



Data driven decision making in Libeccio – the DMSS paradigm

Athanasios Kalogeras

Research Director, ATHENA Research Center



From Data to Knowledge

Wisdom: Knowledge guided by insight and ethics. Answers *why* and chooses the best action.

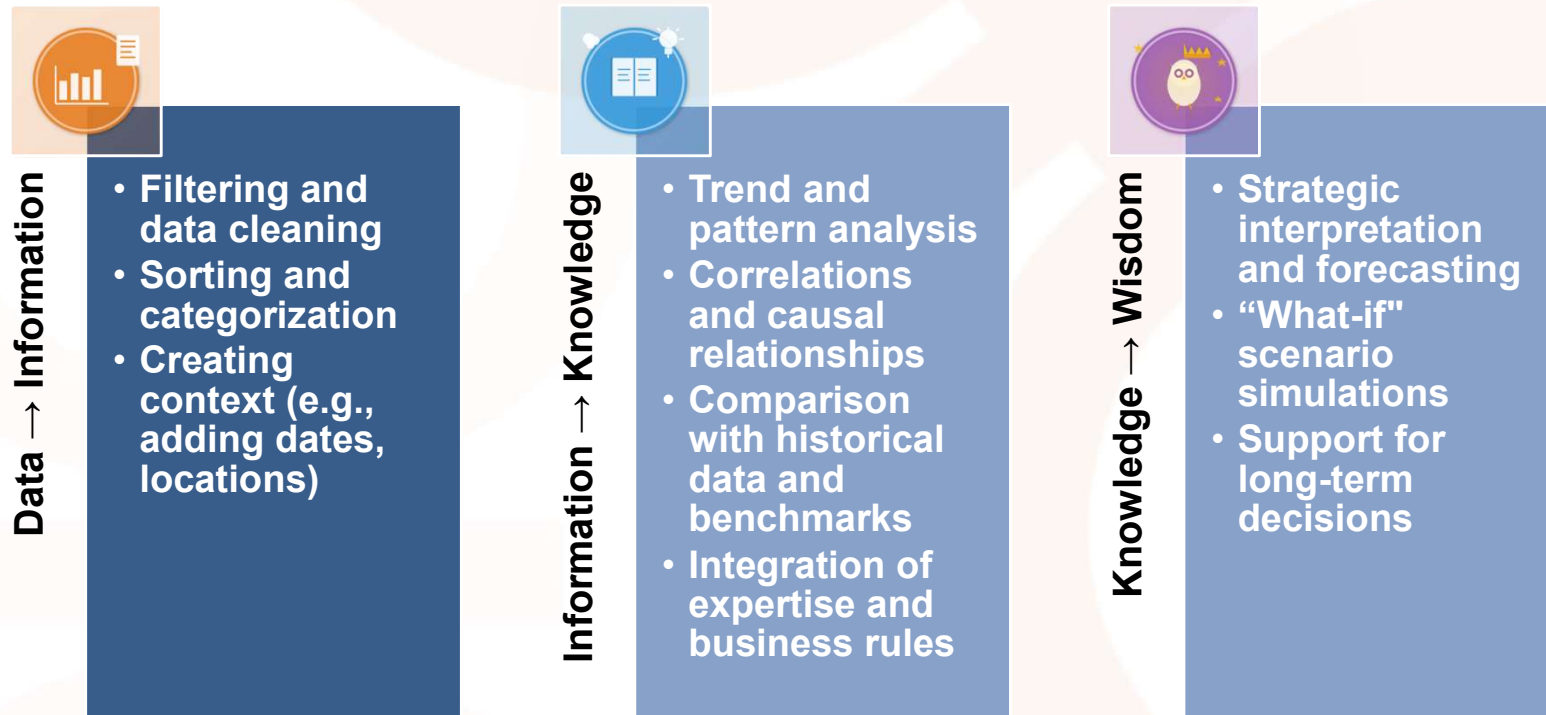
Knowledge: Information applied with rules and experience. Answers *how*.

Information: Data with structure and context. Answers *who, what, where, when*.

Data: Raw, unprocessed figures or signals. Alone, they lack context or meaning.

Information Systems ease this transition exploiting useful knowledge for decision making

How Information Systems turn data into wisdom



Interreg EuroMED LIBECCIO - DMSS

The LIBECCIO DSS is an innovative online platform that leverages sustainability indicators and big data analytics. Its goal is to support decision-making and shape effective, data-driven policies.

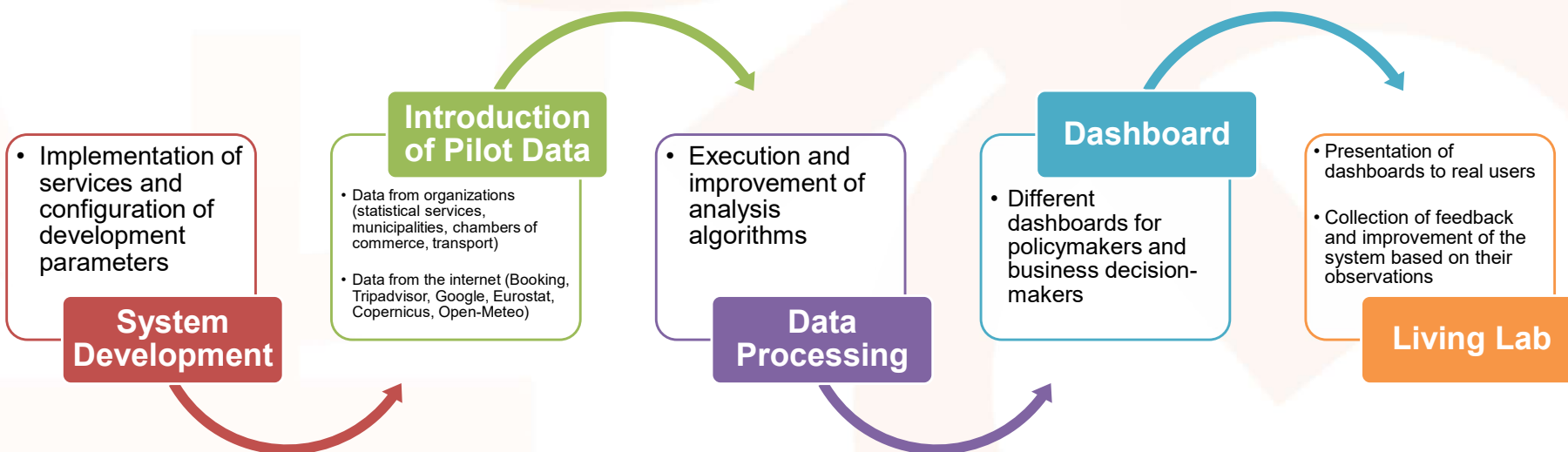


Key Pillars

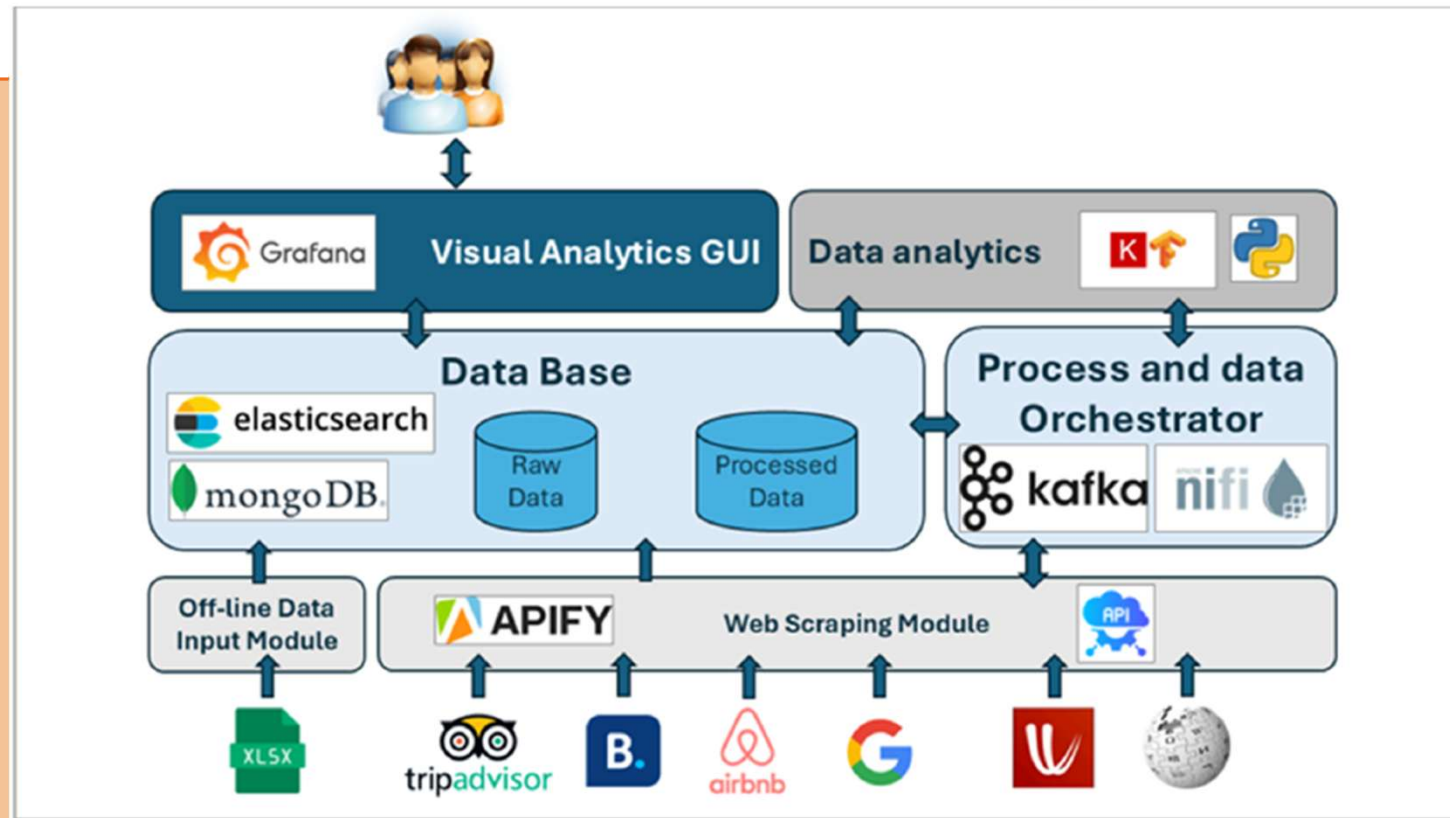
- Support **regional and national policymakers** with **analyses** related to implemented policies, **assessing** their economic, social, and environmental impacts on overall tourism sustainability, while providing a **framework (feedback)** on what is happening in the area
- Providing **assistance to organizations and businesses** in tourist destinations to **monitor** the progress of visitor flows, improve the **decision-making** process regarding commercial strategies, service quality policies, and marketing actions



Implementation Steps



Technologies behind the DMSS



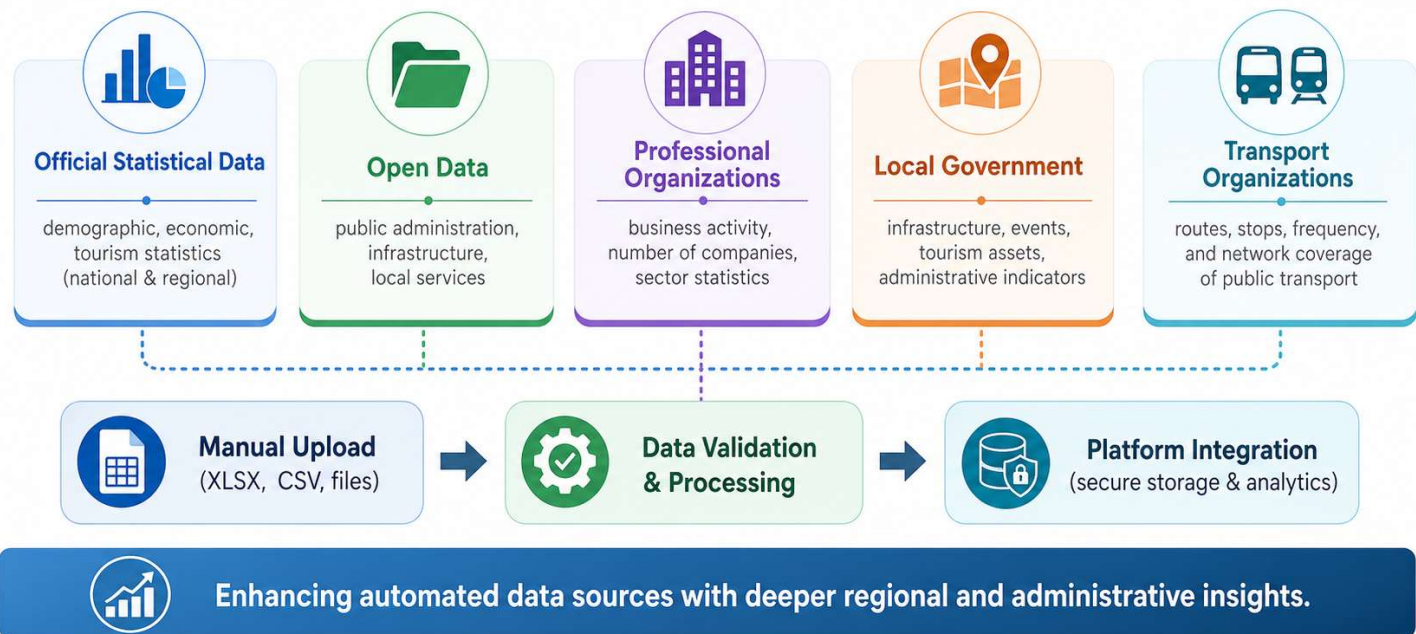
Data collection from the Web



Data added by the users

USER-ADDED DATA

Official, structured data uploaded manually from trusted institutions.



Examples of services for policy makers



Social Sustainability

Accessibility assessment & identification of service gaps per municipality



Airports & Connectivity

Monitoring of passenger flows and air connectivity



Tourism Weather Risk

24–48 hour risk forecasting for event coordination & safety



Economic Impact

Comparison of spending, visitors, and overnight stays between domestic and international tourism



Active Transport

Cycling/hiking routes, attractions, sustainable planning



Criminal Activity

Overview of incidents and annual trends 2010–2019

Examples of services for tourism destination organizations

Accommodation Price Analysis



Market prices, lead time, supply dynamics, and validation metrics

Reputation & Pricing



Linking ratings with pricing for competitive assessment per municipality

Spatial Distribution of Accommodations



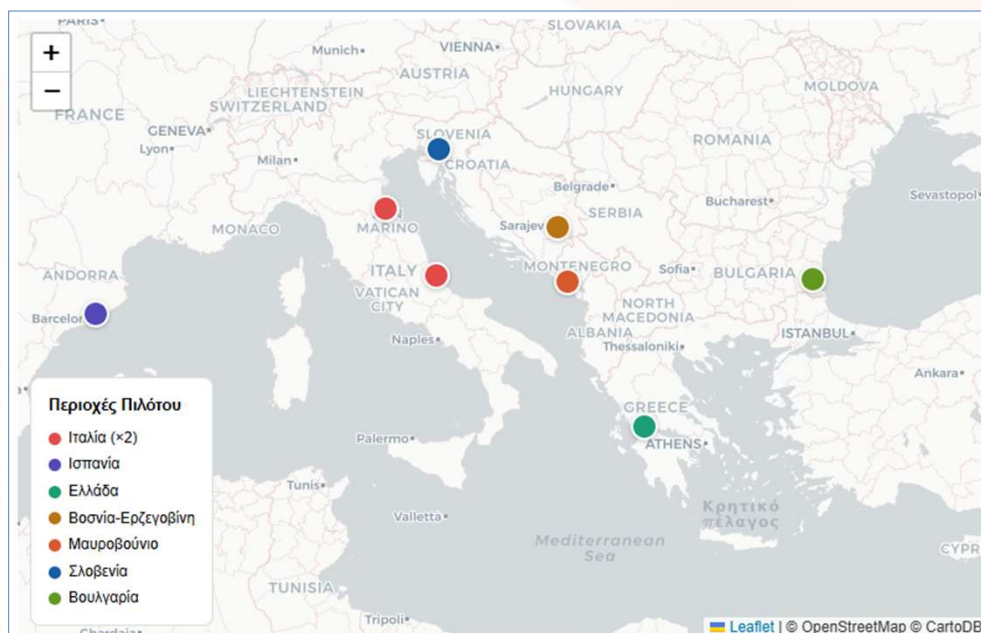
Density of hotels & apartments, coastal & inland patterns

Types of Businesses on Maps



Spatial distribution of tourism businesses across all municipalities

DMSS Pilot Testing



Italy

- **Regione Emilia-Romagna** — 11 coastal municipalities (Rimini, Ravenna, Cesenatico etc)
- **Regione Abruzzo** — 7 coastal municipalities in Teramo (Giulianova, Roseto degli Abruzzi ect)

Spain

- **Terrassa** — city in Catalonia, at a distance of 20 Km from Barcelona, 228.785 inhabitants

Greece

- **Western Greece** — municipalities in Etoloacarnania (Paleros, Astakos) and Achaia (Longos, Selianitika, Egio)

Bosnia Herzegovina

- **Istočno Sarajevo** — 1.450 km², 61.516 inhabitants

Montenegro

- **Kotor** — coastal city UNESCO, 21.916 inhabitants

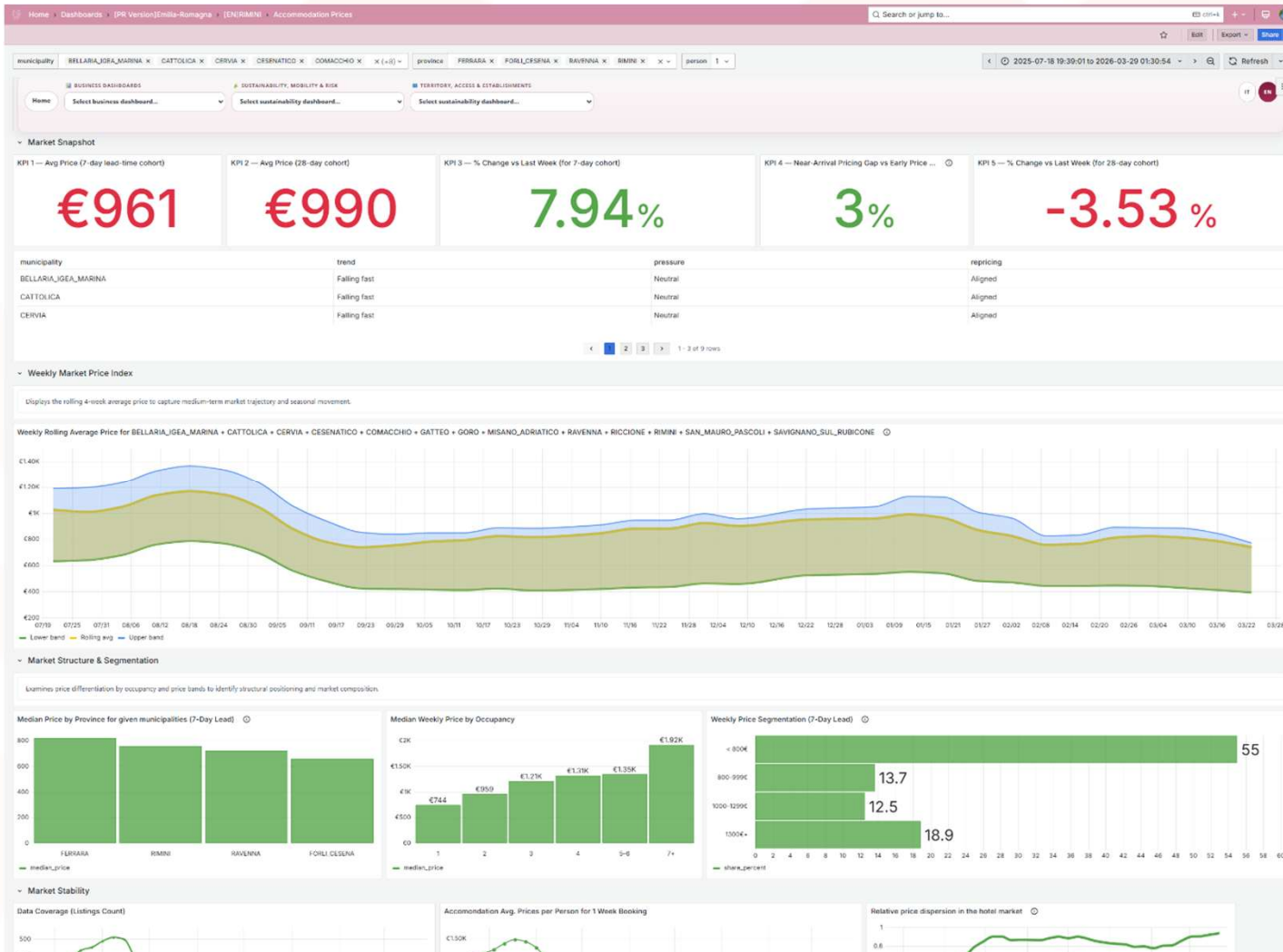
Slovenia

- **Green Karst** — 6 municipalities (Postojna, Cerknica, Pivka etc), 53.092 inhabitants, 1.456 km²

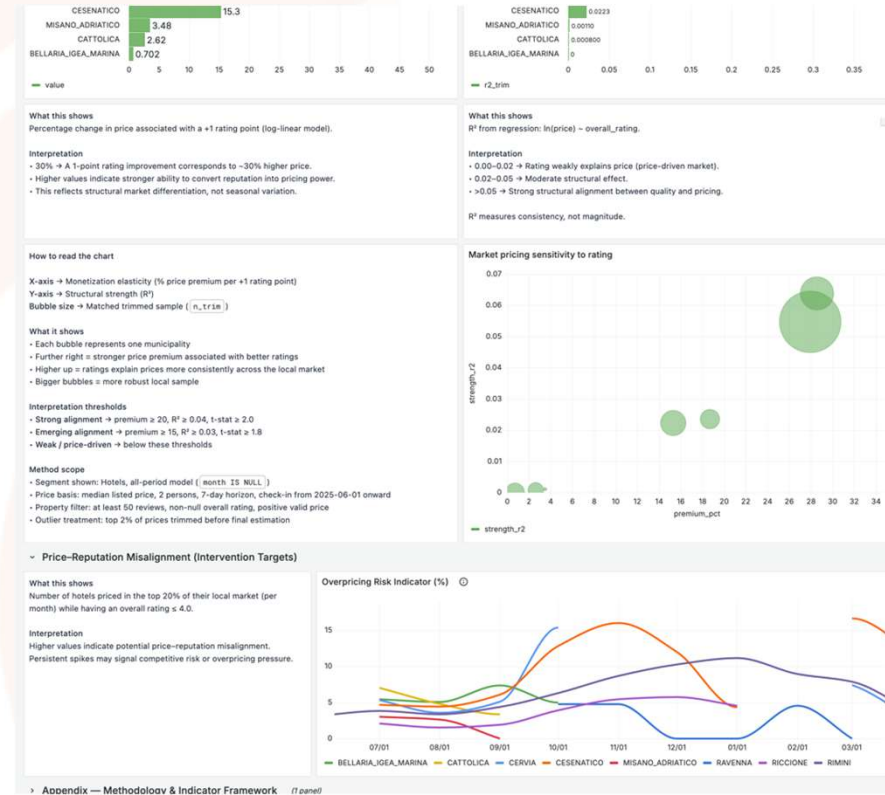
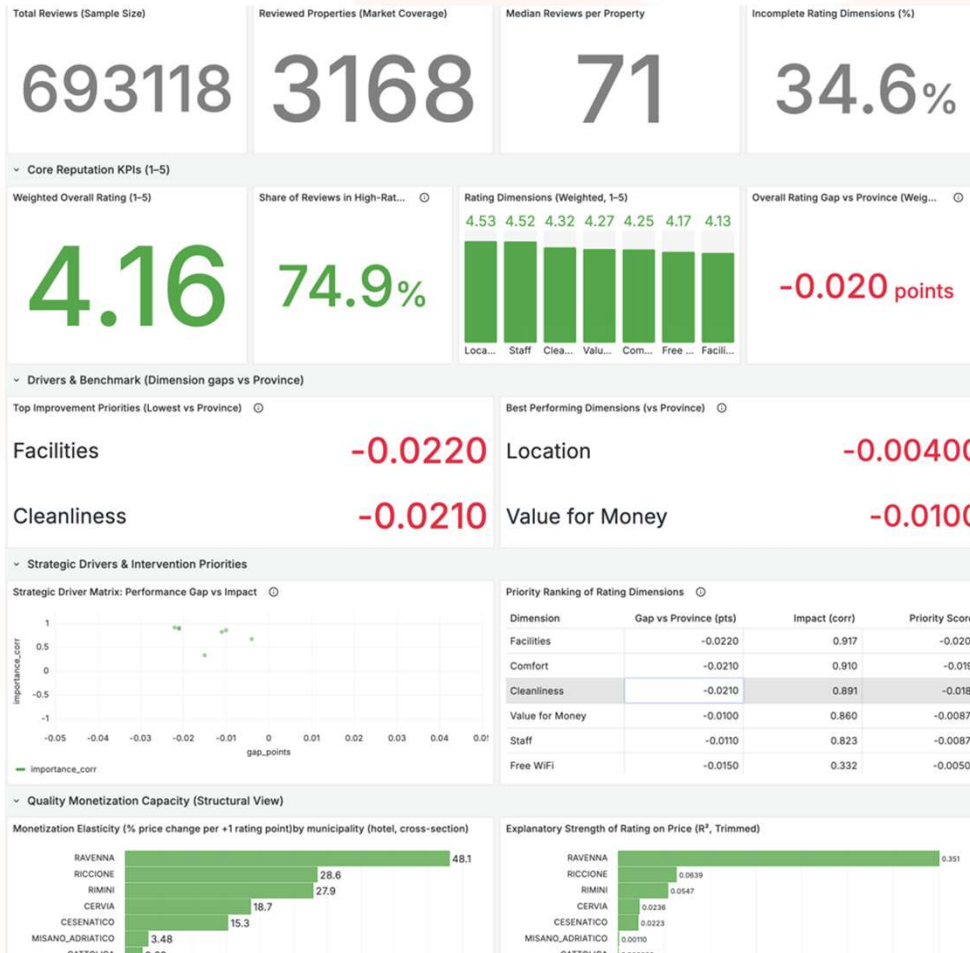
Bulgaria

- **Burgas** — Region in SE Bulgaria, Black Sea, 13 municipalities, 7.748 km²

Pricing and Trends



Visitor Sentiment Analysis



Tourism Flow and Economic Impact

Tourism Flow and Economic Impact – Emilia-Romagna (IT)

This section compares inbound international tourism with outbound travel by regional residents, across expenditure, visitor volumes, and overnight stays. Together, these indicators provide a structural view of tourism inflows, outbound leakage, and overall demand intensity over time.

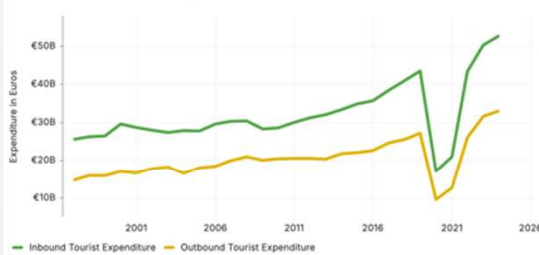
The three panels illustrate revenue trends, flow dynamics, and accommodation pressure, supporting assessment of tourism's contribution and balance within the regional economy.

Source: Banca d'Italia – International Tourism Survey. Annual statistics on inbound and outbound tourism expenditure and flows.

Inbound vs Outbound Tourism Expenditure

This chart compares expenditure by international visitors (inbound, green) with spending by regional residents travelling abroad (outbound, yellow). Values are expressed in euros and illustrate the balance between tourism revenue inflows and outbound spending over time.

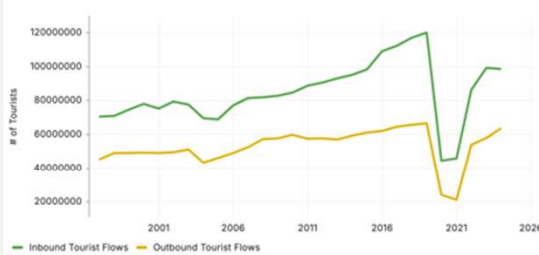
Inbound vs Outbound Tourism – Expenditure



Inbound vs Outbound Tourism – Number of Visitors

This chart compares the annual number of international visitors (inbound, green) with regional residents travelling abroad (outbound, yellow). It illustrates the evolution of tourism flows and supports interpretation of revenue dynamics when analysed alongside expenditure trends.

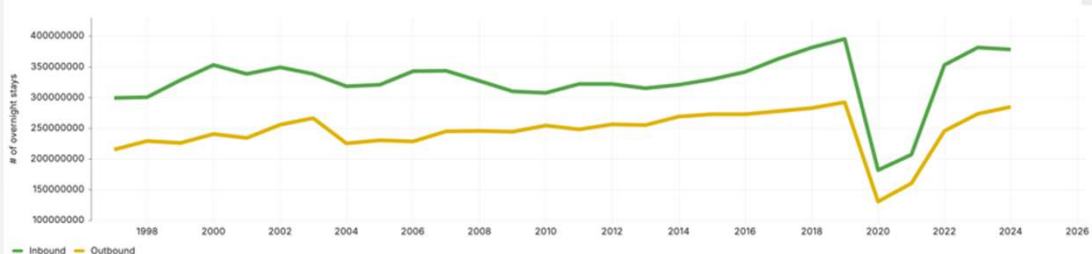
Inbound vs Outbound Tourism – Visitor Flows



Inbound vs Outbound Tourism – Overnight Stays

Annual overnight stays by inbound international visitors (green) and outbound regional residents (yellow). This indicator captures overall tourism intensity, combining visitor volume and average length of stay.

Inbound vs Outbound Tourism – Overnight Stays



Sustainability KPIs

Executive KPIs (Latest Year Snapshot)

Recycling % for YEAR :2024

80.2%

YoY Change (pp)

0.710%

Deviation from Regional Recy...

1.20%

Deviation from Province Recy...

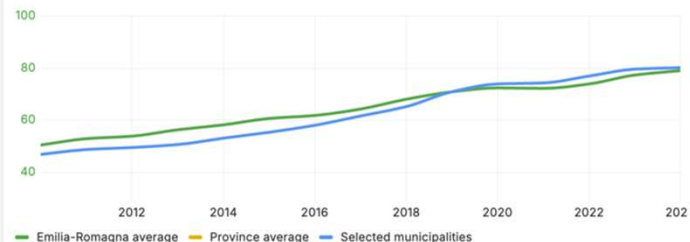
0.00%

Non-Recyclable per ...

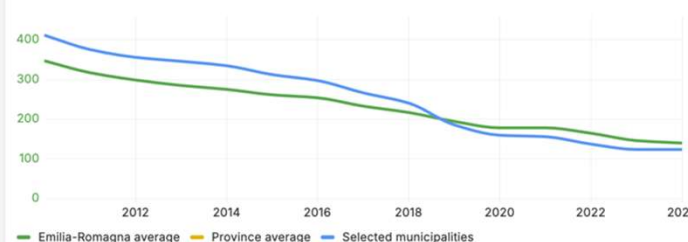
123 kg

Performance Trends vs Province & Region

Recycling % trend (weighted)



Non-recyclable per capita trend(kg)

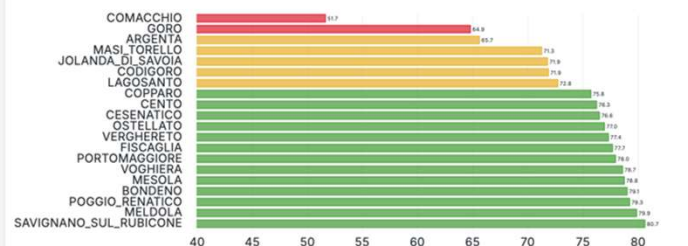


Benchmarking & Ranking

Top 10 Recycling % for Year: 2024



Bottom 10 Recycling % for Year: 2024

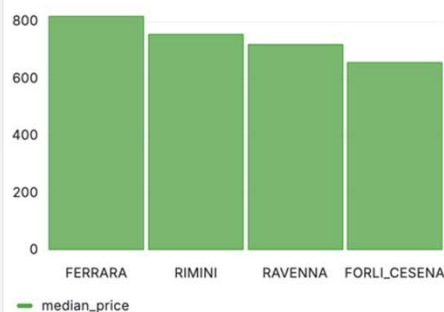


Market Structure & Segmentation

Market Structure & Segmentation

Examines price differentiation by occupancy and price bands to identify structural positioning and market composition.

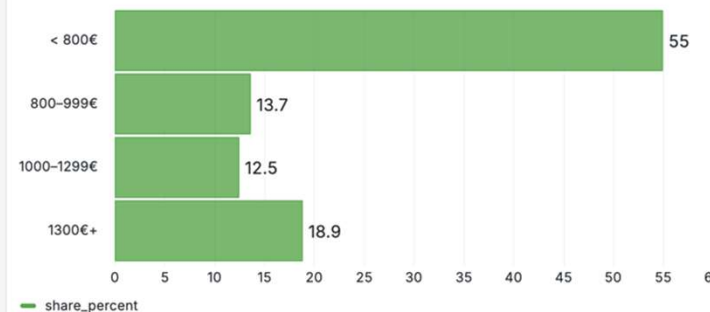
Median Price by Province for given municipaliti...



Median Weekly Price by Occupancy

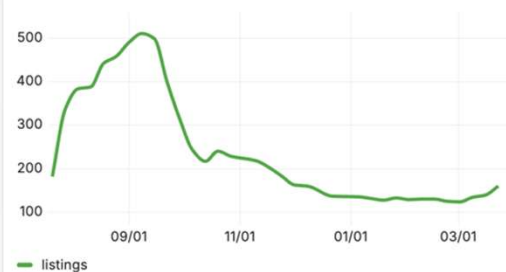


Weekly Price Segmentation (7-Day Lead)

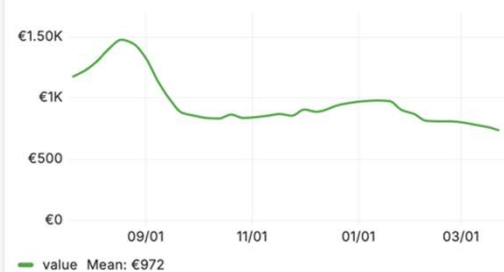


Market Stability

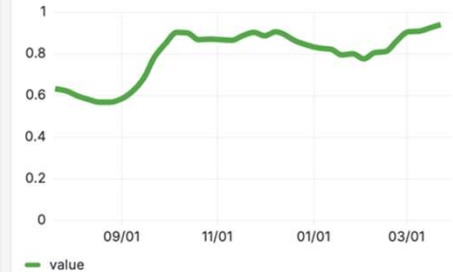
Data Coverage (Listings Count)



Accommodation Avg. Prices per Person for 1 Week Booking



Relative price dispersion in the hotel market

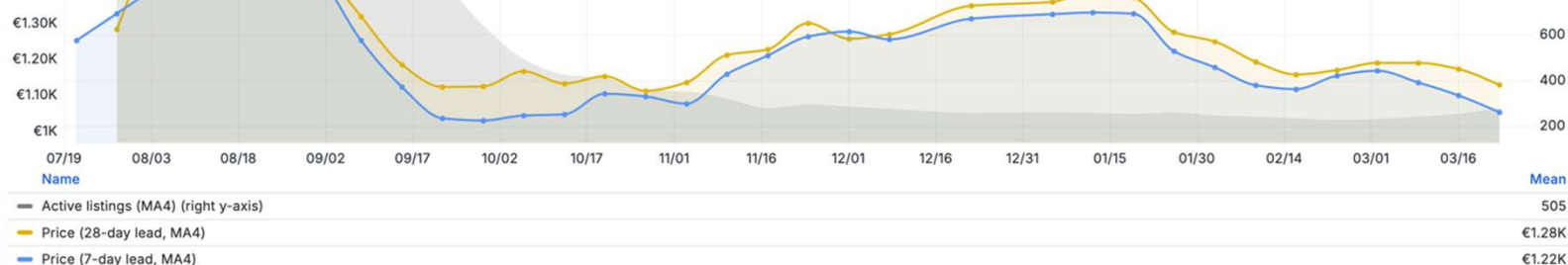


Supply & Pricing Dynamics

Supply & Pricing Dynamics

Measures expectation revision and volatility between early (28-day) and near-arrival (7-day) pricing signals.

Accommodation Avg. Prices for Weekly Stays Booked in Advance for 1 Persons



Data reliability indicators

Volatility Normalizati...

0.17

Outlier Frequency (Extreme-...

3.03%

Market Supply Elasticity

0.714

Price Distribution Consistency

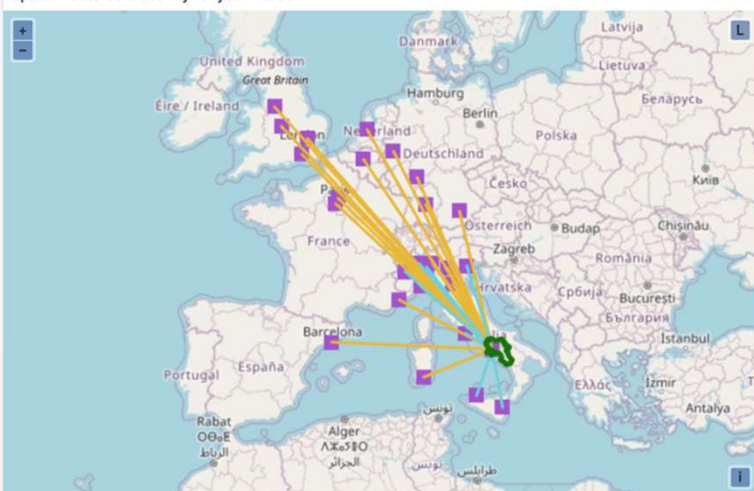
0.223

Seasonal Signal Strength (Tr...

0.746

Connectivity

Spatial Route Connectivity for year : 2002



Naples International Airport (IT_LIRN) Seat Utilization Rate



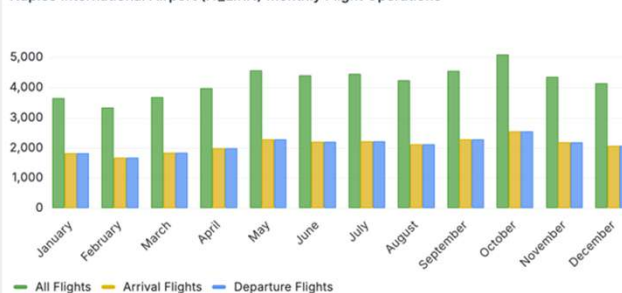
DMSS analytics

Airport Strategic Snapshot — Naples International Airport (IT_LIRN) (2002)

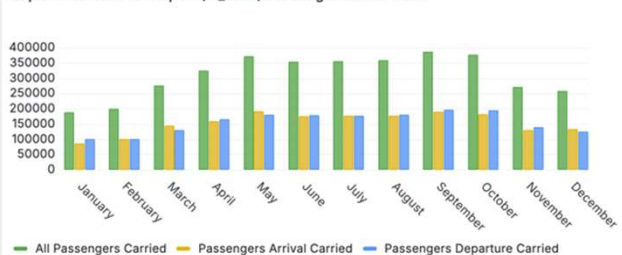


Data source: Eurostat – European Union official statistics. Airport traffic and passenger movement data derived from the Eurostat air transport database.

Naples International Airport (IT_LIRN) Monthly Flight Operations



Naples International Airport (IT_LIRN) Passenger Traffic Trend



Social sustainability

Coverage / penetration

Social Sustainability – Accommodation Coverage

This section evaluates the distribution of socially relevant accommodation amenities across Emilia-Romagna municipalities. It focuses on accessibility, inclusion, and family-oriented facilities.

INDICATORS

- Penetration Rate: % of listings offering a given amenity.
- Accessibility Share: Listings declaring at least one accessibility-related feature.
- Regional Comparison: Difference between selected municipality and regional average (percentage points).

Data based on scraped listing amenities (e.g. Booking). Amenities are self-declared and do not guarantee certified accessibility standards.

Accessibility Coverage

Share of accommodations declaring at least one accessibility-related amenity (wheelchair access, adapted facilities, or barrier-free features).

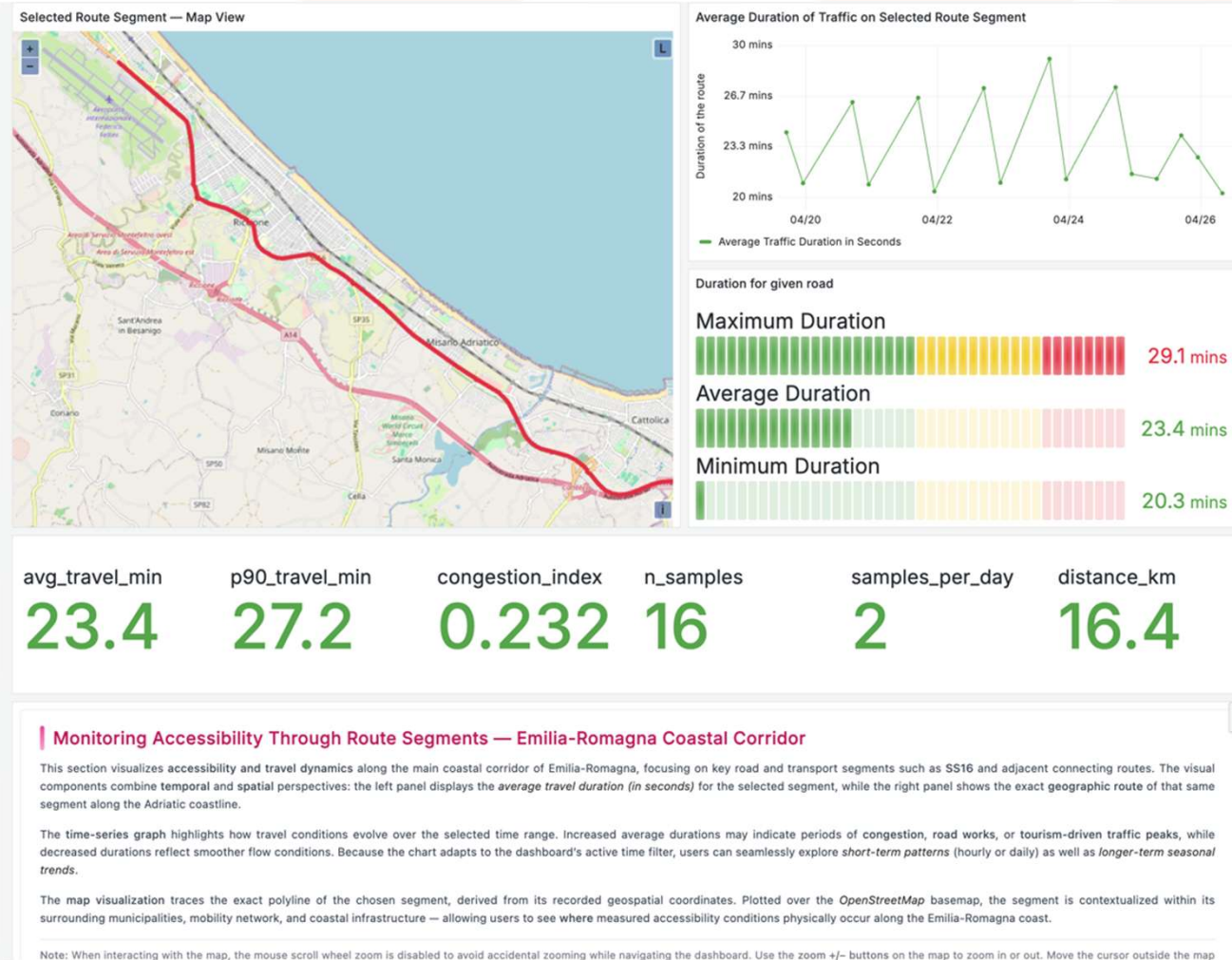
- % Accessible (those areas) → Overall benchmark
- % Accessible (selected area) → Local performance
- Δ → Gap vs benchmark (positive = stronger, negative = weaker)

Accessible Accommodations in CESENATICO Compared to the Emilia-Romagna Total



Amenity Type ▾	% Have This Utility (those areas) ▾		% Have This Utility (selected area) ▾	
family_child_infrastructure	89.2		90.4	
safety_and_security	82.2		75.5	
coastal_scenic_value	73.7		76.9	
international_readiness	72.2		66.4	
breakfast_quality_signal	66.3		66.4	
structural_accessibility	58.3		53.4	
service_intensity_professional_operat	49.0		50.5	
sports_active_recreation	41.8		39.4	
aquatic_infrastructure	34.5		24.5	
wellness_thermal_infrastructure	30.8		34.6	
accessibility_policy_commitment	24.6		27.4	
entertainment_social_experience	22.6		28.9	
bathroom_accessibility	15.2		18.3	

Mobility & Transport



Key Take Aways

- A modular, web enabled, big data analytics platform for evidence based decision making
- A transferable tourism intelligence asset to support tourism governance, sustainability monitoring and destination management
- Technology is here – Main challenges relate to governance, data fragmentation, skills gap, regulatory & data privacy issues, private sector engagement
- Different exploitation models are envisaged: partnership/public service model, territory-by-territory deployment, hybrid exploitation
- Standardised dashboards with capacity for new additions



Merci pour votre attention!

Contactez moi sur :

Kalogeras@athenarc.gr

 www.athenarc.gr; www.isi.gr;

