



From results to lasting impact: Sustainability beyond PERIVALLON Part II: exploitation

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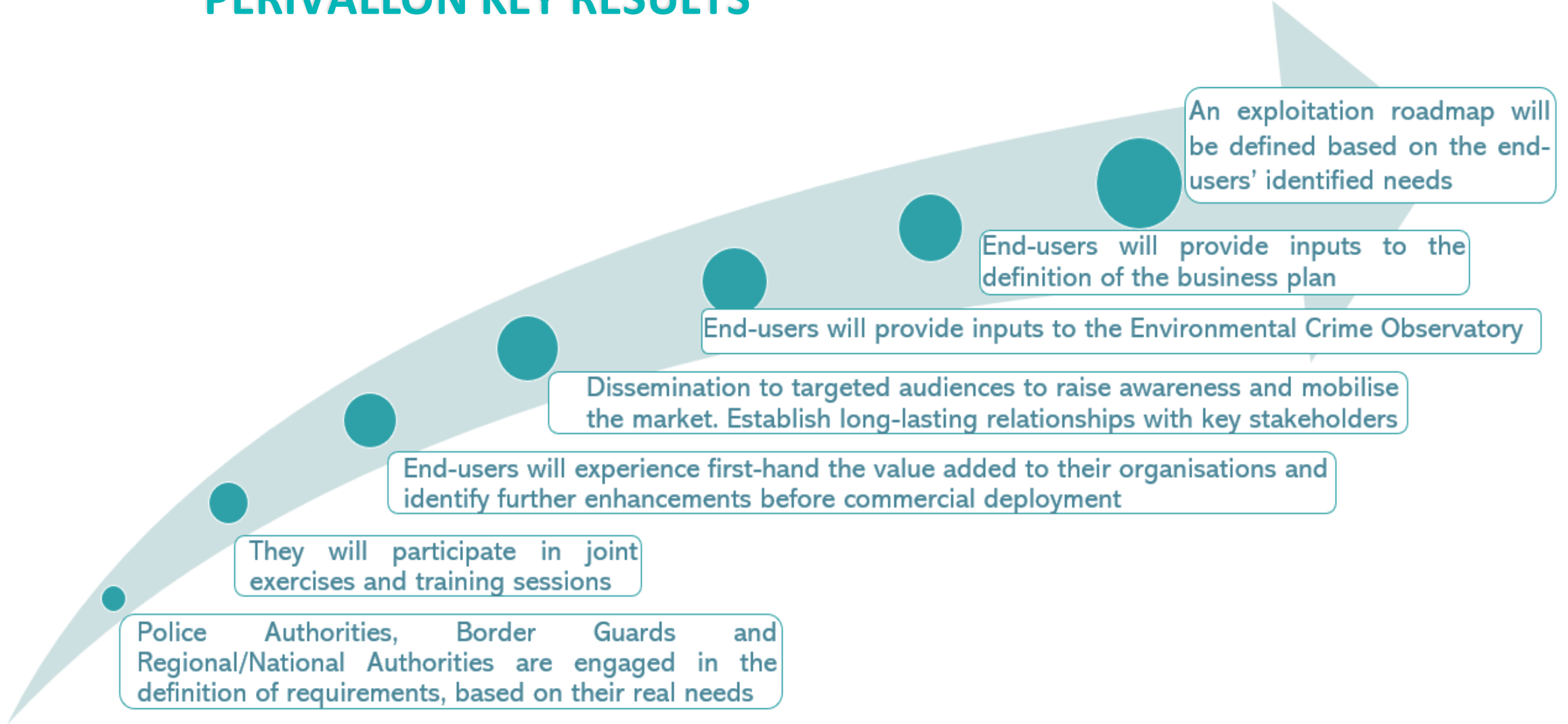
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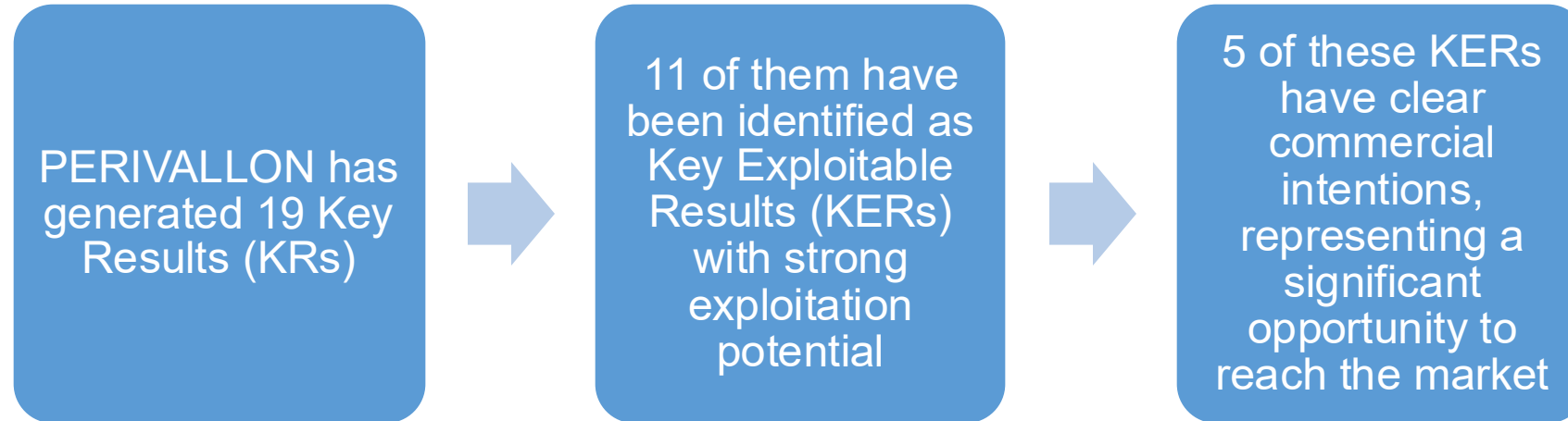
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PAVING THE WAY FOR THE UPTAKE OF PERIVALLON KEY RESULTS



SOME ACHIEVEMENTS...



Several analyses and studies have been carried out during the project to characterise each result, assess its potential market, and define the exploitation roadmap.

For some KERs, a business plan has also been developed, demonstrating their potential for future commercialisation.

NOW INTRODUCING

THE PERIVALLON  TOOL CARDS

PERIVALLON TOOL CARDS



The PERIVALLON project aims to deliver an improved intelligence picture of organised environmental crime and develop tools for **detection, prevention, and impact assessment**. It uses geospatial intelligence, remote sensing, online monitoring, and predictive analytics to enhance investigation processes and methodologies.

These cards present **13 tools**, each a result of the development and validation efforts within the PERIVALLON project.

TOOL 1A

Geospatial intelligence detection tool suite – waste and land pollutants



Exploitation Type



A mix of scientific & commercial



Partner in Charge



POLITECNICO MILANO 1863



Description

A software module that implements advanced artificial intelligence and computer vision algorithms to detect solid waste on land. The module receives as input satellite images over a target territory and outputs geographic locations of potentially illegal dumping sites. These sites can be visualized on a map along with the list of detected materials.



At a glance

AI-driven satellite imagery analysis tool for detection and mapping of potentially illegal solid waste activities.



Who is this tool developed for?



Public Administrations



International security agencies



Environmental agencies



Law Enforcement Agencies (LEAs)



Border guards



Insurance companies estimating industrial risk



Use Case

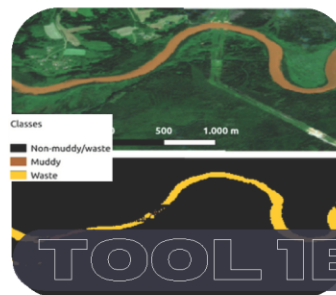
Large territory scanning for potentially illegal dumping site detection and monitoring in support of environmental crime contrast and prevention.



Benefits & Added Value

- Up to 30% time saving to identify and evaluate a dumping site.
- Improved monitoring capacity for LEAs and environmental agencies.
- Site survey prioritization based on detected materials in a candidate landfill.

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TOOL 1B

Geospatial intelligence detection tool suite – water pollutants



Exploitation Type



Commercial



Partner in Charge



Description

An AI-driven module that processes Copernicus satellite imagery to identify water-borne pollutants (oil spills, industrial runoff and muddy waters). Detected events exceeding predefined thresholds trigger automated alerts. The modular architecture supports addition of new detection workflows or deployment in different geographic areas via parameter adjustments.



At a glance

Automated Copernicus data analysis for real-time pollutant alerts in lakes, rivers, and coastal zones.



Who is this tool developed for?



Governmental & Regulatory Agencies



Industrial & Infrastructure Operators



Environmental agencies



Conservation & Research Institutions



Emergency Response & Maritime Services



Water Utilities



Use Case

Continuous monitoring of large water bodies to detect and alert on pollutant events that threaten water quality or indicate illegal discharges.



Benefits & Added Value

- Cleaner waterways and reduced public-health risks.
- Directs inspectors to high-risk hotspots, cutting field-work costs by up to 40%.
- Evidence-grade maps boost prosecution success and fine recovery.
- Empowers data-driven policymaking and fosters community engagement in water protection.

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TOOL 2

Maximised surveillance swarm optimisation module



Exploitation Type



Scientific



Partner in Charge



Description

An autonomous software module that generates optimized flight plans for UAV swarms, ensuring efficient area coverage while minimizing time and energy use.



At a glance

Autonomous optimisation of UAV swarm missions for maximum area coverage and minimal resource use.



Who is this tool developed for?



Academic & Research Institutions



Emergency Response & Security Agencies



UAV Manufacturers & Technology Providers



Environmental Monitoring & Enforcement Agencies



Use Case

Pre-mission and in-field planning of multi-drone surveillance operations such as environmental monitoring, border patrol or emergency response to ensure full ROI coverage under dynamic conditions.



Benefits & Added Value

- Successfully covers more than 90% of the target area and up to 99.7%.
- Cuts mission time and energy use by up to 30%, enabling faster deployment for emergency services and border patrol.
- Lowers operational expenses and carbon footprint through energy-aware routing.
- Compatible with any UAV system, aligning with open-architecture autonomy trends.



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This project has received funding from the European Union's Horizon Europe programme for research and innovation under grant agreement No. 101073952.

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TOOL 3

Optimised X-ray scanner for concealed object detection module



Exploitation Type



Non-commercial



Partner in Charge



Description

Automatically analyzes X-ray scans of packages to detect banned refrigerant chemicals and instantly alerts security inspectors for prompt action.



At a glance

Real-time X-ray image analysis for automatic detection of ozone-depleting substances and hydrofluorocarbons in trade goods.



Who is this tool developed for?



Security Inspectors & Adjacent Security Professionals



Customs & Border Control Officers



Environmental Compliance Officers



Cargo & Postal Screening Operators



Use Case

Screening trade goods X-ray images to identify and alert on concealed ODS and HFC materials.



Benefits & Added Value

- Assists security professionals in detecting high-risk substances
- Contributes to reduction of illegal waste trafficking within operational domains



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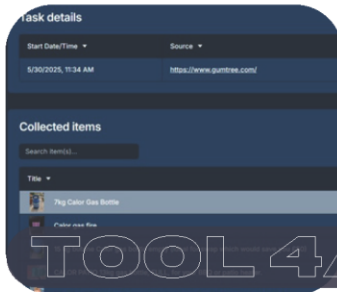
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TOOL 4A

Online content acquisition module – intelligent URL scoring module

Exploitation Type



Scientific

Partner in Charge



Description

Designs focused discovery and monitoring of online marketplaces by applying intelligent URL scoring to detect irregular data indicative of environmental crime in waste management and refrigerant trading supply chains.

At a glance

Intelligent URL scoring for targeted, real-time detection of environmental crime activity across online marketplaces.

Who is this tool developed for?



Law Enforcement & Border Security Agencies



Environmental Regulatory Authorities



Environmental NGOs & Advocacy Groups



Research Institutions & Policy Analyst

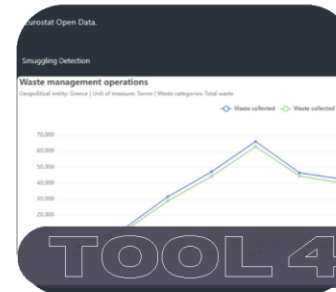
Use Case

Continuous monitoring of online marketplaces to identify illegal environmental crime activities by detecting anomalous waste management and refrigerant trading data.

Benefits & Added Value

- Introduces emerging trends in refrigerant trading and waste-management supply chains.
- Provides updated landscape on environmental crime and conservation challenges at EU and national levels.
- Highlights regulatory and licensing loopholes in online marketplaces for policy and enforcement planning.

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TOOL 4B

Waste crime data monitoring tool

Exploitation Type



Non-commercial

Partner in Charge



Description

A software component for interactive visualization and analysis of environmental crime data, featuring dynamic charting, custom dataset filtering, and API integration for seamless interoperability.

At a glance

Interactive dashboards and custom visualizations to make environmental crime data accessible and actionable.

Who is this tool developed for?



Environmental Protection & Natural Resource Agencies



Regulatory & Compliance Authorities



Non-Governmental Organizations & Advocacy Groups



Research Institutions & Policy Analysts

Use Case

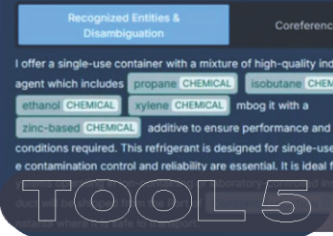
Enables stakeholders to explore trends in environmental crime through tailored charts and integrated datasets for informed decision-making.

Benefits & Added Value

- Enhances accessibility and transparency of environmental crime data.
- Supports awareness-raising and evidence-based decision-making.
- Facilitates effective responses to pollution incidents through clear visual insights.
- Promotes societal understanding of crime trends and sustainability actions.

PERIVALLON TOOL CARDS

Text analysis



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Multilingual text analysis tool



Exploitation Type



Scientific



Partner in Charge



Description

Extracts named entities and chemical mentions from large multilingual text collections, sourced from open data and online marketplaces, using specialized deep-learning models to automate indexing and search.



At a glance

Rapid deep-learning-powered extraction of entities and concepts from massive multilingual text corpora.



Who is this tool developed for?



Environmental Regulatory Authorities



Academic & Research Institutions



Law Enforcement & Intelligence Units



Environmental NGOs & Policy Analysts



Use Case

Automated processing of vast text repositories to save time and enable entity-based indexing and retrieval for environmental-crime analysis.



Benefits & Added Value

- Increases accuracy and speed of detecting and predicting environmental crime activities.
- Reduces manual effort in processing large text datasets.
- Enables effective enforcement of environmental regulations and the EU Environmental Crime Directive.

PERIVALLON TOOL CARDS

Analysed image



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Multimedia content analysis tool



Exploitation Type



Scientific



Partner in Charge



Description

An AI-based module that detects and localizes cylinder-related objects within videos and images to automate identification of illegal refrigerant and hydrofluorocarbons (HFCs) trade in large-scale visual content.



At a glance

AI-driven analysis of multimedia to pinpoint and flag visual evidence of illicit refrigerant trade.



Who is this tool developed for?



Customs & Border Control Authorities



Environmental Regulatory Bodies



Law Enforcement & Security Services



Surveillance & Security Solution Integrators



Use Case

Automated review of selling items on marketplaces and video sources to rapidly identify and map instances of prohibited refrigerant cylinder trafficking.



Benefits & Added Value

- Enhances accuracy and speed in detecting environmental-crime indicators within multimedia content.
- Reduces manual inspection time for large image and video datasets.
- Supports enforcement of environmental regulations and the EU Environmental Crime Directive.

PERIVALLON TOOL CARDS



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TOOL 7

Risk assessment module



Exploitation Type



Commercial



Partner in Charge

etra I+D

Description

Facilitates law-enforcement decision-making by fusing heterogeneous data sources to assess the likelihood of environmental crime and provide real-time risk levels during incidents.

At a glance

Real-time environmental crime risk insights for informed decision-making and targeted resource allocation in law enforcement operations.

Who is this tool developed for?



Use Case

Incident-level risk assessment by integrating diverse data streams to prioritise enforcement actions against environmental offences.

Benefits & Added Value

- Enables accurate, timely risk assessments of environmental crime threats.
- Improves resource prioritisation and supports decision-making for more effective protection of European citizens.

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TOOL 8

Data management and audit trail



Exploitation Type



Scientific



Partner in Charge



Description

Data is stored and protected using a secure model with (SSO/RBAC). Every create/read/update/delete is captured as an immutable, hash-chained audit item; a verifier continuously checks chain consistency, making provenance and integrity visible in real time—even at multi-million-item scale.

At a glance

Secure, role-based evidence repository with tamper-evident, end-to-end audit trails and live integrity verification; integrates with ECMC and the blockchain evidence-sharing module.

Who is this tool developed for?



Use Case

Centralized, secure storage and traceable record-keeping of environmental-crime data and digital evidence generated across ECMC modules—enabling court-ready chain-of-custody and collaborative investigations.

Benefits & Added Value

- Evidential integrity by design: Immutable, hash-chained audit blocks with continuous verification and exportable, reproducible audit reports.
- Operational transparency: Actor- and record-centric histories, live "traffic-light" verification status, and field-level diffs for rapid triage.
- Scales with real workloads: Proven responsiveness on buckets up to ~7M audit items with targeted indexing.
- Cross-agency exchange: Seamless hand-off to the blockchain-based SISEE module for immutable, time-stamped sharing and automated chain-of-custody across nodes.

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PERIVALLON integrated platform



Exploitation Type



Commercial



Partner in Charge



Description

A comprehensive, AI-enhanced solution offering real-time monitoring dashboards, role-based access management, visual analytics, and a secure digital evidence store, all integrated via containerised deployment and message-streaming frameworks.



At a glance

Unified AI-driven platform for detection, monitoring, and prevention of organised environmental crime.



Who is this tool developed for?



Law Enforcement Agencies



Policy Makers & Government Decision-Makers



Environmental Protection & Regulatory Bodies



Research Institutions & Analysts



Use Case

Deployment by law-enforcement and environmental protection agencies as a unified intelligence backbone to detect, monitor, and prevent organised environmental crime through real-time dashboards, visual analytics, and secure evidence management.



Benefits & Added Value

- Enhanced collaboration through data centralisation to support smarter, faster joint responses to environmental crime.
- Streamlines workflows via role-based dashboards and automated evidence management.
- Modular design enables tailored services, from full-platform deployment to individual capabilities.
- Real-time intelligence supports targeted interventions and informed policy development.

PERIVALLON TOOL CARDS



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Environmental crime monitoring centre



Exploitation Type



Commercial



Partner in Charge



Description

The Environmental Crime Monitoring Centre is a high-end dashboard application that provides end users with intuitive, user-friendly access to information collected and processed by the PERIVALLON platform, facilitating situational awareness. It combines live video imagery with advanced 3D cartography and map manipulation tools, leveraging situational data from the Decision Support layer which integrates outputs from all monitoring modules.



At a glance

Interactive 3D-enhanced dashboard unifying live imagery and analytical insights for environmental crime surveillance.



Who is this tool developed for?



Law Enforcement Agencies



NGOs focused on environmental protection



Forestry & maritime authorities



Environmental Protection Agencies



Municipalities & governments



Private industries with high environmental impact



Use Case

Provides law-enforcement agencies and environmental analysts with a consolidated, user-friendly, and visual interface to monitor, explore, and respond to environmental crime threats in real time.



Benefits & Added Value

- Provides a high-end, reliable, centralized, and user-friendly platform that integrates multiple data sources, allowing for a more holistic understanding of environmental crime and enhancing the ability of agencies to detect and respond to environmental threats.
- Supports more informed decision-making and efficient resource allocation through integrated live imagery and analytics.

PERIVALLON TOOL CARDS



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TOOL 11 Data-driven maritime route prediction module



Exploitation Type



Commercial



Partner in Charge

kpler



Description

Monitors AIS (Automatic Identification System) data to detect "AIS-OFF" events and predicts future vessel routes using historical traffic patterns, ensuring continued maritime situational awareness even when transponders are turned off or coverage is limited.



At a glance

AI-driven maritime traffic monitoring that detects AIS transponder outages and forecasts vessel routes for enhanced maritime intelligence.



Who is this tool developed for?



Use Case

Continuous surveillance of maritime routes to identify AIS-OFF events and generate predictive route models, enabling stakeholders to maintain visibility on vessel movements and respond to anomalies.



Benefits & Added Value


- Maintains situational awareness even during AIS transponder outages.
- Supports authorities in identifying and investigating non-compliant or suspicious vessel behavior.
- Reduces legal and financial risk by ensuring proactive compliance with sanctions and regulations.
- Enhances operational efficiency, regulatory compliance, and risk mitigation
- Improves decision-making through real-time maritime surveillance and prediction.
- Streaming event detection and forecasting components to inform security agencies, traders and insurers of potential threats.

- Exploitation of the project is highlighted as a relevant aspect after implementation
 - It ensures sustainability beyond the project life
- Tool cards reflect in a comprehensive way, for the general public, the PERIVALLON offer

CHECK OUT!

<https://perivallon-he.eu/tool-cards/>



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Thank you!

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