litter is displayed on map.
- Basemap Selector
- Scale Bar
- Zoom In / Zoom Out
- Measure Tools: Measure distances and areas on the map.
- Toggle flights: Toggles flight pins and/or clusters.

Flight Panels

The map integrates several panels, which can be opened and closed as needed:

- Live Data Panel: Displays real-time updates and monitoring data.
- User Flights Panel: Lists all flights uploaded by the user (and organization, if applicable).
- Selected Flight Panel: Shows detailed information about a selected flight, allows data/report download.

Flight Display

General

Flights are displayed as pins on the map. When zoomed out, flights can be automatically grouped into clusters for easier navigation. Clustering can be toggled in Edit Account → Application Settings.

Interaction

Clicking on a flight pin (or a flight within a cluster):

- Updates the Flight Details Panel, which then displays the corresponding flight information.
- Displays the flight pseudo-mosaic surrounding polygon.

3.3 Flight Panels

3.3.1 Live Data

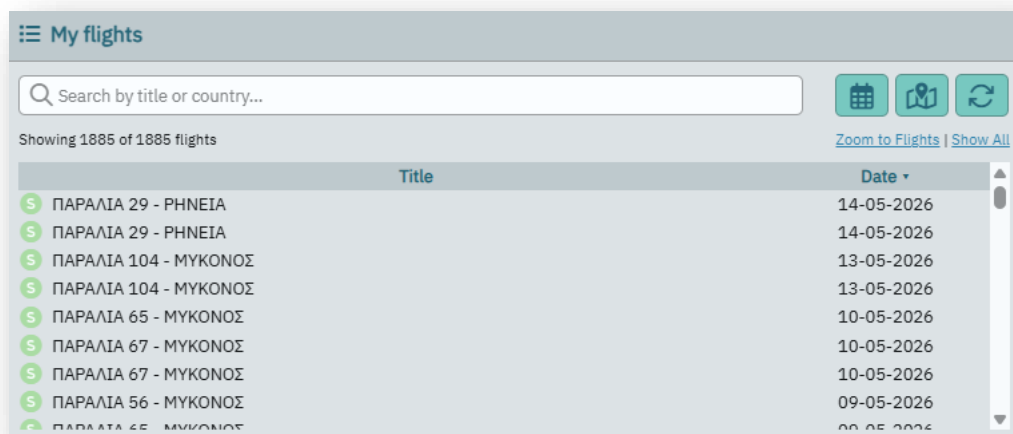
The Live Data Panel is always visible, whether or not the user is logged in. It provides a quick overview of:

- Total Flight Count
- Total Litter Count
- Flight Count (Last Month)
- Litter Count (Last Month)

This panel helps users keep track of overall CMLO activity and trends.

3.3.2 User Flights

The User Flights Panel displays a tabular overview of the user's flights. It contains selected data from the Flight Management Table and allows efficient searching and filtering.



The screenshot shows the 'My flights' panel with a search bar and a table of flight data. The table has two columns: 'Title' and 'Date'. The data rows are as follows:

Title	Date
ΠΑΡΑΛΙΑ 29 - ΡΗΝΕΙΑ	14-05-2026
ΠΑΡΑΛΙΑ 29 - ΡΗΝΕΙΑ	14-05-2026
ΠΑΡΑΛΙΑ 104 - ΜΥΚΟΝΟΣ	13-05-2026
ΠΑΡΑΛΙΑ 104 - ΜΥΚΟΝΟΣ	13-05-2026
ΠΑΡΑΛΙΑ 65 - ΜΥΚΟΝΟΣ	10-05-2026
ΠΑΡΑΛΙΑ 67 - ΜΥΚΟΝΟΣ	10-05-2026
ΠΑΡΑΛΙΑ 67 - ΜΥΚΟΝΟΣ	10-05-2026
ΠΑΡΑΛΙΑ 56 - ΜΥΚΟΝΟΣ	09-05-2026
ΠΑΡΑΛΙΑ 65 - ΜΥΚΟΝΟΣ	09-05-2026

Features

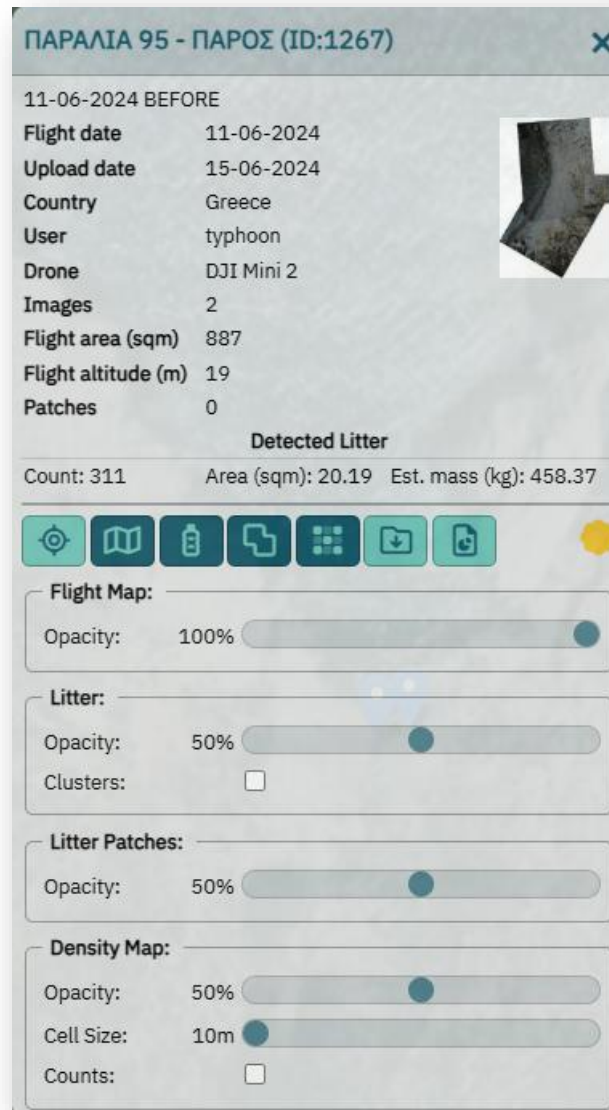
- Search by Title or country: Find a flight by typing part or all of its title, or the country that the flight took place.
- Filter by Date: Filter flights by a specific date, descriptive time period (e.g., “last week”), or a date range.
- Filter by Map View: Show only the flights that are located within the current visible map extent.
- Synchronize with Map View: Keep the flights table synchronized with the map; as the user pans or zooms, the table updates automatically.

Interaction

- Clicking on a flight title in the table opens its details in the Selected Flight Panel.

3.3.3 Selected Flight

The Selected Flight Panel provides detailed information about the chosen flight.



Flight Information

- Flight's ID
- Flight attributes: date, upload date, country, user name, drone type, number of valid images, area, mean flight altitude, litter count, litter area, estimated litter mass
- Flight pseudo-mosaic thumbnail for quick visual reference

Action Buttons

- Zoom to Flight: Pans, centers and zooms the map to the flight's location.
- Show Flight Map: Toggles the flight pseudo-mosaic on the map.
 - Includes a sub-section with an opacity slider.
- Show Litter: Toggles litter detections on the map.
 - Includes an opacity slider and a cluster checkbox; the cluster checkbox groups overlapping detections into polygons in areas of high litter concentration.

- **Show Litter Patches:** Displays Litter Patches, a special “super-class” for unclassified litter items.
 - Litter Patches group together detections that cannot be reliably classified into one of the seven standard classes.
 - CMLO continuously improves its recognition of litter patch shapes through ongoing training.
- **Show Density Map:** Toggles the density map overlay for the flight.
 - Includes controls for:
 - Opacity slider
 - Cell size slider (10–50 m, in 10 m steps)
 - Show counts checkbox (displays per-cell litter counts)
- **Download Data:** Export flight data:
 - Litter Data (CSV/GeoJSON): Includes litter class, polygon coordinates, and detection confidence.
 - Litter Patch Data (CSV/GeoJSON): Contains polygons of litter patches (super-class of unclassified litter), with confidence values.
 - Litter Density Map (CSV/GeoJSON): Density cells’ rectangle coordinates and litter counts per confidence level (Low, Medium, High).
- **Download Report:** Generates a comprehensive PDF report, including:
 - Flight identity attributes
 - Litter class percentage pie chart
 - Litter counts per class
 - Density map visualization
- **Results verification icon:**
 - Yellow sun – Verification pending. The waste results are under review and may be updated.
 - Green flower – The waste results have been verified.