



# EMERITUS

**Environmental crimes' intelligence and investigation protocol based on multiple data sources**



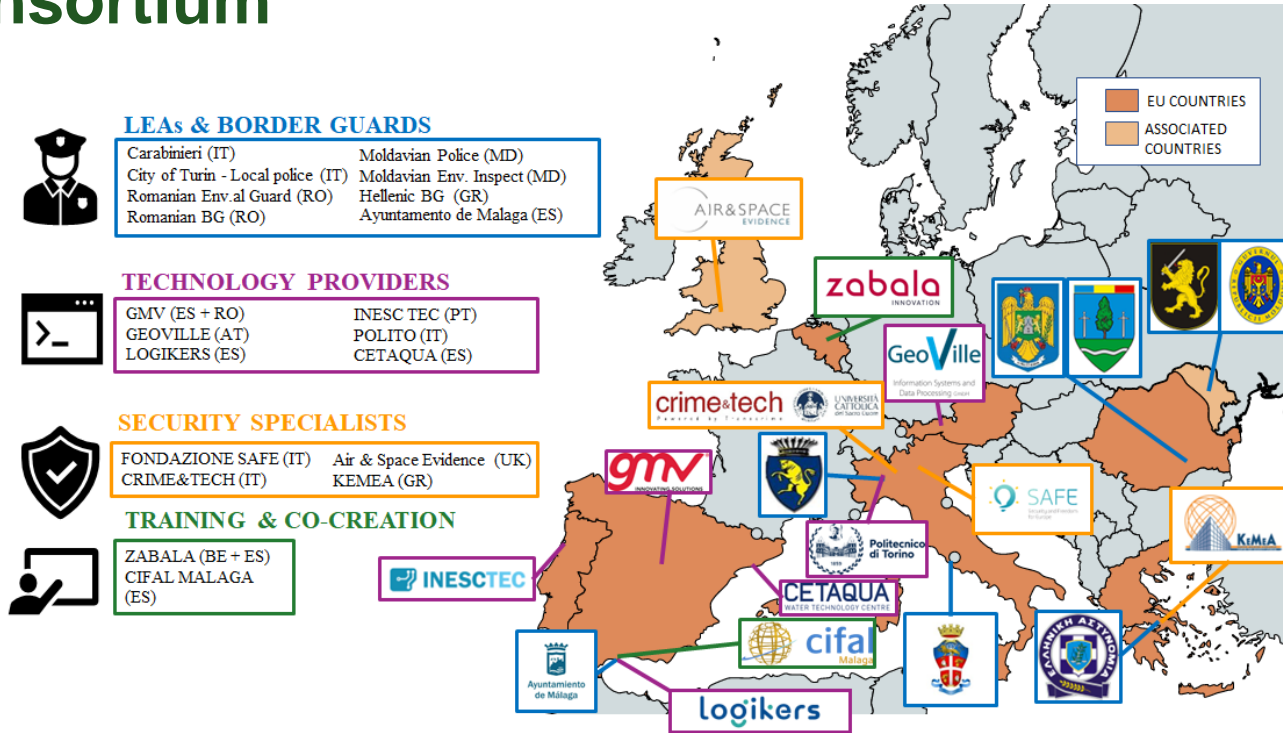
The project has been selected for funding by the EC within the Horizon Europe programme, under the topic HORIZON-CL3-2021-FCT-01-09 - Fight against organised environmental crime



An aerial photograph of a dense forest, overlaid with a semi-transparent green filter. The trees are packed closely together, creating a complex, textured pattern of green. The overall tone is a vibrant, slightly desaturated green.

**EMERITUS** in a  
nutshell

# The consortium



The consortium executing EMERITUS consists of **20 partners**, among which are top-level research institutions, industrial players, security-specialised SMEs, NGOs, LEAs and BGs from **9 countries** – Austria, Belgium, Greece, Italy, Portugal, Spain, United Kingdom, Romania, and Moldova.

# The acronym



EnvironMEntal cRImes' inTelligence and investigation protocol based on mUltiple data Sources

## Project aim

EMERITUS is an innovation project aimed at supporting Law Enforcement Authorities (LEA) and Border Guards (BG) in the investigation and evidence collection against waste-related environmental crimes. To this end, the project will offer a combined package of digital tools, including a single-entry point platform integrating advanced technologies, a training package, operative and train-the-trainers oriented, and an investigation protocol to guide LEAs and BGs in the integration of digital technologies in their daily operations.



# EMERITUS by numbers



**20**

**PARTNERS**

(+3 affiliated entities)



**9**

**COUNTRIES**



**5.9**

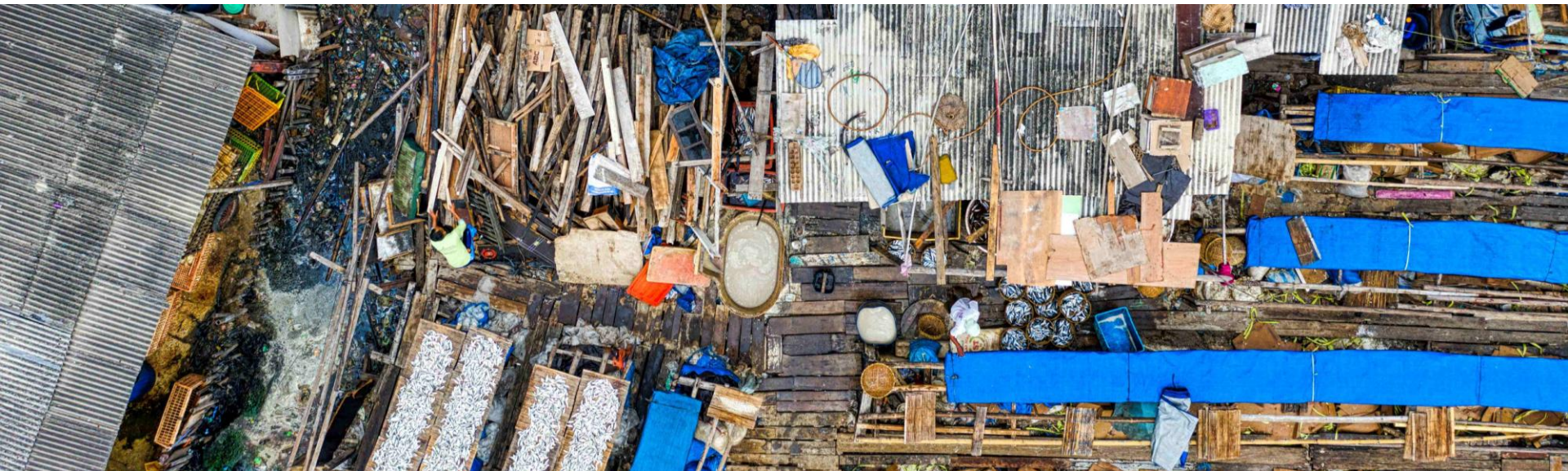
**M€ BUDGET**

(78% EC grant)



**3**

**YEARS**



An aerial photograph of a dense forest with a narrow path leading to a small wooden cabin. The image is overlaid with a semi-transparent green filter. The cabin is a simple wooden structure with a gabled roof, situated in the middle of the forest. The path is a light-colored dirt or gravel trail that winds through the trees. The overall scene is peaceful and natural.

**Aim and  
impact**



# EMERITUS' aim

EMERITUS aims to establish of a new generation of technological tools managed through a **single-entry point platform** for Law Enforcement Authorities (**LEA**) and Border Guards (**BG**) to improve **detection and proof collection capabilities** against waste-related environmental crimes.

To achieve this, EMERITUS will develop a **protocol** for effective **environmental crime investigation**. This will involve combining innovative monitoring and analysis technologies with a complementary training programme to foster LEAs and BGs' intelligence and investigation capabilities at both national and cross-border levels.

The ambition of EMERITUS is to explore and demonstrate how these **technologies** and **specialised training** can boost the efficiency of environmental crime detection and intelligent risk profiling to optimise resources, reduce the risk for operators and provide a deterrent for offenders.



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# Main results

EMERITUS' main target results are:



EMERITUS  
PLATFORM FOR  
INTEGRATED  
INTELLIGENCE



Protocol for  
waste-crimes  
investigation



Training programme  
for environmental  
crimes investigation



UCs-based  
simulation  
exercises



EMERITUS  
community of  
practice



Evidence-based  
recommendations



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# Impact

1. **Improved intelligence picture of organised environmental crime in Europe** and its modus operandi both offline and online;
2. **Improved tools and training for European Police Authorities and BGs** to tackle environmental crime, validated against their needs, supported by advanced digital technologies, ensuring lawful court-proof evidence collection and environmental crime statistics;
3. **Strengthen cooperation among European Police Forces, BGs and other national Authorities as well as with third countries and international actors** involved in tackling environmental crimes;
4. **Empower** security practitioners **to identify and prevent organised crime networks** implicated in environmental crime and **detect illegal waste storage sites**;
5. Contribute to improving **security policy regulation** for combating environmental crimes.



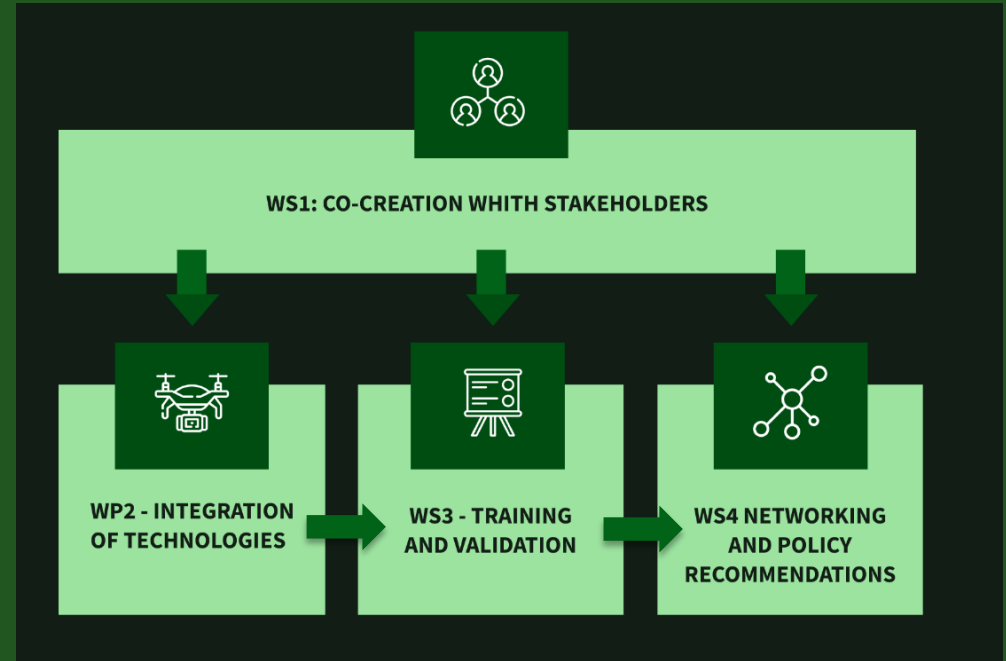
An aerial photograph of a dense forest, overlaid with a semi-transparent green filter. The trees are densely packed, and the overall color palette is dominated by various shades of green. The text 'Methodology' is centered in the lower half of the image, with a vertical white line to its left.

# Methodology



# Work streams

To achieve its goals, the consortium will implement 4 coordinated workstreams corresponding to one or more Work Packages





# WS1: Co-creation with stakeholders

**WS1 is centred on actively engaging LEAs and BGs authorities in a structured co-creation process** spanning across the entire project workflow to assess their needs and co-design the investigation protocol, hence increasing their awareness and ownership in the process.

This approach **ensures the project results reflect operators' needs** and are deployable in real environments.

The chosen *methodology* for this human-centred innovative design is the iterative process of *design thinking*, which will actively involve end-users in the progressive creation process of the final results while enhancing commitment and ownership.



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# WS2: Integration of selected technologies

WS2 takes the move from the integration of **results already developed in previous R&I projects** by core partners such as *eLENS Portal* (developed by GeoVille) and *MICRONETCLOUD* (from LOGIKERS).

Throughout the implementation of the project, **the following functions will be included in the geospatial-intelligence platform:**

- Ad-hoc user interfaces,
- Storage components,
- AI elaboration algorithms,
- Drone missions' organisers,
- Satellite image analysers,
- GIS visualisation,
- Integration layer (API).





## WS3: End-users training and exercising

WS3 involves the **implementation of an ad-hoc designed training programme** focused on the implementation of the investigation protocol defined in WS1.

WS3 integrates **three main action-streams**:

- 1) organisation of the LEAs/BGs **dedicated training**;
- 2) organisation and management of the **demonstration activities**;
- 3) implementation of a coherent approach for **monitoring and evaluation (M&E)** of the validation activities.

→ *WS3 will directly contribute to the implementation of WS4*



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# WS4: Networking and policy recommendations

**WS4 is transversal** to the entire project implementation and has a **double purpose**:

- 1) **Gather relevant inputs** to complement co-creation exercise carried with partner LEAs/BGs;
- 2) **Establish of the CoP and develop long-term evidence-based policy recommendations** and a **roadmap** for broader uptake of the investigation protocol and its standardisation.

These recommendations will help shape European regulations to combat environmental crime effectively, **strengthening the EU legal and regulatory framework**.



# Use cases

Four relevant **use cases** have been identified to ensure that the project results can translate into technologies and operative support fitting in real-world scenarios and needs, as well as to test the EMERITUS results with actual data and operators.



Water  
contaminant  
source detection



Waste storage  
centres  
monitoring



Cross-border  
illegal  
waste trafficking  
monitoring



Identification of  
illegal waste  
discharge sites in  
broad areas





# UC3 - Cross-border illegal trafficking via land

*Cross-border illegal waste trafficking, illegal waste storage and dumping detection*

**Location:** cross border monitoring across Romania and Moldova

**Technology sources:** satellites, AI/ML

**Context:** land, air

**Involved partners:**



Romanian Border Police



GARDA NAȚIONALĂ DE MEDIU

Romanian National Environmental Guard



Moldovan Police



Moldovan Inspectorate for Environmental Protection



GMV Romania



# UC3 - Cross-border illegal trafficking via land

Continuous growth of global population and its behaviour when it comes to socio-economic practices set the premise for a lot of environmental crimes. Illegal deposits and dump sites are the results of those practices. Globally, by 2040 there will be around 3.4 billion tons of waste. (Kaza, 2018).

In Romania stricter EU regulations and imports of waste created an environment prone to multiplication of *illegal waste dumps*.



Municipal waste generated in the EU, 2020

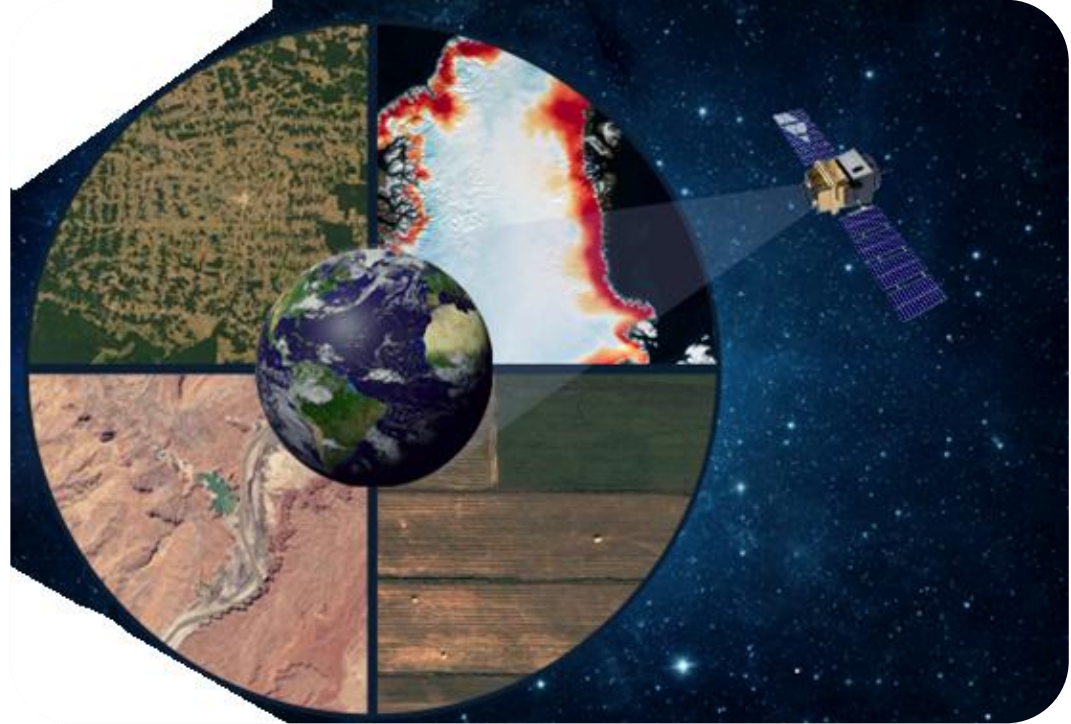
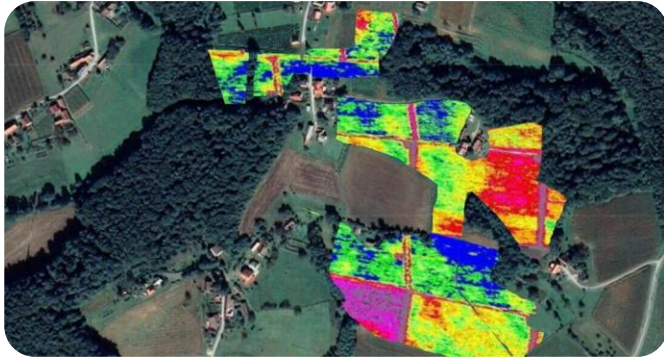
(kg per person)



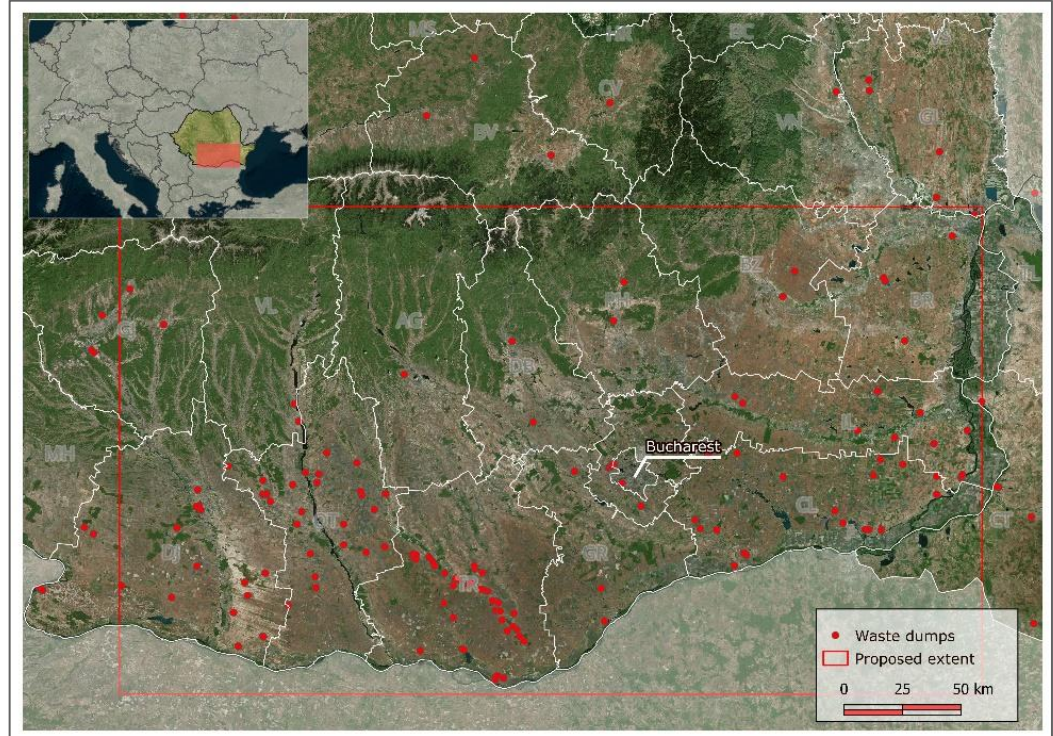
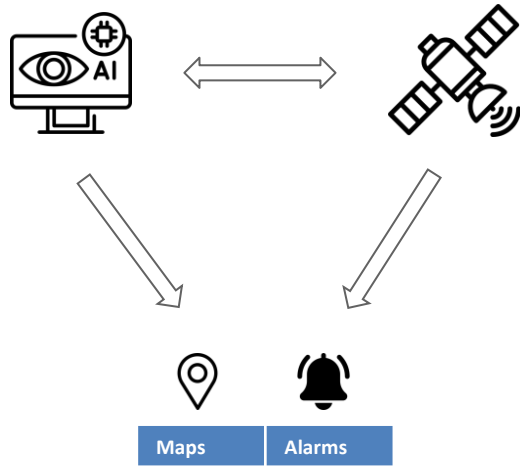
<sup>1</sup> Estimated  
<sup>2</sup> Ireland, Austria, Greece, Italy: 2019 data  
<sup>3</sup> Bulgaria, Iceland: 2018 data

# UC3 – Earth Observation for Waste Detection

- Illegal waste dumping detection
- Landfill monitoring
- Methane emission detection
- Dumping patterns recognition for preventing future incidents



# UC3 – AI Algorithms for Waste Detection



# UC3 – Automatic Detection of Waste in Satellite Imagery

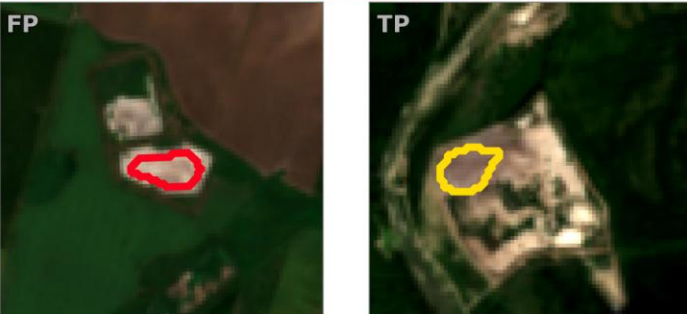
T35TMK, 23/08/2021, DeepLabV3+ & ResNeSt101



3/08/2021, DeepLabV3+ & ResNeSt101

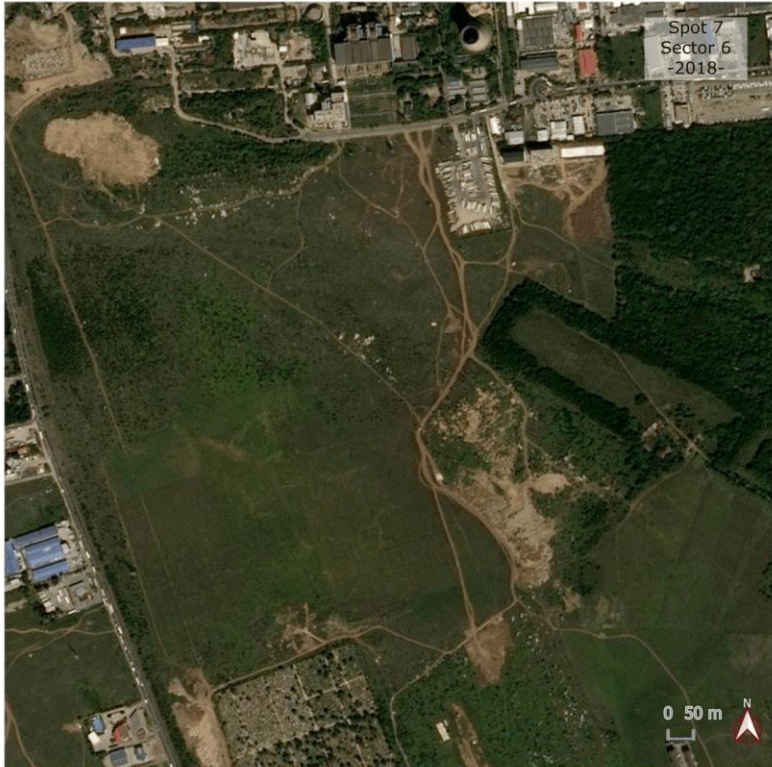


T35TMK, 29/07/2020, DeepLabV3+ & ResNeSt101



# UC3 – The Problem of Spatial Resolution

SPOT 2 - 1.5 m



SENTINEL-2 - 10 m



# UC3 - Cross-border illegal trafficking via land

- All stakeholders mention resolution as the main issue when it comes to waste dumps detection
- High temporal and spatial resolution is necessary for an operational waste detection service
- Sentinel-2 is the most suitable in terms of frequency but not spatial resolution
- We are therefore working on waste recognition models and at the same time on improving the resolution of satellite imagery
- Segmentation models should be adaptable from S-2 to super-resolved imagery



An aerial photograph of a lush green roof, densely packed with various types of vegetation including succulents, small shrubs, and grasses. Several small, dark-colored structures, possibly skylights or vents, are scattered across the roof surface. The entire image is overlaid with a semi-transparent green filter.

**How to get  
involved**



# EMERITUS website and social media

The best way to be informed about the project and its results and to get involved is to follow its **social media** and check the **website** for regular updates and news



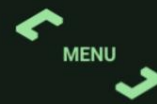
@emeritus\_EU



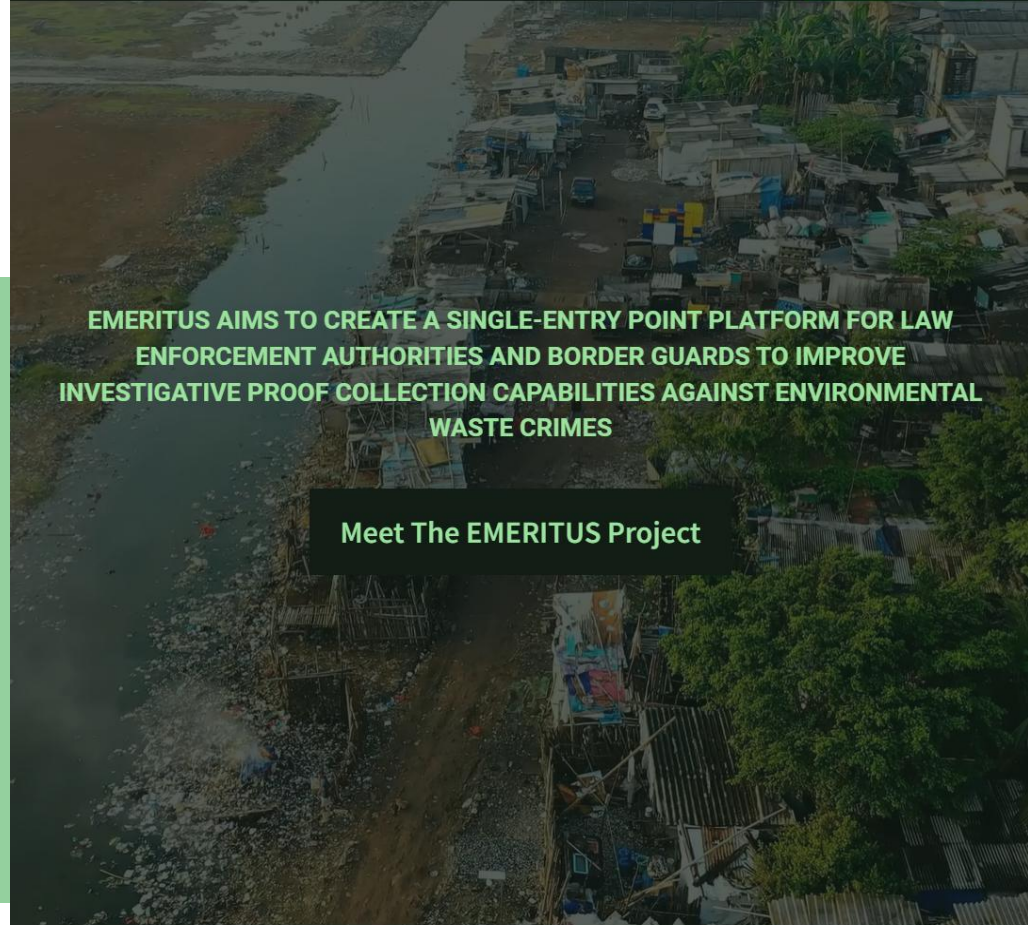
@emeritus\_EU

[www.emeritusproject.eu](http://www.emeritusproject.eu)

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CONTACT



EMERITUS AIMS TO CREATE A SINGLE-ENTRY POINT PLATFORM FOR LAW ENFORCEMENT AUTHORITIES AND BORDER GUARDS TO IMPROVE INVESTIGATIVE PROOF COLLECTION CAPABILITIES AGAINST ENVIRONMENTAL WASTE CRIMES

Meet The EMERITUS Project

# EMERITUS newsletter

But also by subscribing to its newsletter through the contact form at the bottom of each page of its website

<https://emeritusproject.eu>

Name \_\_\_\_\_

Email \_\_\_\_\_

Organisation \_\_\_\_\_

Message \_\_\_\_\_

I accept the Privacy Policy

Subscribe to our newsletter if you want to know the latest developments of the EMERITUS project. (optional)

**SEND**



EMERITUS aims to create a single-entry point platform for law enforcement authorities and border guards to improve investigative proof collection capabilities against environmental waste crimes



[Learn more about the project](#)

# Community of Practice (CoP)

*Are you interested in learning how to exploit technologies to tackle environmental crimes effectively?*

*Would you like to participate in showcase and networking events dedicated to EMERITUS and the fight against environmental crimes?*

*Do you have similar or related projects?*

*Are you available to collaborate with the EMERITUS team to better tailor the project results to actual and concrete needs?*

If so, we invite you to candidate yourself for taking part in the **EMERITUS Community of Practice** through [the form available on the website](#).

Once your candidature is received and reviewed, the EMERITUS team will contact you back to formalise your participation (via a free-of-charge dedicated agreement) and start involving you in the foreseen activities.



*EMERITUS 1<sup>st</sup> Showcase Event, Verona, March 2023*

A satellite with two solar panel arrays is shown in orbit above the Earth's horizon. The sun is visible on the right side of the frame, creating a bright lens flare and illuminating the Earth's surface. The text "Thank you!" is centered in the upper right portion of the image.

**Thank you!**



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